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PERSONAL LEARNING ENVIRONMENTS FOR BUSINESS ORGANIZATIONS

by

DENISE WUNDERLICH

DISSERTATION

Submitted to the Graduate School

of Wayne State University

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

2016

MAJOR: INSTRUCTIONAL TECHNOLOGY

Approved By:

Advisor

Date

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DEDICATION

I dedicate my dissertation work first and foremost to my one true love, my wife, Shawna Gobel, who has unfailingly believed in me, whose eye for detail was instrumental during the editing process, who sacrificed leisure time together, and who carried the flag of confidence in my ability to be a true scholar.

Secondly, I dedicate my dissertation work to my in-laws Frank and Charlotte Gobel, and Shawna's late aunt Muriel Sherbow, who also stood steadfastly by my side, cheering me on when I faltered, providing much support during times of difficulty, and relishing in my successes.

And thirdly, I dedicate my perseverance, determination, and strong value in and passion for learning that sustained me through this dissertation process to my nieces Andrea Wunderlich, Jordan Gobel, Jaime Gobel, and my nephew Mitchell Wunderlich in the hope they follow my lead to pursue their goals with all of their heart and soul, no matter the obstacles. My mother, Helga Wunderlich, who passed during the time I had been pursuing the doctoral degree, is, I imagine, beaming with pride.

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CHAPTER 1: INTRODUCTION

Background

“In a knowledge economy, the flow of information is the equivalent of the oil pipe in an industrial economy” (Siemens, 2004, p. 4). We have arrived at the Knowledge Age where ownership of knowledge and the ability to use that knowledge to create and improve goods and services defines success and wealth. “We are in the midst of another revolution that at least rivals the Industrial Revolution. This revolution... is significantly changing our society and thus the value of knowledge and talents” (Zhao, 2009, para. 2). Business pressures such as shorter product life cycle, new technologies in the workplace, and the increasing instability of employment create a need for workers to update their occupational skills and knowledge continuously (Attwell, 2007). These pressures, combined with globalization, have led to changing work practices that require different ways to prepare and train for workplace skills. Additionally, “the days of isolated desk jobs are disappearing, giving way to models in which teams work actively together to address issues too far-reaching or complex for a single worker to resolve alone” (Johnson, Smith, Willis, Levine, & Haywood, 2011, p. 3). Today’s workers need to be highly educated and highly skilled in working collaboratively, engaging in self-development and lifelong learning to keep pace with accelerating changes in information and technology (Bandura, 2002).

In his article on social transformation, Drucker (1994) described historical changes in the makeup of predominant groups of workers as going from farmers to live-in servants, and by the 1900s to the blue collar or industrial worker, ending with today’s emerging dominant group – knowledge workers. For Drucker, these workers required a “habit of continuous learning” because to be considered educated today means holding more than a college degree. It means

learning how to learn, ongoing learning, and development of specialties. The competitiveness of every industry, according to Drucker, depends on these knowledge workers. He believed that knowledge had become the key resource for a nation's military and economic strength. Bandura (2002) also felt that "the hope and future of people in a knowledge-based global society that is rapidly changing reside in their capacities for continual [educational] self-development and self-renewal" (p. 4). Lifelong learners can pursue their learning in the more institutionalized, formal, curriculum-driven settings typically found within the corporation; in informal contexts that are spontaneous, unstructured, and possibly self-directed, as well as done individually or in a group; or in a combination of formal and informal settings. Lifelong learning, a concept that emerged in the 1990s is broader than its predecessor concept, lifelong education, popularized in the 1960s and 1970s with an almost exclusive focus on formal training. "The exact meaning of lifelong learning is still being debated, but two ways it can be seen are (a) as access to higher education for all or (b) access to training to develop skills needed in the workforce" (Merriam, Caffarella, & Baumgartner, 2007, p. 48).

The Problem: Corporate Formal Training is Insufficient for the Learning Needs of Modern Employees

Formal business educational practices as they exist today are not conducive to employees seeking self-development and continual learning because business education tends to consist of training programs that are instructor-led or online versions of classes. The curriculum content is professionally organized and usually derived from needs/concerns identified by management. A growing number of companies utilize virtual learning environments (VLEs), also known as learning management systems (LMSs) that track and evaluate employees' learning activities as part of professional development. Wilson et al. (2006) believed that these environments made it difficult for employees and companies to go outside of their bounded learning environment to

connect with other organizations or learners (who have the same interests) to exchange and build knowledge. This practice is in opposition to the “...lifelong and life wide learning model where there is an important role for cross-organizational learning and informal learning” (Wilson et al., 2006, p. 3). McLoughlin and Lee (2008) believed that LMSs would soon become outdated because they perpetuated the traditional “student-as-information consumer” model and reinforced learning models that placed the curriculum at the center rather than the learner. Siemens (2006a) who planned, researched, and implemented social networked technologies, and Cross (2007) believed these structured, course-based delivery methods of education were not able to meet the challenges of “a complex information climate.” Siemens (2006a) noted that if the education provided was intended to increase employees’ ability to stay current and to innovate, the needed knowledge might not be readily encountered or acquired by relying exclusively on top-down, formal learning initiatives. Siemens asserted that it is more effective to implement multi-faceted learning experiences, which includes the informal learning that occurs naturally in the workplace, as well as self-directed and networked learning. For society to stay productive and innovative, our workforce needs to become proficient at self-directing their learning (Bandura, 2002).

In his exploratory study, done for The American Society for Training & Development and The Institute for Corporate Productivity, Paradise (2008) surveyed 1,104 human resource and learning professionals. His findings pointed to the need for those professionals to find ways that could leverage informal learning and achieve organizational goals because workers are “. . . clearly accessing knowledge through channels besides official company platforms” (Paradise, 2008, p. 53). Employees tend to learn more from the informal practices they experience in their daily work-life than from the top-down formal learning initiatives offered by companies

(Merriam et al., 2007). Corporations can be unaware of what and how their employees are acquiring knowledge as they spend their training money on structured programs that end up playing a smaller role, as compared to informal learning. “Training programs, workshops, and schools get the lion’s share of the corporate budget for developing talent, despite the fact that this formal learning has almost no impact on job performance” (Cross, 2007, p. xix). Cross reported 10 to 20% as the percentage of learning that occurs through classes and workshops in workplace learning, with the remaining 80 to 90% of learning taking place informally. Clardy (2000) maintained that research literature demonstrated that self-directed learning (SDL) commonly was used by adults to address their learning needs and that there had been a growing interest in the application of self-directed learning in the workplace. As employees now must constantly be able to access the latest knowledge in their field or profession, Guglielmino and Murdick (1997) concluded that self-directed learning was an important approach for workers.

Guglielmino and Murdick (1997) discovered a “quiet revolution” of corporations (e.g., Motorola, Disney, Aetna, Xerox, and American Airlines) that are implementing self-directed learning as part of their training initiatives. According to these authors, they are saving 20 to 50% in their training expenditures. The following is a sampling of reasons given as to why self-directed learning is more efficient and effective: (a) SDL has greater relevance to the particular needs of each individual; (b) skills and knowledge can be updated in a more timely fashion; (c) SDL can provide more focus in specialized fields; and (d) the cost of training can be reduced.

Wilson et al. (2006) also indicated that the dominant learning structures of organizations (LMSs) are being challenged:

...by the desire to bridge the worlds of formal and informal learning and to realize the goals of lifelong learning, and ...by the increasingly prevalent forms of social software and the new paradigms of the web as technology platform. (p. 10)

The University of Massachusetts Dartmouth Center for Marketing Research published their fourth yearly online report by Barnes and Mattson (2009) that examined the use of social media by fast growing U.S. companies. This study (based on 171 company respondents out of 500) showed that corporate familiarity with and use of social media is growing at a rapid rate. Companies in the study recognized the importance of social media to their business success.

In summary, a need exists for an alternative to standard corporate eLearning approaches that can reflect the needs of life-long learners better and capture the rich and valuable knowledge created and shared through informal, self-directed learning of company employees. In today's emerging culture of life-long learning, maximizing learning in the workplace is essential. Ellinger (2004) reported that having "environments conducive to learning" (p. 158) is an advantage so corporations can be competitive in the marketplace and employees can engage in the necessary practice of lifelong learning.

One way companies can maximize learning is to support employees' use of personal learning environments (PLEs) that rely on self-directed learning and informal learning opportunities. These PLEs can coexist alongside, or be integrated with a company's LMS, thereby allowing informal knowledge to be disseminated and shared among employees who can benefit from that knowledge. Unlike an LMS, a PLE provides autonomy to the learner and is "...highly customizable, adaptable and particularly flexible. Its objectives are to enable learners to aggregate their knowledge, but also to extend and develop their own knowledge" (Moccozet et al., 2011, p. 2). In essence, a PLE is created by employees for their continuous, life-long learning and can be the perfect combination of informal plus self-directed plus formal learning. Downes (2007a, 2007b, 2009) described a PLE as consisting of social networks, web 2.0 technologies, multiple views, and multiple technologies. The learning technology used in a PLE should be able

to promote autonomy, encourage diversity, enable interaction, and support openness (Downes, 2007a). PLEs can be created using a combination of “devices (laptops, mobile phones, and portable media devices), applications (newsreaders, instant messaging clients, browsers, calendars), and services (social bookmark services, weblogs, and wikis) within what may be thought of as the practice of personal learning using technology” (Wilson et al., 2006, p. 9).

Linked to the idea that self-directed learning is gaining in importance is the idea that learning increasingly takes place in different environments and contexts and is not furnished by a single provider (Attwell, 2007). Attwell noted that PLEs have the potential to bring together “...informal learning, workplace learning, learning from the home, learning driven by problem solving and learning motivated by personal interest as well as learning through engagement in formal educational programmes” (p. 2). For Attwell, PLEs offer much potential for knowledge creation and sharing within organizations.

Purpose and Research Questions

Business educational practices have, for the most part, centered on content-focused, top-down, structured initiatives such as classroom workshops and trainings and, more recently, eLearning courses that mirror classroom-based learning and make use of social media for learning initiatives. Until recently, the focus has been on how to implement online courses within corporate learning management systems (LMSs). There is, however, an emerging learning paradigm, which requires a new learning structure; one that allows for flexible, adaptable, networked, and employee-centered learning experiences (e.g., PLEs) that are essential if corporations and organizations want to stay on the cutting edge of growth in knowledge acquisition for their employees and organizations.

PLEs are a modern manifestation of self-directed learning that has evolved from the conveniences of internet tools and technology, along with the advent of Web 2.0 technologies, such as social media. This study builds on research in self-directed learning that is concerned with how the structure of learning projects evolve and are constructed by learners in business environments, as well as how employees make decisions about initiating, planning for, engaging in, and evaluating their own learning. Based on their research, Spear and Mocker (1984) developed the concept of the “organizing circumstance,” which proposed that learners tend to select learning projects from a limited number of opportunities that occur by chance within their environment rather than learners’ preplanning their learning projects. A caveat to the results of their research is that their study was conducted using adults who had not completed high school, so it is uncertain if their findings would be true for adult learners with higher formal education. Spear and Mocker concluded that research is needed to understand “...how the structure for learning is constructed and why learners make their decisions as their learning progresses” (p. 8).

This study examined the status of adoption of PLEs and factors that contributed to the adoption process by supervisor/manager-level employees in a local area healthcare organization. The common learning experiences, customs, and practices of supervisor/manager-level employees who used internet/Web 2.0 tools to solve work-related problems were examined, as well as how those employees designed the architecture of their PLEs. The healthcare organization chosen for this study was based on convenience, in light of this researcher’s previous involvement with the organization as an instructional design intern and the resulting positive working relationships that were established.

Research questions.

The following research questions guided this study and were in the context of supervisor/manager-level employees building/using their PLEs to accomplish work-related learning goals or for professional development.

Question 1: How do employees construct their PLEs?

- What internet/Web 2.0 technologies and/or applications are used by employees for:
 - finding information?
 - managing information (store, retrieve, classify)?
 - building and using networks to collaborate?
 - sharing information and knowledge with others?

Question 2: What triggers an employee to construct a PLE?

Question 3: How do employees use their PLEs?

- With what frequency do employees utilize their PLEs?
- What strategies do employees use through their PLE to:
 - critically analyze information?
 - make decisions about the information found?
 - create knowledge?
 - self-evaluate whether their PLE is effective in accomplishing their work-related learning goal(s)?

Significance of the Study

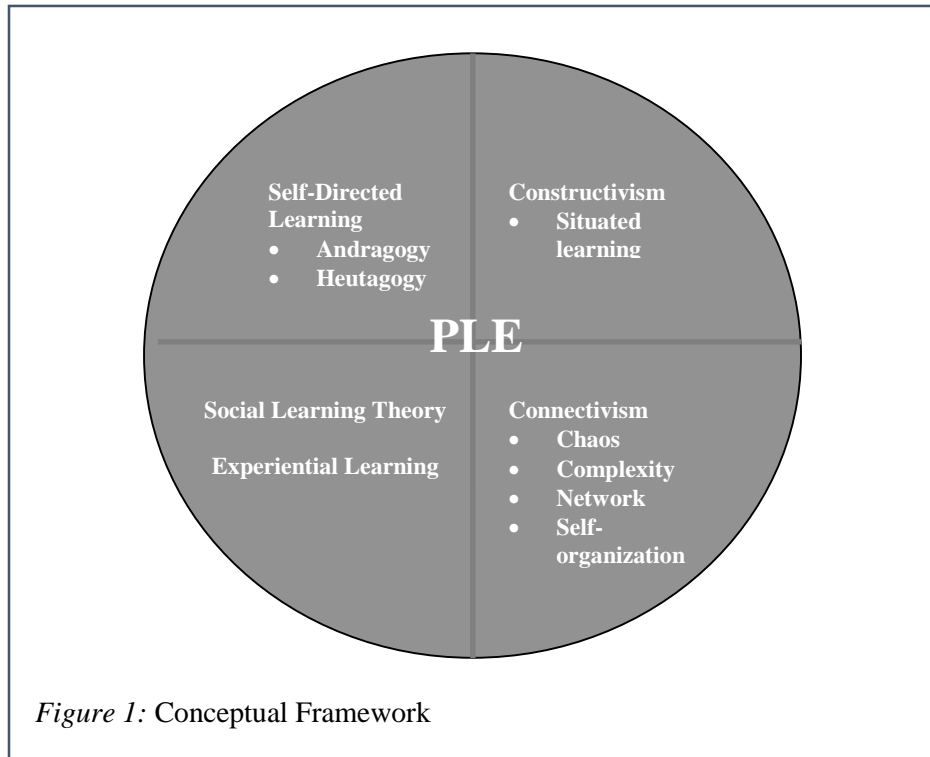
Personal learning environments allow learners to bring their formal, informal self-directed, social, and constructive learning experiences together. Promoting use of PLEs by employees is one way that organizations can foster lifelong learning in the workplace, thereby

ensuring that employees stay up-to-date, have the skills to effectively navigate and use available information, and expand and create knowledge within the work arena. This knowledge can be valuable currency in the knowledge economy, thereby making organizations that implement practices that promote PLEs stay competitive and cutting edge in the global economy.

This exploratory, mixed-methods, case study of how working adults go about planning, meeting, and evaluating their own learning experiences using internet/Web 2.0 technologies provided useful information regarding identification of factors that contributed to the adoption of PLEs by employees. The information may be used to inform further research on how instructional designers could support employees in creating and using PLEs and on how organizations could implement learning environments that maximize their employees' ability to create PLEs. The results of this study laid the foundation for future research to examine (a) what impact scaffolding strategies can have on employees using PLEs and (b) how an organization's learning infrastructure (i.e., electronic tools, Web 2.0 technologies, and policies and procedures) can be enhanced to create a learning organization: the next evolution from a teaching organization.

Conceptual Framework

The concepts and theories of self-directed learning, constructivism, connectivism, social learning theory, and experiential learning add a rich foundation and understanding of the ecologies of learning in PLEs. The following illustration shows this conceptual framework.



Each of the concepts and theories shown in Figure 1 contribute to understanding aspects of how individuals create and use various technologies to learn on their own volition. Understanding how employees independently take initiative to pursue a work-related learning goal, determine what information and knowledge they need to find, organize, and manage their efforts, and evaluate the relevance of what they discover is an important first step toward finding out how to help organizations build robust learning environments that can keep them internationally competitive and viable.

Self-directed learning speaks to the aspect of employees directing their own learning efforts rather than relying on their company to manage their learning. “Broadly defined, self-directed learning refers to activities where primary responsibility for planning, carrying out, and evaluating a learning endeavor is assumed by the individual learner” (Brockett as cited in

Brockett & Hiemstra, 1991, p. 24). It can also be seen as “learners controlling both the means and the objectives of their learning” (Mocker & Spear, 1982, p. 25).

Constructivism speaks to acknowledging that there can be more than one view or understanding of experiences, and that the view is subjective. By inference, one can argue that multiple realities exist as no two views will be the same because each person’s view will be influenced by a multitude of factors, including the community the person was raised in, the person’s cognitive abilities and limitations, and the person’s motivation, just to name a few. “Constructivism proposes that learning environments should support multiple perspectives or interpretations of reality, knowledge construction, and context-rich, experience-based activities” (Jonassen, 1992, p. 137). In constructivism, the mind “...is instrumental and essential in interpreting events, objects, and perspectives on the real world, and that those interpretations comprise a knowledge base that is personal and individualistic” (Jonassen, 1992, p. 139). Social constructivists make the argument that reality can only be socially negotiated. No one person’s experiences constitute reality, but rather the collective experience creates reality.

Activities undertaken by learners in a particular field or profession often are unrelated to the kind of activities performed by practitioners of that field or profession in their everyday work, thereby making it more likely that learners would not be able to apply what they learned to the work world. Responding to this, researchers (Brown, Collins & Duguid, 1989; Lave & Wenger, 1991) proposed a new model of instruction, situated learning, where learners would be taught their “trade” through social interaction and activity based on the traditional apprenticeship model. By situating learning in a relevant context, it is more likely that meaningful learning can occur.

In developing social learning theory, Bandura (1977) "...attempted to provide a unified theoretical framework for analyzing human thought and behavior" (p. vi). He spoke to the limitations of behavioral explanations and addressed the need for conceptualizations based on the new understandings of psychological processes. "Social learning theory emphasizes the prominent roles played by vicarious, symbolic, and self-regulatory processes" (p. vii).

Experiential learning speaks to how adults learn based on real work/life experiences. Models developed by Kolb, Boud, and Walker, Dean, and Joplin (as cited in Beaudin & Quick, 1995) offer theoretical frameworks for experiential learning that added to existing behavioral and cognitive models. There is a growing understanding of the importance of experience in informal and formal learning in the workplace. Experiential learning is an active form of learning that requires reflection, self-assessment, and self-correction. "Experiential learning is the ideal way of learning within unfamiliar and changing situations that do not behave in a stylised, predictable, fashion..." (Pietersen, 2002, para. 3), such as occurs in the modern day workplace. Informal, experiential learning constitutes a large part of the type of learning that occurs in PLEs.

Connectivism speaks to a new conceptualization of what knowledge is in the 21st century and how people generate and trade knowledge based on their connections with each other. Connectivism is one of the more recent pedagogical theories on which PLEs rest. Connectivism concerns itself with networks (internal – neural, external – social, nodes, and connections), knowledge (personal and social – distributed), and learning. Connectivism is "...the view that knowledge and cognition are distributed across networks of people and technology and learning is the process of connecting, growing, and navigating those networks" (Siemens & Tittenberger, 2009, p. 11).

Chapter 2 provides a comprehensive review of the literature on each of the aforementioned concepts and theories that make up the conceptual framework. Chapter 2 concludes with a summary of how each concept and theory supports a model of a PLE.

Variables Relevant to the Topic

This study used a mixed research design incorporating both quantitative and qualitative elements. The primary concept of interest is the PLE created by each supervisor/manager-level employee. A PLE is comprised of technology tools, social networking, contact with experts, and learning processes developed and used by an employee. Variables that could influence how supervisor/manager-level employees construct their PLEs are:

Demographic variables.

- gender
- age
- educational level
- race/ethnicity
- years worked for organization
- job title
- years in current position
- employee participation in formal training programs in last 12 months

Independent variables.

- employee perceived access to internet/Web 2.0 technologies
- employee level of expertise using social network sites
- reasons employees use internet/Web 2.0 technologies to accomplish work-related learning goals

- Characteristics that influence employees use of internet/ Web 2.0 technologies to accomplish work-related learning goals

Dependent variables.

- methods used to document /demonstrate their accomplishment of their learning goal
- employee degree of satisfaction with internet/Web 2.0 technologies and applications
- employee perception of credibility of internet/Web 2.0 technologies
- criteria (self-defined or other defined) used by employees to determine if learning goal has been achieved
- employee confidence in their abilities to utilize internet/Web 2.0
- likelihood of employees to use internet/Web 2.0 technologies to communicate with experts inside of their organization
- number of internet/Web 2.0 applications being used and for what purpose
- likelihood of employees to use internet/Web 2.0 technologies to communicate with experts inside and outside of their organization

Extraneous variables.

- employee exposure to and understanding of what a PLE is
- type of work-related problem they are attempting to solve
- type of professional development they are trying to achieve
- informal learning culture of the organization
- organizational support (e.g., technology made available, open or closed internet access, work polices on use of social media)
- open or closed nature of the organization in terms of communication with outsiders
- supervisor/manager support
- peer approval

- personality traits that influence employee preference/non-preference for self-directed learning

Definitions

Audioblogging/Podcasting:

Audioblogs and podcasts are audio recordings, typically in MP3 format, of an individual's opinions, talks, interviews, or lectures that can be played on a wide range of computer and handheld devices. Podcasts also can be comprised of video clips that express the same types of content but are referred to as vidcasts or vodcasts (Anderson, 2007).

Blogs:

A blog is a personal web page, section of a website, or web-based publication where an individual or several individuals share their knowledge through writing summaries, articles, or diaries. The entries (or posts) are usually viewed in reverse chronological order. A blog can contain images and links to other blogs and/or websites as part of their entry. Sometimes a group blogs together and shares their blog with other individuals or groups. Readers of the blog can typically add their own response in the form of a comment, which is available for the author and other readers to read (Anderson, 2007; Siemens & Tittenberger, 2009; Tutty & Martin, 2009).

eLearning 2.0:

eLearning 2.0 is more personal, social, and flexible than traditional types of learning in institutions, organizations, and businesses. It is "... an approach to learning that is based on conversation and interaction, on sharing, creation and participation..." that tends to be embedded in meaningful contexts such as a game or a workplace situation (Downes, 2006, p. 1). Learners can form together for the purpose of creating learning communities where they can pursue their learning objectives with the assistance of others who share similar objectives. Typically, e-learners use internet/Web 2.0 tools such as blogs, wikis, podcasts, etc. Pettenati and Cigognini

(2007) described eLearning 2.0 as an “open, destructured, immersive, and relational learning process amplifying the learning curve towards the social, relational side of knowledge construction over the net” (p. 47).

Formal Learning:

Formal learning is “institutionally sponsored or highly structured, i.e., learning that occurs in courses, classrooms, and schools resulting in learners receiving grades, degrees, diplomas, and certificates” (Dabbagh & Kitsantas, 2012, p. 4). Learners in these environments have minimal control over their learning objectives and how they achieve their objectives (Mocker & Spear, 1982; Spear & Mocker, 1984).

Informal Learning:

Informal learning places greater control in the hands of learners in terms of learners choosing the means, but they still do not have control over learning objectives. This type of learning occurs in personal and business contexts, tends not to be classroom based, and happens through observation, seeking input from others, and trial and error. (Dabbagh & Kitsantas, 2012; Mocker & Spear, 1982).

Information Literacy:

Information literacy is the “ability to critically evaluate and think effectively about information encountered, make relevant judgments and discriminate among values of the information, and communicate one’s thoughts” (Grafstein, 2002, p. 200). The Association of College and Research Libraries (2000) defined information literacy as “a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (Information Literacy Defined section, para. 1). By their

definition, an information literate person should have the ability to

- determine the extent of information needed;
- access the needed information effectively and efficiently;
- evaluate information and its sources critically;
- incorporate selected information into one's knowledge base;
- use information effectively to accomplish a specific purpose; and
- understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally.

(Information Literacy Defined section, para. 3)

Internet/Web 2.0 Technologies:

Internet technologies are means that allow information to be transmitted and consumed, and tend to be read-only. The associated technologies are considered information mediums rather than social mediums. Examples of these technologies are information resources (e.g., web pages, electronic books, and online newspapers), search engines, email, Skype, and online courses.

Web 2.0 technologies provide means for interacting, networking, and collaborating with others to exchange ideas, build knowledge, and get feedback. Common applications are: blogs, wikis, multimedia sharing (e.g., YouTube), and social network sites (e.g., Facebook, Twitter. Web 2.0 technologies allow individuals to participate in a collective learning process (Bouchard, 2011).

Knowledge:

Knowledge is a body of truth, information, and principles that exists within an intellectual and social context. "Information becomes knowledge when within the framework of

a discipline, it becomes integrated into that disciplines knowledge base” (Grafstein, 2002, p. 200).

Connectivist Knowledge:

Knowledge is a process located in distributed networks between people and systems: it results from connections (Siemens, 2006b). Knowledge does not stand alone – it emerges from the relationships between people and the properties of objects (Downes, 2012).

Knowledge Creation:

For cognitivists, knowledge is created by reasoning through a sequence of steps; for constructivists knowledge is made or built; and for connectivists knowledge is created through the formation of networks.

Knowledge Management:

Managing one’s personal knowledge through technologies, including creating, organizing, and sharing digital content and information (Dabbagh & Kitsantas, 2012).

Multimedia Sharing:

The creation and/or sharing of multimedia content such as videos, pictures, and podcasts through internet services that facilitate sharing, such as YouTube, Facebook, and Pinterest. The act of creating and sharing multimedia allows users to actively contribute to the production of web content (Anderson, 2007).

Networking:

Networking can be both for social and professional purposes. Networking is an age-old practice. For this study, the focus is on networking that occurs for the purpose of learning, through the use of web-based sites that allow for some type of interaction among members, such as chatting, emailing, video sharing, file sharing, picture sharing, etc. (Anderson, 2007).

Open Educational Resources:

“OERs are materials made freely available online for educators and learners to use, repurpose, and extend” (Siemens & Tittenberger, 2009, p. 47).

Personal Learning Environment (PLE)

Many tools used in PLEs will be based on software...that lets people rendezvous, connect, or collaborate by uses of a computer network. It supports networks of people, content and services that are more adaptable and responsive to changing needs and goals. (Attwell, 2007, p. 4)

PLEs use technologies to enhance learning, and consist of more than specific software applications. “PLEs can provide more holistic learning environments, bringing together sources and contexts for learning hitherto separate...[where] students learn how to take responsibility for their own learning” (Attwell, 2007).

Personal Learning Network (PLN):

When people interact and follow one another through one or more suite of tools on the internet (e.g. Facebook or Twitter) for the purpose of learning collectively within a particular area of interest, they are creating a personal learning network. The technology allows individuals to have “...more diverse, connected, autonomous, and open learning communities than ever before...learning within these networks is measured by the knowledge produced as a result of the interaction between and among members” (Watwood & Nugent, 2011, p. 21). These networks can resemble a community of practice. Forming networks allows individuals to stay current in the face of rapidly developing knowledge.

Professional Development:

Professional development is broadly defined as acquiring information/knowledge to enhance professional skills that can contribute to career building. Professional skills include: communication, leadership, personal, and professional skills (Guglielmino & Carroll, 1979).

Professional development also includes activity conducted in a PLE that falls under a process defined by Kolb (as cited in Zakarevičius & Župerkien, 2008) that involves obtaining specific career information/knowledge and determining how this newly acquired information/knowledge can be applied to work. Professional development can occur by participation in online learning communities, that allow for participants' reflection and conversation about their questions and needs for improving their job performance.

Search strategies:

A search strategy is an efficient, effective, and methodical process of planning how to use resources to find the most relevant information on a topic. For this study, the resources are limited to the internet/Web 2.0 technologies. There are different stages in the process of building a search strategy: (a) build concepts and groups of concepts to analyze the topic, (b) create a list of search terms, keywords, and phrases, (c) develop synonyms for the terms, (d) boolean operators can be used to define the relation between search terms and then can be used to facilitate the search process. (Literacy Course: Module 3: Search Strategies. http://www.itc.nl/Pub/Home/library/Library-Guides/LiteracyCourse/Module_3/Module3-Search_strategies.html)

Social Media:

“Social media is a 21st century term used to define a variety of networked tools or technologies that emphasize social aspects of the internet as a channel for communication, collaboration, and creative expression, and is often interchangeable with the terms Web 2.0 and social software” (Dabbagh & Reo as cited in Dabbagh & Kitsantas , 2012, p. 3).

Tagging/Social Bookmarking:

A tag is a descriptive word or phrase that is added to a digital resource, such as a website, a photo, a video clip, or a learning object. These tags can then be used as part of bookmarking systems, which allow users to “store, organize, search, manage, and share bookmarks of web pages on the Internet” (Tutty & Martin, 2009, p. 53). “When saving a webpage, users can tag the resource, select it for public or private view, and share it with others in a network” (Siemens & Tittenberger, 2009, p. 44), thus making it a “social” process.

Technology devices:

Technology: “the application of scientific knowledge for practical purposes, especially in industry” (<http://www.oxforddictionaries.com/definition/english/technology>).

Device: “a device is a machine designed for a purpose” (<http://whatis.techtarget.com/definition/device>). In this study, a technology device is a tool that advances learning. Examples are: computer, laptop, MP3 player, Smartphone, and e-reader.

Wikis:

“Wikis are a Website or a collection of Web pages that allow users to add and edit content collectively....most of the Wikis are available to the general public to read and edit, however there are private wikis that require secure access to alter the pages” (Tutty & Martin, 2009, p. 51). Wikis are collaborative tools that facilitate the production of group work. Users are typically allowed access to an online editing tool to change or delete the contents of the page the user is viewing. “A Wiki is basically a simple web page that anyone can edit....Wikis are chaotic, informal knowledge spaces. Wikis enable individuals to create a collective resource” (Siemens & Tittenberger, 2009, p. 43). The best known example of a wiki is Wikipedia.

Work-related Problems:

For the purpose of this study, solving work-related problems is defined as using information/knowledge acquired in a PLE to apply a solution to a problem or work assignment as dictated by a job task enumerated in the job description, or assigned by a manager, or as part of a work team.

Limitations of the Study

- Convenience sample of supervisor/manager-level employees who have gone through the leadership training program at XX. The results may not generalize to all employees at healthcare organizations.
- Results found in this organization may be particular to the healthcare industry and not generalize to other types of organizations.
- The healthcare industry has Health Insurance Portability and Accountability Act (HIPAA) laws related to patient confidentiality that can impose restrictions on use of internet/Web 2.0 technologies not encountered in other industries.

Assumptions of the Study

- The identified supervisor/management-level employee group would be highly educated, motivated for success, and most likely to be using internet/Web 2.0 technologies for self-directed and informal learning, thereby increasing the likelihood that they were creating and using PLEs for work-related problems and career development.
- Organizational contextual factors influence the adoption of PLEs by employees in the workplace

- The responses of the participants to the survey and interview process reflect their attitudes and perceptions of personal learning environments.

CHAPTER 2: LITERATURE REVIEW

Self-Directed Learning (SDL)

By definition, PLEs require the learner to be self-directed in their pursuit of knowledge. As learners develop their PLE, there is a simultaneous demand on them to apply skills in self-regulation and to grow these skills as their learning environment is continuously transformed. “The central question of how adults learn has occupied the attention of scholars and practitioners since the founding of adult education as a professional field of practice in the 1920s” (Merriam, 2001a, p. 3). Research in adult education grew in the 1960s and during this time adult education started to be viewed as a field. After much research and debate, a unifying theory of adult education still does not exist. “What we do have is a mosaic of theories, models, sets of principles, and explanations that, combined, compose the knowledge base of adult learning” (Merriam, p. 3). Self-directed learning, as one category of adult learning, has been widely studied and researched starting in the 1970s and 1980s (Brockett & Hiemstra, 1991; Merriam, Caffarella, & Baumgartner, 2007). “An important finding from self-directed learning research, as it relates to adult learning, is that...most learners prefer to take considerable responsibility for their own learning when given the opportunity” (Hiemstra, 1994, p. 81). In addition to this preference, today’s workers are required to adapt to rapid changes for which they constantly need to update their skills and knowledge. Businesses are in need of alternative methods of learning for their employees to help them stay current. Self-directed learning can be one of those methods (Durr, Guglielmino, & Guglielmino, 1994).

Andragogy.

Knowles (1968) earned the moniker “father of adult learning” by taking the position that adult learners have separate needs from pre-adults and he proposed a myriad of ways that

educators could respond to those needs. Knowles' ideas became affiliated with the concept of andragogy (a term first originating in Germany), as compared to the concept of pedagogy for children. As part of his work, Knowles developed five assumptions underlying andragogy that defined how the adult learner was different. Merriam (2001a) summarized Knowles' five assumptions about the adult learner:

(1) has an independent self-concept and who can direct his or her own learning, (2) has accumulated a reservoir of life experiences that is a rich resource for learning, (3) has learning needs closely related to changing social roles, (4) is problem-centered and is interested in immediate application of knowledge, and (5) is motivated to learn by internal rather than external factors. (p. 5)

Knowles used these assumptions in a myriad of ways as he developed strategies on how to design, implement, and evaluate adult learning activities. Andragogy came to be used by those who wanted to define adult education as distinct and separate from other areas of education.

Knowles' (1968) model or theory of andragogy later received criticism because "...it slights the full range of adult learning experiences, makes misleading distinctions between adult and child learners, minimizes individual differences between learners, and does not adequately deal with the relationship between motivation and learning" (Clardy, 2006, p. 2). Other scholars have critiqued andragogy as Knowles used it for not taking into account the context in which learning takes place; "...there is little or no acknowledgement that every person has been shaped by his or her culture and society..." (Merriam, 2001a, p. 7). Finally, it was debated as to whether or not andragogy could be considered a theory of adult learning. (Merriam & Caffarella, 1999).

In spite of these problems, Knowles' (1968) approach dominated the field of adult education for almost 40 years. He was attentive to the criticisms his work received and he later acknowledged that his ideas were less a theory than a conceptual framework.

Knowles revised his thinking between 1970 and 1980 from viewing pedagogy as only applying to children and andragogy as only applying to adults (in opposition

to each other) to seeing pedagogy (teacher-directed learning) and andragogy (student-directed learning) as existing on a continuum, where each could apply to a child or an adult, depending on the circumstances. (Merriam, 2001b, p. 6)

Andragogy thus came to represent the type of learning rather than the learner them self. This shift in thinking led Knowles to focus on self-directed learning, both defining self-directed learning and outlining ways educators can implement self-directed learning in the classroom (Knowles, 1975).

Considering that andragogy has been the primary model of adult learning for nearly thirty years [now nearly forty], relatively little empirical work has been done to test the validity of its assumptions or its usefulness in predicting adult learning behavior [and yet]...practitioners who work with adult learners continue to find Knowles's andragogy, with its characteristics of adult learners to be helpful. (Merriam & Caffarella, 1999, p. 276-277)

Pilling-Cormick (1996) believed that andragogy was used primarily in nonformal or self-directed learning situations because that model is best suited for those types of learning. Today andragogy is viewed as one prescriptive model in adult education in North America.

Heutagogy.

Hase and Kenyon (2007), two educators from Southern Cross University in Australia, felt that Knowles made significant contributions to responding to the limitations of pedagogy, but did not go far enough. They expanded on his work by elucidating the idea of adult learning that was not teacher-centric and that arose spontaneously from situations encountered through experience. They coined the term heutagogy to describe "...learner-centered learning that sees the learner as the major agent in their own learning, which occurs as a result of personal experiences" (Hase & Kenyon, p.112). These authors have an interest in understanding how self-determined learning (as different from self-directed learning) that occurs during the normal course of work leads to "capable" workers: workers who can apply their knowledge and skills to new and complex contexts.

To design learning processes that are informed by heutagogy, Hase and Kenyon (2007) prescribed: (a) an open and flexible curriculum that is responsive to the learner's changing needs, (b) the learner as the key driver, (c) identification of learning activities/processes by the learner in addition to the teacher, (d) learner involvement in the formulation of assessments and self-assessments, and (e) coaching of learners as required. Blaschke (2012) indicated that other researchers (e.g., Anderson, Wheeler, Bhoryrub et al., Ashton & Newman, Gardner et al.) are working with the concept of heutagogy. Hase and Kenyon (2007) were the first to state that there is a need to "...investigate through a focused research program whether or not heutagogy is a useful concept" (p. 115). In the heutagogical approach, as with PLEs, learners are the designers who decide what their learning goals and plans are and determine which resources they want to pursue. By placing the focus on what learners are doing, rather than what the teacher is doing, learners' capacity and capability for lifelong learning can be developed to facilitate their preparation for the complexities of current and future workplaces.

Blaschke (2012), in her review of heutagogical practices and approaches, sees heutagogy as applying to "...emerging technologies in distance education and for guiding distance education practice..." (p. 56) as it relates to social media, specifically Web 2.0 technologies. Web 2.0 technologies allow people to create, share, collaborate and communicate (activities that occur within PLEs). Blaschke noted that in addition to the learning path being under the control of the learner, an important aspect of "double-loop" learning is that the learner needs to be able to reflect on the problem-solving process in which they are engaged, to question their own values and assumptions, thereby allowing them to enhance how they learn. According to Blaschke, as one progresses from pedagogy, to andragogy, to heutagogy, greater learner maturity and autonomy and less instructor control and structuring are required.

Bhoyrub, Hurley, Neilson, Ramsay, and Smith (2010) agreed that heutagogy is an emerging term for self-determined learning and they recognize it as a “...potentially highly congruent educational framework to place around practice based learning” (p. 322), which is, for example, the type of learning in which nurses engage. They argued that traditional learning (teacher-centric) can provide important skills and knowledge, but typically learners can only repeat what they learn in similar contexts. However, in unpredictable and complex work environments such as patient care, learners need to know how to apply and adapt what they have learned independently, thereby acting “capably” rather than merely “competently” (Hase & Kenyon, 2007). Heutagogy is a useful concept (even though it has not received much attention from researchers to date) that can be applied to the complex learning that occurs in personal learning environments.

Informal self-directed learning.

In exploring existing literature on informal learning, understanding the many terms that are used interchangeably in research literature can cause confusion: informal learning, nonformal learning, experiential learning, on-demand learning, self-directed learning, action learning, tacit knowledge, and situated cognition (Marsick & Watkins, 2001). Mocker and Spear (1982) have derived classifications for some of the terms listed. They define *formal learning* as learners having little control over the objectives and means of learning, and *informal learning* as learners controlling the means but not the objectives of learning.

Informal learning can also be confused with incidental learning. “Informal learning is usually intentional but not highly structured” (Marsick & Watkins, 2001, p. 25), whereas incidental learning tends to happen as an unintended side effect of another activity. These authors stated that a review of the literature by researchers demonstrated that both informal and

incidental learning occur frequently within a variety of learning settings, including the business world. Informal learning can be planned or unplanned, because the learner may not set out to intentionally and explicitly learn a preplanned learning objective. Informal learning can "...take place wherever people have the need, motivation, and opportunity for learning" (p. 28). Pilling-Cormick (1996) sees formal education as "...taking place in educational institutions and often leads to degrees and credit of some sort...and informal learning refers to the experiences of everyday living from which we learn something" (p. 21). This author indicated that many types of organizations make use of informal learning as part of their instructional practices.

The necessity of informal learning.

In spite of the confusion in defining informal learning, researchers have suggested "that it is the natural learning complement to a world that is increasingly on-demand" (Paradise, 2008, p. 53). Paradise asserted that the focus on informal learning is especially important as workplace learning shifts to continuous knowledge acquisition. Cross (2007) reported 80-90% of learning takes place informally. Cross cited the following six references that reported similar percentages of informal learning in workplaces (Conner [75%]; Raybould [85-90%]; Dobbs [70%]; Lloyd [75%]; and Vader [75%]). Data collected in 2000-2001 indicated that the rate of informal learning taking place in the workplace remains upwards of 70% (Kim, Hagedorn, Williamson, & Chapman, 2004). For Merriam et al. (2007), self-directed learning conceptually fits under the category of informal learning and is distinguished from informal learning because it is intentional and conscious. Garrison (1997) also perceived self-directed learning as originating from independent and informal adult learning contacts, thereby connecting informal learning and self-directed learning that he defined as "an approach where learners are motivated to assume personal responsibility and collaborative control of the cognitive (self-monitoring) and

contextual (self-management) processes in constructing meaningful and worthwhile learning outcomes” (p. 18).

Self-directed learning defined.

Similar to the conceptual confusion engendered by the numerous terms used in relation to informal learning, the concept of self-directed learning has multiple meanings, creating the same confusion, and at times contradictions (Pilling-Cormick, 1996). Knowles (1975) noted that other terms used in research when referring to self-directed learning are: “self-planned learning, inquiry method, independent learning, self-education, self-instruction, self-teaching, and self-study” (p. 18). Candy (1991) identified additional terms used throughout the literature to indicate degree of learner control: “open education, individualized instruction, discovery learning, student-centered instruction, learning to learn, and independent study” (p. 24).

In addition to multiple, inconsistently applied terminology, confusion exists in the research literature over whether self-directed learning is viewed as a process of internal change or as an instructional process (Brockett & Hiemstra, 1991). In his review of the literature on self-directed learning, Candy (as cited in Brockett & Hiemstra, 1991) concluded:

...that self-direction has been used ‘(i) as a personal quality or attribute (personal autonomy); (ii) as the independent pursuit of learning outside formal instructional settings (autodidaxy); and (iii) as a way of organizing instruction (learner-control).’ (p. 23)

Long (1991) asserted that confusion in literature about the term, self-directed learning, resulted from the term coming to represent both a goal and a process. Self-directed learning as a goal can occur in two ways: “...the goal of self-directed learning ‘is a change in consciousness’ ...or SDL is the goal” (p. 13). Long also recognized that the process of self-directed learning can have two meanings, “...the first emphasizes the pedagogical process of teaching SDL and the second is the internal processes of SDL” (p. 14).

Knowles's (1975) definition of self-directed learning is still one of the most frequently used:

In its broadest meaning, 'self-directed learning' describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (p. 18)

Although Knowles was criticized for placing too much emphasis on the singular nature of the adult learner, he argued that self-directed learning was a social activity rather than an isolative one. He recognized the importance of learners being able to assess their knowledge, understanding, and skills and prescribed ways for that to be done.

Long (1989) made the argument that in addition to the pedagogical aspect of self-directed learning (e.g., whether or not the learner is isolated as they learn, the degree of authority the instructor has) there are also psychological and sociological aspects to self-directed learning. Long believed that "...psychological self-directedness, or psychological control is the necessary and sufficient cause for self-directed learning" (p. 4). Learners need to accept responsibility for their learning rather than simply following authority. Long explained that psychological control includes the learner's "...cognitive processes such as reflection, metacognition, critical analysis, creativity..." and includes "...learner proficiency, learner motivation, and learner persistence" (p. 6). Autonomous (or self-directed learning) occurs when learners have both pedagogical and psychological control.

Brockett and Hiemstra (1991) asserted that self-directed learning "...refers to both the external characteristics of an instructional process and the internal characteristics of the learner" (p. 13). In their definition and model, Brockett and Hiemstra combined two aspects of self-directed learning: the instructional method (which they label self-directed learning or the process

orientation) and personality characteristics (which they label as learner self-direction or the personal orientation). They named this combined perspective “self-direction in learning” (p. 29) and created the “Personal Responsibility Orientation Model (PRO)” (p. 26) to represent their ideas. According to Brockett and Hiemstra personal responsibility is “...the ability and/or willingness of individuals to take control of their own learning” (p. 26) and is the cornerstone of self-direction in learning since learners accept different degrees of responsibility for their learning. Brockett and Hiemstra argued that “...optimal conditions for learning result when there is a balance, or congruence, between the learner’s level of self-direction and the extent to which opportunity for self-directed learning is possible in a given situation” (p. 30).

Self-directed learning theory and research.

In their review of the history of research on self-directed learning, Merriam et al. (2007) discussed how the research evolved from descriptive research on how adults learn, to an examination of what the goals of self-directed learning should be (e.g., enhancing the ability of adults to be self-directed or fostering transformational learning), to examining the process of self-directed learning, and finally to identification of the personal attributes of learners who are self-directed. They concluded that the most “recent research and writing in self-directed learning demonstrates an interest in the concept’s applicability to lifelong learning, human resource development and online learning” (p. 124).

According to Merriam et al. (2007), researchers interested in the process of self-directed learning have produced models of self-directed learning that fall into three primary categories: (a) linear models of the process of self-directed learning as introduced by Tough and Knowles; (b) interactive models of the process of self-directed learning introduced by Spear, Brockett and Hiemstra, and Garrison; and (c) instructional models (i.e., what “...instructors in formal settings

can use to integrate self-directed methods of learning into their programs and activities” [p. 117]). Of the interactive models, Garrison’s ‘collaborative constructivist’ model, which integrates “self-management, self-monitoring, and motivation” (Merriam et al., 2007, p. 114), has the most applicability to the concept of personal learning environments. According to these authors, Garrison viewed self-management as the learner choosing learning materials that allow for sustained communication (where understanding was confirmed collaboratively), and self-monitoring as learners ability to reflect and think critically.

Brockett and Hiemstra (1991) offered their perspectives on the theory and research of adult self-directed learning by identifying ideas they perceived as implicit in the concepts of self-directed and life-long learning, such as autonomy, independence, and personal development of the learner. They believed that self-directed learning provides numerous benefits including: a greater transfer of learning, greater interest in the subject, and increased retention, although they suggested that additional research is needed to confirm and test these beliefs. Brockett and Hiemstra also identified two evolving perspectives in the research: (a) interest in the internal processes of individuals who engage in self-directed learning, and (b) the instructional processes required to promote self-directed learning. They labeled these two diverging interests as the “personality perspective” versus the “process perspective”, or learner characteristics versus learning environment.

Brockett and Hiemstra (1991) asked, “So then, where do things stand relative to the knowledge base of self-direction?” (p. 97). They determined that self-directed learning is an activity so prevalent it can be considered a “way of life” among individuals from all socioeconomic strata, and that findings relating self-directedness to various demographic and psychosocial variables (e.g., locus of control, intellectual development) are mixed at best. An

important missing element in the literature they reviewed was attention to the social context of self-directed learning. The newer conceptual theories of networked learning and connectivism address this element.

Candy (1991) also detected a divergence in the research on self-directed learning, but maintained that the split was between researchers viewing self-direction as an outcome of learning (i.e. self-directedness) or as a goal of adult learning, as compared to self-direction as a process of learning or a method of teaching. For Candy, this divergence meant that researchers could mistake the means for the end in their discussions on this topic, thereby adding to the conceptual cloudiness in this area of adult learning research. Candy also offered the view that research on self-direction in learning has been dominated by the positivist/empiricist paradigm and that there is a “...fundamental incompatibility between the assumptions underlying positivism and those underlying ‘self-direction’...” (p. xx). Candy viewed self-directed learning through the lens of constructivism, which he defined as “...a branch of philosophy concerned with how people individually make sense of their worlds and how they create personal systems of meaning that guide them through their lives” (p. xv). For Candy, self-direction is comprised of “four distinct, but related, phenomena” (p. 23): (a) the personal attribute of personal autonomy, (b) the willingness and ability to self-manage one’s learning, (c) learner control of instruction, and (d) autodidaxy (the independent pursuit of learning outside of formal institutional settings and without institutional support). Candy did not see self-directedness as either a personal, psychological attribute of the learner or as the quality of a particular learning situation, but rather viewed self-directedness as a product (or intersection) of both.

In conducting his review of research on self-directed learning, Brookfield (1984) critiqued research on the following fronts: the research relied too much on quantitative studies,

the samples in the studies were not representative of the total adult population (study subjects tended to be more educated), the methodology was limited, and almost no attention was paid to the quality of learning.

Self-directed learning and workplace learning.

In the 1990s, interest in self-directed learning in workplaces increased. A shift occurred from studying types of learning projects in which self-directed learners were engaged, to studying the learning process itself. This increased interest was related to a growing awareness that the advent of the information age was having a significant impact on workplace learning.

...The nature of most work people do in the information age is sufficiently complex that organizations can no longer supply anything but a small part of the learning opportunities and learning resources people need in order to keep up with the demands of their work roles. People need to plan and organize the additional learning required, that is in this day and age we are all forced to manage much of our own learning. (Cheren, 1987, p. 4)

Guglielmino and Guglielmino (1994) believed there were several reasons for the increased interest in self-directed learning in the workplace, two of which were the need for continuous learning due to rapid changes in technology and society, and the increase in use of self-directed teams.

According to Smith (1987), to manage learning in the workplace effectively, a person had to understand him/herself as a learner, be able to reflect on his/her own learning activities and self-monitor for quality and effectiveness, as well as have a good understanding of the nature of knowledge. Smith discussed the development of workplace competencies, including increased learner control, and training programs that were needed to develop competencies. Surprisingly, he was prescient in regard to observing that one method to achieve these competencies, identified in the literature at that time, was the establishment of useful personal learning environments at work.

Foucher and Tremblay (1993) conducted a literature review and held five focus group meetings with representatives from 27 Canadian organizations to answer three questions: "...how widespread is self-directed learning in the workplace, how is it defined, and to what extent do organizations value its use?" (p. 230). Their data indicated that an estimated average of 150 hours a year was spent by employees on work-related projects, and that most learning efforts occurred informally. These authors made a distinction between the definitions of self-directed learning and autodidactic learning. Self-directed learning allows for management on some of the dimensions of learning by the trainee, while autodidactic learning is where the trainee is responsible for managing all dimensions of learning (e.g., content, goals, resources, method, and pace). The autodidactic definition is more aligned with the definition of self-directed learning for this study.

Training needs of professionals.

In the early 1990s, as part of professional education projects, both the Royal College of Physicians and Surgeons of Canada and the American Institute of Architects conducted surveys to determine if their members were using self-directed learning activities (Confessore & Confessore, 1994). They discovered that their "...members were regularly engaging in self-directed learning activities in response to their need to improve practice" (p. 35). These surveys also indicated that the members did not feel that the existing systems of education were meeting their needs.

Kops (1993) conducted a study whose purpose was to "...investigate job-related self-planned learning efforts of managers and the influence organizational context had on their learning efforts" (p. 248). As with self-directed learning, the definition of self-planned learning in this study was that learners were in charge of all the critical decisions related to the learning.

Twenty mid-level managers were interviewed about their self-planned job and career related learning, while 20 senior-level managers were interviewed about their perceptions of the learning of these mid-level managers. The description of the methodology of this qualitative study was weak, but it stated that the interviews were semi-structured. The findings indicated that for these managers, self-planned learning covered a wide range of topics, fit within the plans of their organization, was seen as quality learning by the organization, and was rewarding for both learners and the organization.

Piskurich (1994) examined various self-directed learning efforts implemented by businesses, including but not limited to Motorola Corporation, IBM, and K-Mart. He noted that these businesses had differing ideas of what constitutes self-directed learning. These ideas fell on a continuum from

- lock-step self-instructional packages (where trainees were responsible for their own training, but had little to no choice on anything) to
- computer-assisted development (sometimes with choices in time for completion and progression through the content) to
- a contract learning process (where the trainees are given choices on content, methods, environment, and time and are allowed to be self-directed) to
- continuous (on-the-job) learning in the “learning organization,” where personal mastery and mental modeling are valued.

Piskurich observed that some businesses had established Self-Directed Learning Centers (SDLC) where there were ...”formalized training systems to help employees discover their ‘training needs’, and provide them with one of more forms of learning interventions...and where ...learner choice in time, progression, and some aspects of methodology are usually available”

(p. 116). Piskurich asserted that businesses that used learning contracts represented a large leap because these organizations were concerned with more than just what an employee does; they were also concerned with whether or not an employee could "...recognize, analyze, and meet their own learning needs" (p. 117). Piskurich was optimistic in his conclusion that more businesses recognized the importance and potential of self-directed learning.

Straka, Kleinmann, and Stokl (1994) reached a similar conclusion as Piskurich (1994), that companies could support their employees' professional development by considering their employees self-directed learning and that "...workplace learning is becoming the focus of attention of companies in their personnel and organization strategies" (p. 157). A questionnaire was administered to 453 employees (from major, medium, and smaller companies who worked in commercial and administrative jobs). The findings indicated that employees typically initiated self-organized learning (i.e., "...self-initiated activities with which the employee organizes his own sphere of learning by choosing forms of resources of learning according to individual preferences" [p. 150]), either because their company did not have the training available or the training was of poor quality. Approximately two thirds of employees' professional development resulted from their taking the responsibility to initiate and organize their own learning. Triggering events that stimulated these employees to engage in self-organized learning were (in descending order): introduction of new technology, training for a new job, and learning new tasks for an old job. The most popular preferences for types of learning (for younger employees and employees from larger companies) were informal learning activities of self-reflection, talking to other employees, and trial-and-error. Relying on the results of this study was difficult because information was not provided on sampling procedures, the actual interview protocol, or interview questions.

Stipp (1997) did a qualitative, grounded theory dissertation study on the self-directed learning of 15 business education leaders where the questions were focused on how individuals plan and implement learning activities to enhance their professional development. Results of the study found that of the most cited resources for learning such as reference books, manuals, handouts, and trade magazines, other people (i.e., coworkers and specialists) were ranked as the most frequently used resource, and tended to be accessed through informal conversations and networking. Accessing the internet was not one of the most cited resources, although it was an activity in which they were engaged. Other learning activities of the participants included experimentation, observation, writing, reading, discussion, and use of media. In this study, participants chose resources based on cost, time, access, ease of use, and what was judged useful.

Clardy (2000) determined that "...self-directed learning is commonly used by adults to solve job-related or vocational issues such as changes in job duties, work processes, and licensing and certification requirements" (p. 106). Clardy was interested in finding out how this type of learning could be promoted by companies: what organizational conditions contributed to employees' willingness to engage in self-directed learning. Clardy concluded there are three types of vocationally oriented self-directed learning projects: (a) when employees need to address an imbalance between job requirements and skills (induced); (b) when employees undertake projects of their own accord (voluntary); and (c) "...when there are new enabling organizational conditions that ignite a latent employees readiness to act and learn" (p.121). His results showed that a greater number of learning projects were started by employees who worked for companies that were dealing with substantial changes in the workplace.

Concerns about use of self-directed learning.

...Learners lacking explicit guidance may invest their energies in exploring or attempting to understand some phenomenon of interest for which they lack the

necessary vocabulary or conceptual framework. Self-directed learners, therefore, run the risk of misunderstanding the subject of their study and hence of being miseducated. (Candy, 1991, p.287)

Brookfield (1984) also noted that the largest criticism by institutions of the practice of self-directed learning is that learning can be problematic and ineffective. To address this issue, research should place more of an emphasis on the quality and value of the self-directed learning projects. Based on findings from focus groups in their study, Foucher and Tremblay (1993) realized that from an organization's managerial perspective, management might wonder how they could support self-directed learning activities for their employees, while also wondering if their employees possessed the skills and motivation to direct their own learning, and if not, could deficiencies be ameliorated.

Self-directed learning in organizations.

Changes in organizations such as "... rapidly evolving technologies, decentralized decision making procedures, and larger spans of control" (Foucher & Tremblay, 1993, p. 229) create an interest in self-directed learning because it can offer a means for companies to stay competitive (Guglielmino & Guglielmino, 1994). They continued that:

The combination of economy and productivity resulting from the use of SDL strategies is likely to lead to a major and lasting change in the way training and development takes place in the leading organizations---the 'learning organizations'---of this century and the next. (Guglielmino & Guglielmino, 1994, p. 45)

Organizations are exploring ways to incorporate informal learning in their operations (Paradise, 2008). Cui (2010) reported that the strongest predictor of adoption of on-demand learning (a related concept to informal learning) is "the *compatibility* between on-demand learning and the organization's training design and delivery method, culture and value system, and e-learning design" (p. 178). In this study, 71.4% of the 126 small to large organizations

reported having on-demand learning applications (such as electronic performance support systems, learning games and simulations, webcasts, podcasts, job aids, etc.). Cui found that top management support played a key role in the adoption of this kind of learning within an organization.

Personal Learning Environments (PLEs)

Attwell (2007) indicated that researchers were aware that tacit knowledge existed in organizations and there was value in making this knowledge external, but it required a different model of learning. The newer concept of Personal Learning Environments (PLEs) emerged from an amalgamation of alternative learning models (e.g., connectivism, constructivism, and social network theory). The concept of PLEs arose through discussions of online educational researchers, theorists, and developers as a “... result of the limitations of the learning management systems (LMSs), recognition of the importance of informal and lifelong learning, and the growth of social software” (Martindale & Dowdy, 2010, p. 178). The LMS was challenged by evolving technologies and changing learning environments (e.g., increased use of mobile devices for on-the-go, on-demand learning). LMS vendors have sought ways to incorporate social media into their LMSs. Out of these discussions, an educational technologist published a conceptual model he saw as the virtual learning environment of the future: the PLE (Buchem, Attwell, & Torres, 2011; Wilson, 2005; Wilson, Liber, Griffiths, & Johnson, 2007), which served as catalyst for further discussion, debate, research, and eventually conferences on the topic of PLEs. Dabbagh and Kitsantas (2012) realized the potential of PLEs to integrate formal and informal learning, and to foster self-regulated learning among higher education students. They believed that the use of social media as part of individuals’ PLE development

could help learners “share the results of learning achievements, participate in collective knowledge generation, and manage their own meaning making” (p. 3).

Research on PLEs is in its infancy and consensus on what constitutes a PLE has not been reached (Chatterjee, Law, Owen, Velasco, & Mikroyannidis, 2011; Kop & Fournier, 2011), with ongoing debate and discussion continuing in the online learning community. Authors of the New Media Consortium (NMC) 2011 Horizon Report (as cited in Dabbagh & Kitsantas, 2012) predicted that PLEs may have a large influence on teaching and learning around the globe within the next four to five years. The PLE is based on the historical notion of personalization of learning that predated the internet, going back as far as the 19th century when the Dalton Plan was conceived to allow students to tailor their own curriculum by choosing the timing and order of content. Mastery oriented teaching methods are another example of personalized learning. With the advent of the internet, flexibility and easy access to resources is possible in learning, allowing the conceptualization of personalized learning to evolve. Presently, a PLE consists (in part) of an integration of internet technologies and Web 2.0 (social media) tools that empower individuals to take charge of their own learning. In his blog, Attwell (2012) briefly discussed how the expanding concept of PLEs developed.

At the first [PLE] conference, in Barcelona in 2010, PLEs were a largely new and unexplored concept. Much effort and discussion was expended in trying to arrive at a common definition of a PLE, in debating the dichotomy between technological and pedagogy approaches and constructs to developing Personal Learning Environments, and the role of PLEs in institutional strategies. Further discussions focused on the impact and affordance of Web 2.0 and social software on developing PLEs. (para. 9)

The 2010 PLE conference, hosted by CitiLab, allowed educators and researchers interested in the development and implementation of PLEs to share their ideas and experiences, as well as discuss how to make PLEs effective learning spaces. The conference administrators

viewed PLEs as making learners their own “director of studies” and defined a PLE in the following way:

PLE consists of tools, communities and services that make up each individual learning platform used to direct their own learning process and achieve their learning goals. This model ... represents a qualitative change in the education system: students go from being mere consumers of information controlled by others to become agents of knowledge, creating links between resources that they have selected or that others have recommended. (Citilab, 2010, para 2) <http://citilab.eu/en/node/3335>

Personal learning environment defined.

Buchem et al. (2011) reviewed over 100 conference papers, reports, and blog articles to determine the “characteristic, distinguishing features of Personal Learning Environments” (p. 1). They identified Liber, Tosh, Wilson, Attwell, and Downes as influential originators of the concept of PLEs. They noted that PLEs have been presented, discussed, analyzed, and reviewed through journal articles, conferences, podcasts, and blogs beginning in 2005. Research projects have been conducted in countries outside of the United States, such as the European collaborative project Responsive Open Learning Environments (ROLE, <http://www.role-project.eu/>), where 16 international research groups from six EU countries and China have come together for the purpose of assisting teachers in developing PLEs for their students. Even with all of this work, no single definition or archetype of a PLE exists.

For some, a PLE is a specific tool or defined tool collection used by a learner to organize his or her own learning processes. For others, the PLE simply acts as a metaphor to describe the activities and milieu of a modern online learner. (Martindale & Dowdy, 2010, p .3)

In response to concerns about the adoption of virtual learning environments by large educational institutions starting around 2000, particularly with the lack of customization of these environments and the inability for transfer between institutions, educators started investigating alternative approaches. The PLE Project funded by JISC (the former Joint Information Systems

Committee, a company that provides consultation to UK educational organizations) and carried out by the Centre for Educational Technology and Interoperability Standards (CETIS) through Bolton University (from August of 2005 through July of 2006), was one such effort directed at investigating an alternative approach. Several aims of the project were to define the scope of a PLE and propose a reference model and prototype software tools that would delineate the concept of a PLE. This group produced “The Personal Learning Environment: A report on the JISC CETIS PLE Project August 2006” (Johnson et al., 2007), in which they considered the concept of a PLE from the emerging exchanges between educators and researchers in informal discussions as well as through developing projects. In entering this investigative project, Johnson et al. wondered if the PLE was going to be a lasting new learning technology or if the PLE concept was going to fade, as had other preceding educational concepts. They noted an important technology trend making PLEs viable: the easier access individuals had to powerful personal technologies, such as mobile devices with more computing power than large computers once had. They wrote that there is “no single definition of a PLE” (p. 67) because of disagreements on the characteristics of a PLE. Through examination of weblogs they were able to detect a number of themes, such as PLEs potentially empowering users away from institutions, PLEs as an extension of electronic portfolios, and PLEs as transformers of pedagogy because the organizational structure of a PLE is different than a learning management system (LMS). Another theme, aligned with transforming learning environments, was concerned with shifting the control of learning from an institution to the learner.

Areas of interest among PLE researchers show a split: some researchers are examining PLEs from the technological aspect (i.e., what types of technologies support PLEs and what types of technologies learners use to construct their PLEs) while other researchers are examining

the pedagogy of PLEs (i.e., how to most effectively integrate into academic or business learning environments; Atwell, 2007; Wilson, 2008).

The power of the emerging concept of the PLE is exemplified by the range of definitions offered in the literature. Through research, writing, and theorizing, a number of authors have offered their definitions of what constitutes a PLE. The definition offered by Attwell (2007) captures both the technological and pedagogical viewpoints of PLEs.

Many of these [PLE] tools will be based on software...that lets people rendezvous, connect or collaborate by uses of a computer network. It supports networks of people, content, and services that are more adaptable and responsive to changing needs and goals... PLEs are not an [software] application but rather a new approach to the use of new technologies for learning....PLEs can provide more holistic learning environments, bringing together sources and contexts for learning hitherto separate...students learn how to take responsibility for their own learning. (p.4)

The following list identifies components from definitions made by leading contributors to the knowledge base of PLEs:

- people and tools and communities and resources interact in a very loose kind of way (Wilson, 2008, p. 3)
- collection of tools used by a user to meet their needs as part of their personal working and learning routine(Wilson et al., 2007, p. 9)
- person-centric view of learning using technology that cuts across different types of learning, including higher education, company training, and informal learning(Wilson et al., 2007, p. 8)
- gives the learner control over one's own learning process (Martindale & Dowdy, 2010, p. 3.)
- using a combination of existing devices, applications, and services as the practice of personal learning using technology (Martindale & Dowdy, 2010, p. 4)
- the management of learning migrates from the institution to the learner(Downes, 2006, p. 10)

- the learner not only consumes learning resources, but produces them as well (Downes, 2006, p. 10)
- learners integrate distributed contents, services, tools and contacts based on personal goals and preferences (Chatterjee, Law, Owen, Velasco, & Mikroyannidis, 2011, p. 2)

EDUCAUSE is a nonprofit association whose mission is to advance higher education. The current membership is comprised of more than 2,200 colleges, universities, and educational organizations, including 250 corporations. According to EDUCAUSE, PLEs are the “tools, communities, and services that constitute the individual educational platforms learners use to direct their own learning and pursue educational goals” (2009, p. 1). The term refers to how individuals approach the task of learning, with the management of learning in a PLE moving from the company to the employee.

A consensus has been reached among some researchers (Attwell, 2007; Downes, 2007b; Wilson et al., 2006) that a PLE is not just applications per se, but rather a characterization of an approach to eLearning. For Downes (2007b), “the heart of the concept of the PLE is that it is a tool that allows a learner (or anyone) to engage in a distributed environment consisting of a network of people, services and resources. It is not just Web 2.0” (p. 24).

PLEs are further characterized by Downes (2007a, 2007b, 2009) as having actively engaged learners; being an environment where learners collaborate and critically think and reflect; stressing connectedness to others; and having a high degree of autonomy in learning and openness in communications. Learners are engaged in developing and maintaining social networks and communities. The emphasis is on creation of content instead of just consuming information. The content is not kept in a centralized location, but rather open and shared; individuals assume control of their learning. “There exists a need to integrate [learning] experiences in a range of environments, including education, work, and leisure activity” (Wilson

et al., 2006, p. 5), with PLEs a useful vehicle in which to do so. Being able to capture employee knowledge production could be invaluable to a business. The learning technology used in a PLE has to promote autonomy, encourage diversity, enable interaction, and support openness (Downes, 2007b). PLEs can be created using a combination of “devices (laptops, mobile phones, and portable media devices), applications (newsreaders, instant messaging clients, browsers, calendars) and services (social bookmark services, weblogs, and wikis) within what may be thought of as the practice of personal learning using technology” (Wilson et al., 2006. p. 9).

Factors that influence learning in a personal learning environment.

PLEs require learners to delve into complex online knowledge environments and master learning competencies such as “critical thinking, reflective thinking, self-monitoring skills, independence, and autonomy” (Kop & Fournier, 2011, p.94). For learning to occur in a PLE, motivation, persistence, and engagement in learning are necessary. Learners using the networks they have developed within their PLE to build knowledge need to be able to “...make connections, see patterns, reflect, (self)-criticize, detect and correct errors, inquire, test, challenge and eventually change their theories-in-use” (Chatti, 2011, p. 108). Knowledge management, self-regulatory, and social media skills are needed for learners to be able to customize and sustain their PLEs (Dabbagh & Kitsantas, 2012). Siemens and Tittenberger (2009) conceptualized the need to view the skills learners require to navigate the new technologies successfully as a multi-literacy approach. These multi-literacy skills are the ability to aggregate information, stay focused while searching for information, know how to extract important information, ensure authenticity of knowledge, and “...navigate between repositories, people, technology, and ideas while achieving intended purposes” (p. 28). The aforementioned

competencies were similar to what is described as 21st Century information literacy (Grafstein, 2002).

Web 2.0.

The term Web 2.0 was coined during a conference meeting as a result of a discussion between the host of the meeting (O'Reilly) and another member of O'Reilly's company, also considered one of the pioneers of the web (Dougherty). They were expounding their belief that in spite of the dot-com bust, the web was actually evolving in ways that allowed business to make the most of what was happening, providing businesses grasped this new architecture Dougherty labeled as Web 2.0 (Anderson, 2007; O'Reilly, 2005). At this conference, the participants created a meme map where they identified the following elements as possibly comprising the core of Web 2.0

- web-based services instead of software,
- an “architecture of participation,”
- data from sources can be reused and transformed,
- use of multiple devices for accessing the services, and
- some way for “harnessing collective intelligence” (O'Reilly, 2005).

They viewed blogging and the developing blogosphere as a means of turning the web “...into a kind of global brain” (O'Reilly, 2005, para. 10), and hyperlinking as a means for collecting the intelligence of the crowd. As individuals discover content by clicking on a hyperlink and forming a connection, the web of connections grows organically, with increasing numbers of users linking to the same connections, much like the synapses in our brains getting stronger as a result of repetitive use. Not everyone viewed these developments as constitutive of a new concept, as Anderson (2007) noted, “...Sir Tim Berners-Lee, the creator of the World Wide

Web, maintains that Web 2.0 is really just an extension of the original ideals of the Web that does not warrant a special moniker” (p. 2). Berners-Lee maintained that technologies used for Web 2.0 were created by designers of the Web and were reaching their full potential. Viewed from this perspective, Web 2.0 is a richer, more interactive extension of the Web. “The Web was shifting from being a medium, in which information was transmitted and consumed, into being a platform, in which content was created, shared, remixed, repurposed, and passed along...a conversation, with a vocabulary consisting not just of words but of images, video, multimedia...” (Downes, 2005, Sec. The Web 2.0, para. 4). There is agreement with Downes (Anderson, 2007; Bell, 2010; Brown, & Adler, 2008; Hsu, Ching, & Grabowski, 2014) that the Web’s platform has changed from read-only to read and write, with “write” including production and dissemination of original words and images, comments on other’s work, as well as repurposing of others’ content. Anderson (2007) elaborated on O’Reilly’s (2005) ideas associated with building Web 2.0, which Anderson viewed as more of a social space than an information space. Anderson’s ideas that most relate to the idea of PLEs include

- individual production and user generated content
- harnessing the power of the crowd
 - “...acting independently, but collectively, the ‘crowd’ is more likely to come up with ‘the right answer’, in certain situations, than any one individual” (p.16).
- folksonomies
 - Where individuals can tag web-based resources they find, and the tags are stored in open, social environments where others can add their own tags. These individual tagging systems can then be aggregated to create a folksonomy.

- openness
 - “A powerful force in Web 2.0: working with open standards, using open source software, making use of free data, re-using data and working in a spirit of open innovation” (p. 25).

Although the ideas and developments associated with Web 2.0 did not develop specifically in an educational context, it appeared that Web 2.0 technologies and services could support multiple ways of learning. More importantly, Web 2.0 could provide an alternative to the standard, more programmed instructional approaches to online learning that were in use. That alternative being “...participation in a collectively generated learning process that is facilitated by network interactivity” (Bouchard, 2011, p. 1). Bouchard (2011) did not view the type of knowledge that can be produced by people interacting in a network as a new type of knowledge, as Downes (2005) thought. Instead Bouchard believed that features of the Web 2.0 allowed individuals to participate in a collective learning process, where “...people are confronted with an evolving epistemology where the learner is expected to define not only the process of learning, but also the meaning and value of knowledge itself” (p. 291).

Hsu, Ching, and Grabowski (2014) asserted that Web 2.0 technologies and applications can support both individual and social learning. They argued that the real value was that

Web 2.0 applications provide the means to support knowledge building through multiple modalities for negotiating ideas and creating artifacts, multiple means for quick or thoughtful sharing, and multiple channels for exchanging shared and varied perspectives and feedback among the participants wherever they are. (p. 748)

Brown and Adler (2008) went further in presenting their thoughts that developments associated with Web 2.0 combined with developments in open education resources, are sparking a revolution in open and participatory learning, which they labeled “Learning 2.0.” Williams,

Karousou, and Mackness (2011) realized that the advent of Web 2.0 has made “...emergent behaviour possible at an unprecedented scale, pace, and breadth of participation” (p. 44). This behavior could lead to emergent learning, which they defined as:

...learning which arises out of the interaction between a number of people and resources, in which the learners organise and determine both the process and to some extent the learning destinations, both of which are unpredictable...it may include virtual or physical networks, or both. (p. 41)

Learning that results from connectivity to others is not necessarily desirable; there must also be constraint and inclusive values, because without these people can form self-reinforcing groups with anti-social values and norms. Williams et al. cautioned that there are instructors who do not consider emergent learning through the use of Web 2.0 to be “real” learning, because it is not yet clear how learners can validate or self-correct their learning.

Anderson (2007) identified key Web 2.0 services and applications as: blogs, wikis, tags and social bookmarking, multimedia sharing, audio blogging/podcasting, and RSS (Really Simple Syndication), as well as newer services and applications such as social networking, aggregation services, data ‘mash-ups,’ tracking and filtering content, and collaborating. As individuals construct their personal learning environments, they can increasingly use Web 2.0 tools and applications, thereby increasing opportunities to experience emergent learning through interacting, networking, and collaborating with others.

Existing learning theories that inform the understanding of personal learning environments.

Social learning theory. Bandura (1977) explained psychological functioning “...in terms of continuous reciprocal interaction of personal and environmental determinants... [where] symbolic, vicarious, and self-regulatory processes assume a prominent role” (p. 11). From this perspective, emotional experiences could be learned through observation, an idea that formed the

foundation of Bandura's social learning theory. Learning in this manner is possible, and Bandura saw observational learning as an important means of development. Consequences shape behavior (as demonstrated empirically through behavioral research on reinforcement) where they serve as guides for future behavior through the individual's anticipation of positive or negative consequences associated with certain behaviors; positive anticipation can create motivation. Because people tend to observe those with whom we associate, we do not have to experience consequences firsthand; the people we observe assume the role of behavior models. Bandura believed that "...modeling is an indispensable aspect of learning..." (p. 12) and that complex behaviors can result when others are modeled. This theory postulates that for observational learning to occur, a person needs to pay attention when they observe consequences that the model incurs, retain what they observe, and then take appropriate action based on their observation (i.e., making self-corrective adjustments to their own behavior based on the feedback from their observation).

Merriam, Caffarella, and Baumgartner (2007) viewed Bandura as having broken away from behaviorism (during the 1960s) because he focused more on cognitive processes that influenced motivation, affect, and action as he explored vicarious learning. "His work was first known as social learning theory, but as his thinking progressed and as he put a stronger emphasis on cognitive components it became known as social cognitive theory" (p. 289).

Bandura (1977) postulated that in addition to people regulating their behavior based on consequences that were either experienced first-hand or observed, they also "...set certain standards for themselves and respond to their own actions in self-rewarding or self-punishing ways" (p. 129). People are able to judge their own behavior based on certain criteria, such as quality, quantity, and originality. A variety of sources can be enlisted to make these judgments

(e.g., performance of others, standards, and norms). People react to their self-evaluations one of three ways: positively, negatively, or neutrally.

As mentioned earlier, being able to judge one's learning behaviors through self-evaluation is a required competency to perform effectively when using a PLE. An important question follows, which is how do learners judge their own performance when constructing and using PLEs for their learning goals. According to social learning theory (Bandura, 1977) people typically use standard norms based on representative groups to assess their standing, and people often compare themselves to others in similar situations. Since PLEs are a relatively new concept, learners employing PLEs may not have standard norms to refer to when they need to check their progress. Learners can turn to others who are developing and using PLEs to get input or feedback to help them judge their performance, such as others in their organizations, or others found through social media and communities of practice. Social learning theory recognizes that performance accomplishments can build a sense of personal efficacy, increase interest in activities, and produce self-satisfaction. This process makes an argument for use of scaffolding to help individuals improve proficiency in the development and use of PLEs for themselves or in their organizations.

Constructivism. “Constructivism is a philosophical view on how we come to understand or know” (Savery & Duffy, 2001, p. 1). Constructivism made a paradigm shift from the idea that individuals learn by knowledge transmission to the idea that individuals learn by actively making meaning from their experiences (internally mediated reality; Jonassen & Land, 2012).

Jonassen (1991) viewed the paradigm shift in the field of learning psychology as a shift from an objectivist philosophy where “...knowing and learning are processes for representing and mirroring reality... [to a constructivist philosophy where] ...knowing is a process of actively

interpreting and constructing individual knowledge and representations” (p. 5). People create their representation of reality when they test their individual and unique viewpoints or interpretations against other peoples’ representations of the same situations, and then they use their reality as a guide for their action (Candy, 1991). Candy suggested that “...like positivism, constructivism ...is not a single monolithic theory, but rather a cluster of perspectives united by underlying similarities in worldview” (p. 252). These similarities are represented by the following list of constructivist beliefs:

- Knowledge is constructed not transmitted.
- Knowledge construction results from activity, so knowledge is embedded in activity.
- Knowledge is anchored in and indexed by the context in which the learning activity occurs.
- Meaning is in the mind of the knower.
- There are multiple perspectives on the world.
- Meaning-making is prompted by a problem, question, confusion, disagreement, or dissonance (a need or a desire to know) and involves personal ownership of that problem.
- Knowledge building requires articulation, expression, or representation of what is learned (meaning that is constructed).
- Meaning may also be shared with others, so meaning-making can result from conversation.
- Meaning-making and thinking are distributed throughout our tools, culture, and community.
- Individual meaning must be viable. (Jonassen, Peck, & Wilson, 1999, pp. 3-6)

Bridge between SDL and constructivism. In spite of the large amount of research and attention given to SDL by both theorists and practitioners, Candy (1991) observed that there is

“...no robust theoretical framework, no universally accepted method for enhancing learners’ capacity for self-directed learning” (p. xv). In an attempt to fill that void, he examined self-directed learning through the lens of constructivism. He argued that the two concepts were closely related, and that the constructivist view of learning is congruent with self-directed learning because such learners are active in their learning process and in making meaning of their experiences. Self-directed learners are responsible for transforming their understandings. For Candy, the driving questions of education are how learners’ construe events and ideas, how they assemble and then build structures of meaning, and how these constructs can be assessed as useful or valid. Candy found the constructivist view of learning to be “...particularly compatible with the notion of self-direction, since it emphasizes the combined characteristics of active inquiry, independence, and individuality in a learning task” (p. 278). Merriam et al. (2007) concurred that constructivist learning is an active form of learning that involves “dialogue, collaborative learning, and cooperative learning” (p. 292).

Epistemology informs how people know what they know, what kinds of knowledge are possible, and the legitimacy of that knowledge. The epistemology of constructionism arose in opposition to the epistemology of objectivism, where objectivism holds the “...view that things exist as meaningful entities independently of consciousness and experience, that they have truth and meaning residing in them as objects” (Crotty, 1998, p.5). Candy (1991) concurred that “...until recently, the dominant view of knowledge---at least in the behavioral sciences---was derived from a positivistic perspective... [where there exists]...an accumulated body of verified ‘facts,’ derived directly from observation and experimentation” (p. 262).

Constructionism holds the view “...that there is no objective truth waiting for us to discover it” (Crotty, 1998, p. 8); rather than being discovered, meaning is constructed through

engagement with the realities in the world, and no true or valid interpretation of reality exists. Because humans inherit a system of symbols from the culture into which they are born, a valid description of how humans construct reality should include the historical and social perspective of that time. Thus, one can argue, reality is socially constructed; however, there are some who believe "...that only social realities, have a social genesis... [and that]...natural or physical realities do not [or put a different way] ...constructionism means 'the construction of social reality' rather than 'the social construction of reality'" (p. 54). Crotty made a distinction between constructionism ("...the collective generation of meaning as shaped by the conventions of language and other social processes," p. 58) and constructivism ("...meaning-making activity of the individual mind..." p. 58), and he acknowledged that the two terms often are used interchangeably. Crotty further described the perspective of constructionism as maintaining that individuals are born into a whole world of meanings that are learned through acculturation, which he then contrasted with the perspective of constructivism, where individuals construct their world singularly as they make sense of the objects they encounter in the world.

Kanuka and Anderson (1999) also noted different epistemological positions in constructivism, but they labeled the distinction described by Crotty as social constructivism (which equated to Crotty's constructionism) and individual constructivism (which equated to Crotty's constructivism).

Vygotsky (1978) believed that knowledge is first constructed in a social context and then taken up by individuals and that "...the mechanism of individual developmental change is rooted in society and culture" (p. 7). According to Merriam et al. (2007), "Vygotsky (1978) is credited with developing the foundation of this [social constructivist] view because he proposed that

learning is socially mediated through a culture's symbols and language, which are constructed in interaction with others in the culture" (p. 292).

Kanuka and Anderson (1999) clarified constructivist epistemological positions by differentiating the major forms of constructivism along two dimensions. The first dimension defines the constructivist position along a continuum between an understanding of reality as being objective at one end, and a view of reality that is defined subjectively at the other end. The second dimension defines each position on a continuum where knowledge is either socially constructed at the one end, or individually constructed at the other end. (Sect: Abstract, Para. 1). Kanuka and Anderson add a more layered conceptualization of the positions by having the two dimensions intersect and form quadrants (see Figure 2).

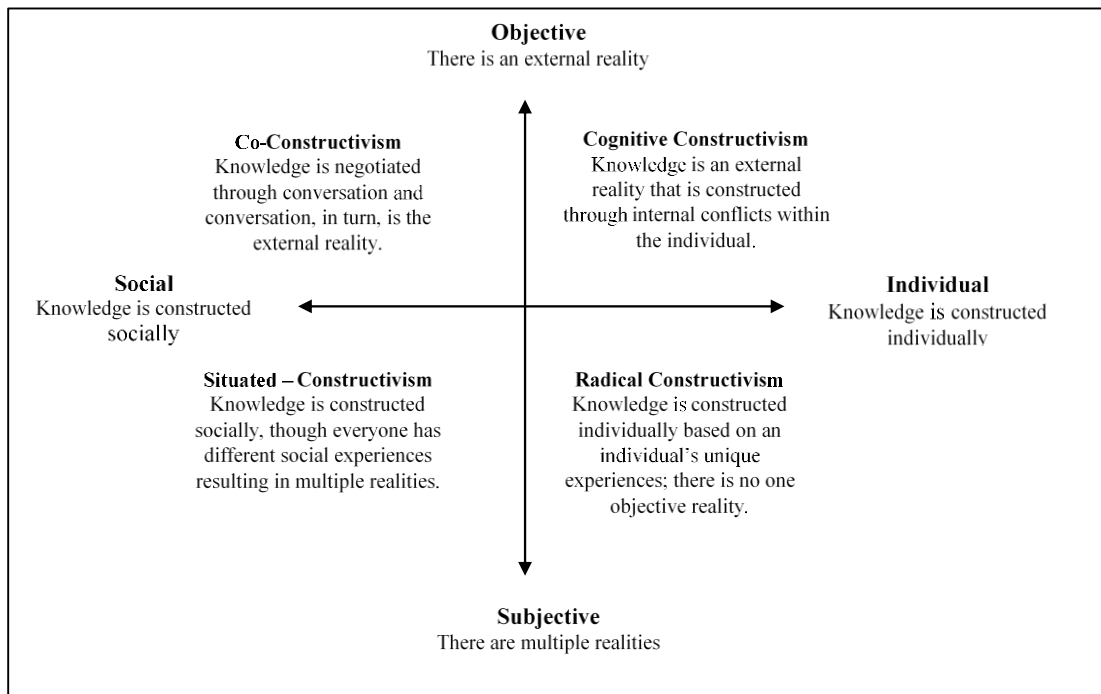


Figure 2 Epistemological constructivist positions from "Using constructivism in technology-mediated learning," by H. Kanuka and T. Anderson, 1999, *Radical Pedagogy*, 2(1), Sect: Findings from the Narrative Literature Review, Para: 4. Copyright 1999 by Radical Pedagogy. Reprinted with permission (<http://www.radicalpedagogy.org/radicalpedagogy8/Copyright.html>).

In one quadrant the authors locate “situated constructivism,” which reflected the social and subjective dimensions. “In situated constructivism, knowledge is constructed socially. No one person’s experiences constitute reality, but rather the collective experiences create reality. Meaning-making comes from an individual’s ability to detect patterns in social interactions” (Kanuka & Anderson, 1999, Sect: Situated Constructivism, para.2). In another quadrant, they located “radical constructivism” that reflected the individual and subjective dimensions. The term radical is used to denote the fact that this position maintained there is no such thing as a single objective reality.

Kanuka and Anderson (1999) located “cognitive constructivism” in a quadrant that reflected the individual and objective dimensions, where “knowledge is an external reality that is constructed through internal conflicts within the individual” (Sect: Cognitive Constructivism, Para. 2). They viewed the work of the developmental psychologist, Jean Piaget (1896-1980), as fitting under the cognitive constructivist position. The co-constructivism quadrant reflected the social and objective dimensions. In this form of constructivism, people who have similar cultural practices construct knowledge through negotiation, and whatever is agreed upon becomes “reality.” “In this view, it is possible to have shared meanings and understandings” (Section: Co-constructivism, Para. 2).

Liu and Matthews (2005) also noted that a dualism emerged in constructivist views: between individual knowledge construction (which they labeled as cognitive/radical and associated with Piaget) and social knowledge construction (which they labeled as social/realist and associated with Vygotsky). “The fact that constructivists, of whatever ilk, consensually hold that knowledge is not mechanically acquired, but actively constructed within the constraints and

offerings of the learning environment, was commonly regarded as a shift in paradigm in educational psychology” (Liu & Matthews, 2005, p. 102).

Wherever the learner is on the continuum, it is a given that learning is active rather than passive (Merriam, Caffarella, & Baumgartner, 2007). The emphasis in individual constructivism is on meaning-making constructed from an individual’s experiences, where learning results from a personal interpretation of knowledge. The emphasis in social constructivism is on meaning being negotiated from the perspectives of multiple individuals and results from the acculturation to or adoption of a group’s views and actions. Jonassen and Land (2012) maintained that there is an increasing focus on the social nature of the meaning-making process where knowledge exists in the dialogue between individuals within their communities; the physical artifacts that individuals use; and theories, models, and methods individuals use to produce those artifacts.

Constructivism suffered the criticism of “relativism” (i.e., lack of a way to distinguish true from false models of the world or where there is no absolute truth and any truth is as good as the other). Savery and Duffy (2001) responded to the criticism of relativism by stating that “Constructivism is not a deconstructivist view in which all constructions are equal simply because they are personal experiences. Rather...we must test understandings to determine how adequately they allow us to interpret and function in our world” (pp. 2-3). Savery and Duffy summarized their concepts of constructivism using three principles:

1. Understanding is in our interactions with the environment. (p. 1)
2. Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned. (p. 2)
3. Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings. (p. 2)

Constructive knowledge. VonGlaserfeld (1989) posited that constructivism was a new theory of knowing in which a different view from mainstream Western thinking of knowledge was emerging: one where the idea of knowledge as representative of an independent, objective world was being replaced by the idea that knowledge had to be personally relevant to individuals. “Instead of presupposing that knowledge has to be a 'representation' of what exists, they posit knowledge as a mapping of what, in the light of human experience, turns out to be feasible” (p.135). VonGlaserfeld viewed Piaget’s scheme theory as constructivist because in Piaget’s theory

Knowledge is never acquired passively, because novelty cannot be handled except through assimilation to a cognitive structure the experiencing subject already has. Indeed, the subject does not perceive an experience as novel until it generates a perturbation relative to some expected result. Only at that point the experience may lead to an accommodation and thus to a novel conceptual structure that re-establishes a relative equilibrium. (p. 136)

Thus, new knowledge is built on the foundation of previous learning, which is a core constructivist principle. Bruner (1986) supported the idea that a world independent of human mental activity and language does not exist. “...What we call the world is a product of some mind whose symbolic procedures construct the world” (p. 95).

As far back as Vygotsky (1978), importance was placed on the socio-cultural context in which learning occurs. “The history of the process *of the internalization of social speech* is also the history of the socialization of children’s practical intellect” (p. 27). Social constructivists do not accept that reality is purely individual in nature. For them, knowledge and beliefs develop from communities in which people live and practice, and exist in what happens in negotiations between people in their social relationships (Jonassen & Land, 2012). How knowledge is constructed “...has nothing to do with truth validation; rather, meanings emanate from the patterns of our individual and unique social experiences that occur over time in a contextual,

situated, and continually changing synthesis” (Kanuka & Anderson, 1999, Sect: Situated Constructivism, para.2).

Learning in constructivism. Bruner (1990) discussed how the concept of learning changed over time in the study of psychology. He started with classical learning theory, which examined learning from the perspective of means – ends relationships and focused on how reinforcement shaped responses to stimuli. One or two decades later came the cognitive revolution where learning equaled the acquisition of knowledge. The focus was on how individuals created constructs to make sense of their worlds. Bruner discussed transactional contextualism theory, which postulated that “...human action cannot be accounted for only by internal dispositions, traits, capacities, motivations, etc.... [that] coming to know anything...is both situated and...distributed. [In this theory the emphasis was on] ...the cultural nature of knowledge acquisition” (p. 106). Transactional contextualism is consistent with the constructivist stance “...that learning is a process of constructing meaning; it is how people make sense of their experience” (Merriam et al., 2007, p. 106). Jonassen (1999) described constructivist learning as the individual and social construction of knowledge by learners “...based on their interpretations of experiences in the world. . . [as compared to the objectivist conception of learning, which assumes] that learning can be transferred by teachers or transmitted by technologies and acquired by learners” (p. 217). Jonassen made a point, however, that contrary to the popularly held conviction that the two approaches were incompatible, they offered two different perspectives from which inferences could be made on how to foster the learning process. Jonassen and Land (2012) believed that learning was a process of meaning-making, not just the passive reception of information and additionally, they believed that there was an increasing focus on the social nature of how individuals come to make meaning. Kirschner, Sweller, and Clark (2006) who

were critical of constructivism, (specifically constructivist practices of minimally guided instruction and discovery learning), conceded that “the constructivist description of learning is accurate...” (p.78).

Constructivist learning environment. Based on the constructivist conception of learning, it followed that a constructivist learning environment emphasized knowledge construction instead of knowledge reproduction. A constructivist learning environment begins with a focus on an identified authentic problem, issue, case, or project, of which the learner takes ownership and is interested in or wants to be engaged in solving. Additionally

- The problems should be viewed from multiple perspectives and interpretations to ensure that the complexity of a problem is fully appreciated.
- The learner should be able to access rich, just-in-time information to help them interpret the problem.
- The environment should offer learners technology tools for visualizing the problem, information gathering, and conversation and collaboration.
- The environment should support and encourage learners to explore, articulate, and reflect (Jonassen, 1999).

“Learning environments are personal and group exploration spaces in which learners control the learning activities and use information resources and knowledge construction tools to solve problems” (Jonassen, Peck, & Wilson, 1999, p.194). By this definition, PLEs are constructivist learning environments.

Role of media and technology in constructivism. Jonassen, Campbell, and Davidson (1994) wrote about learning with media and the salient question they posed is: how can media be used to facilitate knowledge construction rather than to merely convey instruction? Their answer was “...that media are more than mere vehicles; they are resource enabling tools which if selected properly can enhance cognitive processing and affect learning efficiencies” (p. 37). For

them, media can be used as "...computational and memory tools for off-loading unproductive cognitive tasks that may interfere with knowledge construction by the learner" (p. 33), which best fits their conception of learner-centered learning.

Jonassen, Peck, and Wilson (1999) also addressed learning with technology by looking "...at how modern technologies, such as computers and video, can be used to engage learners in personal and socially co-constructed meaning making" (p. iii). They believed that an essential component to the construction of knowledge is a learner's reflection on what they are experiencing because just doing is not sufficient. They concluded that "the technologies afford students the tools to explore, experiment, construct, converse, and reflect on what they are doing..." (p. 194) as opposed to what they viewed as the traditional use of technology by instructors, which was to transmit information, and use messages in the media to direct and control the learning experience.

Constructivism and connectivism.

Siemens (2004) characterizes connectivism as a successor to behaviorism, cognitivism, and constructivism. He identified three limitations of these theories: (a) their intrapersonal view of learning; (b) their failure to address the learning that is located within technology and organizations; and (c) their lack of contribution to the value judgments that need to be made in knowledge-rich environments. (Bell, 2010, p. 102)

Kop and Hill (2008) cited Kerr as maintaining that prior to the advent of connectivism, constructivism offered sufficient explanations about internal and external knowledge environments, as well as active cognition, so connectivism really is not offering anything new. "One of the major differences between connectivism and constructivist theories generally is that in connectivism, learning is a property of the system, something that happens all the time, and is not therefore the subject of intentional activity" (Downes, 2012, p. 110). There are also differences in the concepts of learning, knowing, and understanding between social

constructivism and connectivism. Table 1 compares three concepts (learning, knowing, and understanding/meaning) of constructivism and connectivism.

Table 1

Comparison of the Concepts of Learning, Knowing, and Understanding between Social Constructivism and Connectivism

	SOCIAL CONSTRUCTIVISM	CONNECTIVISM
LEARNING	<ul style="list-style-type: none"> • Is the subject of intentional activity (Downes, 2012, p. 110) • An individually constructed experience (Siemens, 2005, p. 3) • Constructivists hold learning to be a process of active construction on the part of the learner. Learning occurs as the learner “attempt to make sense of their experiences” (Driscoll, 2000, p. 376; Siemens, 2006a, p. 28) • Social meaning created by each learner (Siemens, 2006a, p. 36) • Discuss, create, construct (Anderson & Dron, 2011, p. 92) • “Constructionism contends that learning occurs through learners’ engaging in creative experimentation and activity” (Kop & Hill, 2008, p. 6) • Knowledge is individually constructed and socially co-constructed (Jonassen, 1999, p. 217) 	<ul style="list-style-type: none"> • Connection-forming (network-creation) process (Siemens, 2005, p. 3) • Learning is a “door opening” process which first permits the capacity to receive knowledge, followed by encoding the knowledge as a node within our personal learning network (Siemens, 2005, p. 16) • Distributed within a network, social, technologically enhanced, recognizing and interpreting patterns (Siemens, 2006a, p. 36) • Explore, connect, create, and evaluate (Anderson & Dron, 2011, p. 92) • In connectivism learning is a property of the system, something that happens all the time, and is not therefore the subject of intentional activity. (Downes, 2012, p. 110)
KNOWING	<ul style="list-style-type: none"> • New knowledge builds upon the foundation of previous learning • Context shapes learners’ knowledge development • Learning as an active rather than passive process • Language and other social tools are used to construct knowledge • Metacognition and evaluation are used as means to develop learners’ capacity to assess their own learning • Learning environment is learner-centered • The importance of multiple perspectives • Knowledge needs to be subject to social discussion, validation, and application in real world contexts • The above 8 points are from 	<ul style="list-style-type: none"> • Information in context and internalized (Siemens, 2005, p. 6) • Both cognition and beliefs are sources of knowledge. The empirical notion of knowledge—what we can see, touch, or observe—has played the dominant role in the development of research and scientific methods. The parallel developments of belief and faith as knowledge structures are often ignored by established institutions. (Siemens, 2006b, p. 22) • To know something is to be organized in a certain way, to exhibit patterns of connectivity (Downes, 2005, p. 14) • There is no transferring of

	SOCIAL CONSTRUCTIVISM	CONNECTIVISM
UNDERSTANDING/MEANING	<p>(Honebein as cited in Savery & Duffy, 2001; Jonassen, 1991; Kanuka & Anderson, 1999) as cited in (Anderson & Dron (2011, p. 85)</p> <ul style="list-style-type: none"> • Constructivism asserts that we assign meaning internally (Siemens, 2006b, p. 11) 	<p>knowledge, making knowledge, or building knowledge (Downes, 2012, p. 85)</p> <ul style="list-style-type: none"> • Meaning in a network is created through the formation of connections and encoding nodes (Siemens, 2005, p. 13) • It is a by-product of a complex process of evaluation and reflexivity (Siemens, 2005, p. 14) • Meaning is an emergent phenomenon, arising from the connections between underlying entities (Downes, 2005, p. 9)

Situated learning.

Brown, Collins, and Duguid (1989) argued that not only is knowledge constructed by individuals, but that the knowledge is “situated,” meaning that knowledge comes from an intersection of activity, context, and culture. They criticized conventional education for assuming “... a separation between knowing and doing, treating knowledge as an integral, self-sufficient substance, theoretically independent of the situations in which it is learned and used” (p. 32). Instead, they compared conceptual knowledge to a set of tools, where the active use of the tool affords understanding of both the tool and the world in which it is being used because, they noted, it is possible to have a tool and not know how to use it. Brown et al. argued that “the occasions and conditions for use arise directly out of the context of activities of each community that uses the tool, framed by the way members of that community see the world” (p. 33). The different use of mathematical formulae by engineers and physicists is an example given of how the meaning of cultural tools is a product of negotiation within a community. Based on these ideas, Brown et al. viewed conversation and the exchange of ideas among people within

communities as essential to the negotiation process, and ultimately to the social process of learning.

As part of Lave and Wenger's (1991) research on the practice of apprenticeship, they developed a need to clarify the concept of situated learning (apart from conventional definitions of 'learning by doing'), which led them to formulate the view that "... learning is an integral and inseparable aspect of social practice" (p. 31). Lave and Wenger ask "...what kinds of social engagements provide the proper context for learning to take place" (p. 14). To answer their question, they put forth the concept of "legitimate peripheral participation [which means that a learner] ...participates in the actual practice of an expert, but only to a limited degree and with limited responsibility for the ultimate product as a whole" (p. 14). Legitimate peripheral participation is a social process that includes the learning of knowledgeable skills and is "...the process by which newcomers become part of a community of practice [and]...the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice" (p. 29). Their work furthered interest in the idea of communities of practice, which "...encompasses apprentices, young masters with apprentices, and masters some of whose apprentices have themselves become masters" (p. 56). Lave and Wenger believed that "...understanding and experience are in constant interaction – indeed, are mutually constitutive" (p. 52).

Choi and Hannafin (1995) observed that an important aspect of situated learning is the anchoring of knowledge and skills to realistic contexts. "When dealing with real problems, learners reference their personal experiences and strategies which evolve through continuous self and context-referencing" (p. 58). A primary goal of situated learning is to process information deeply and through this processing alter the structure of one's knowledge. "In problem-solving

settings beyond the classroom, individuals decide what tools to use, what information is pertinent, how the information should be organized, what parameters restrict the solution, and which ideas should be explored further or discarded” (p. 65).

With the use of constant self-reflection as part of the situated learning process, concern arises about how to control for inaccuracy, inefficiency, and misconceptions. The assertion that more attention is paid to how learners make their constructions instead of the “correctness or wrongness” of what they construct, is a criticism of constructivism made by objectivists. “Situated learning commonly advocates practices that lead to overly specific learning outcomes while constructivism advocates very inefficient learning and assessment procedures” (Anderson, Reder, & Simon, 2000, Sect: Abstract; Para. 1). These authors felt that it was an exaggerated claim to say that all knowledge is specific only to the task in which it is performed. “In particular, knowledge does not have to be taught in the precise context in which it will be used, and grave inefficiencies in transfer can result from tying knowledge too tightly to specific, narrow contexts” (Sect: Situated Learning; Claim 1: Action is grounded in the concrete situation in which it occurs; Para. 12). Anderson et al. believed that general knowledge could be transferred to real world situations.

Experiential learning.

Definition of experiential learning. At its most elementary level, experiential learning means learning from experience or doing (Lewis & Williams, 1994) and has been viewed as an exciting and diverse field of study (Walters & Marks, 1981). It can be considered an ideal way of learning in unpredictable and changing circumstances that are prominent in our 21st Century world (Pietersen, 2002). Fenwick (2003) noted that some form of experiential activity or dialogue is common in adult education and “... over 20 major associations internationally are

devoted to experiential education, and informal (experiential) learning is increasingly the focus of analysis in the workplace (Boud and Solomon, 2001)...” (p. 124). Applications of experiential learning can be seen in medical education, science instruction, teacher preparation, and wilderness education programs. Researchers and theorists of experiential learning and educators who use experiential education approaches come from diverse fields.

The approximately 1,500 members of the Association for Experiential Education (AEE; a nonprofit organization devoted to educators, students, and practitioners) share a belief that experiential forms of education are fundamental to learning. The organization defines experiential education as “... a philosophy and methodology in which educators engage with learners in direct experience and reflection in order to increase knowledge, develop skills, and clarify values” (AEE; About Us; AEE Fact Sheet: Who We Are; Para. 2).

A distinction can be drawn between experiential *education* and experiential *learning*. *Education* refers to the educational process that involves interactions between the learner and the teacher, other learners, and the environment; the learning that occurs is co-created and evaluated together by both the learner and the teacher (Itin, 1999). Itin described experiential *learning* as “...the change in an individual that results from reflection on a direct experience and results in new abstractions and applications. Experiential learning rests within the student and does not necessarily require a teacher” (Sect: Defining Experiential Learning; Para. 2). Le Cornu (2005) provided a definition of experiential learning attributed to Jarvis (who created a model of experiential learning first published in 1987): individuals first construct experiences, then transform their experiences into “...knowledge, skills, attitudes, beliefs, values, emotions and the senses...” (p. 5) and the outcomes of the transformations become part of people’s individual biographies. Experiential learning can be seen as “...holistic, authentic, and relevant...where the

emphasis is on the learners' participation, activity, and 'discovery' ” (Usher & Solomon, 1999, Sect: Experiential learning; para. 2).

Reflection in experiential learning. A common element to definitions of experiential learning is the idea that although experience is a necessary starting place, experience by itself is not sufficient to make the claim that learning has taken place. Experience can be defined as a “...direct encounter with a subject, person, or thing” (Burnard as cited in Beaudin & Quick, 1995, p. 6) or engagement in action or activity. To move from having an experience to learning, the experience must be analyzed and processed. “Reflection is therefore needed for experience to work as a legitimate basis for authoritative knowledge claims” (Johnston & Usher, 1997, Sect: We Have Ways of Making You Reflect; para. 1) and is a key idea or core attribute of learning from experience (Beaudin & Quick, 1995; Pietersen, 2002). By engaging in reflection, learners change their perspectives through developing new abstractions and applications (Itin, 1999). Based on various frameworks of reflective learning (Fenwick, 2001; Piercy, 2013), reflection can involve learners:

- looking back on what they experienced,
- examining thoughts and feelings associated with experience,
- interpreting and generalizing experiences to form mental structures (which become concepts stored in memory that can be transferred to new situations),
- putting experiences into frameworks based on prior knowledge,
- critically viewing choices made by looking for positive and negative outcomes,
- thinking about what other choices could have been made or actions taken, and
- formulating a plan that can be used in future similar situations.

Fenwick (2001) found the “reflection orientation” to experiential learning to be comparable to the process of learning in constructivism and identified Mezirow’s critical reflection theory as “...one of the most influential ideas in the field of adult learning in the past 20 years” (p. 13).

Mezirow (1981) developed a concept that described a method of learning called “perspective transformation” through a national study he conducted on women who were going through college reentry programs. Mezirow’s work conceptually built on the work of Habermas and Freire, and he came to view perspective transformation as a natural tendency of learning and as a central component of adult education. Mezirow defined perspective transformation as:

...the emancipatory process of becoming critically aware of how and why the structure of psycho-cultural assumptions has come to constrain the way we see ourselves and our relationships, reconstituting this structure to permit a more inclusive and discriminating integration of experience and acting upon these new understandings. (p. 6)

By engaging in critical reflection, individuals can see how their underlying, and sometimes unconscious, psychological and cultural assumptions have influenced the way they see themselves and the way they have structured their lives. This self-knowledge opens options for individuals to challenge their assumptions and reconstruct themselves and their lives if they choose. Significant learning occurs when people understand how they have developed particular criteria for judging their perceptions and how they acquired particular habits. Dirkx (2000) discussed ideas of deeper emotional and spiritual dimensions of learning that add to Mezirow’s conception of perspective transformation. Discussion of these types of reflectivity is beyond the scope of this study.

Historically, theorists and researchers operated on an assumption that doing and thinking (or action and reflection) were separate processes. Fenwick (2003) challenged this dualistic frame where body and mind are split and mental activities of the mind are considered more valid.

Fenwick asserted that the emphasis on reflection (one of the mental activities) creates a “myopic view of learning [because]...individual mental representations of events become prominent, static, and separated from the interdependent commotion of people together in action with objects and language” (p. 126). The argument made by Fenwick advanced thinking about *reflection* in experiential learning from individual constructivist principles to principles associated with social constructivism. According to Fenwick (2003) “...experience, reflection, and knowledge are mutually determined” (p. 126), are rooted socially, and embodied such that the spirit, mind, and body are not separated from experience.

Models of experiential learning. During the 1960s and 1970s, constructivism exerted a great influence on ideas related to experiential learning to the point where it almost became an “ideological movement.” This movement focused on finding ways to have institutions of higher learning credit adults for prior life experience, to find ways to empower adults to be able to respond to the rapid changes of modern society, and be empowered to make positive changes in their lives (Fenwick, 2001; Seaman, 2008). Experiential learning has evolved to include an emphasis on the consideration of feelings in the learning process in addition to cognitive elements (Beaudin & Quick, 1995), and to challenge the dominance of the idea that the only type of knowledge is “expert knowledge,” which is universal and derived only from scientific evidence (Fenwick, 2003).

Supporters of experiential learning recognized a need for models (Jackson & MacIsaac, 1994); theorists responded, resulting in models including Kolb’s Experiential Learning Cycle (as described in Seaman, 2008), Jarvis’s model (as described in LeCornu, 2005), Boud and Walker’s model (as described in Caffarella & Barbett, 1994; Miller, 2000), and Dean’s Process Model and

Joplin's Five Stage Model (as described in Beaudin & Quick, 1995). The most influential was Kolb's Experiential Learning Cycle (Seaman, 2008; See Figure 3).

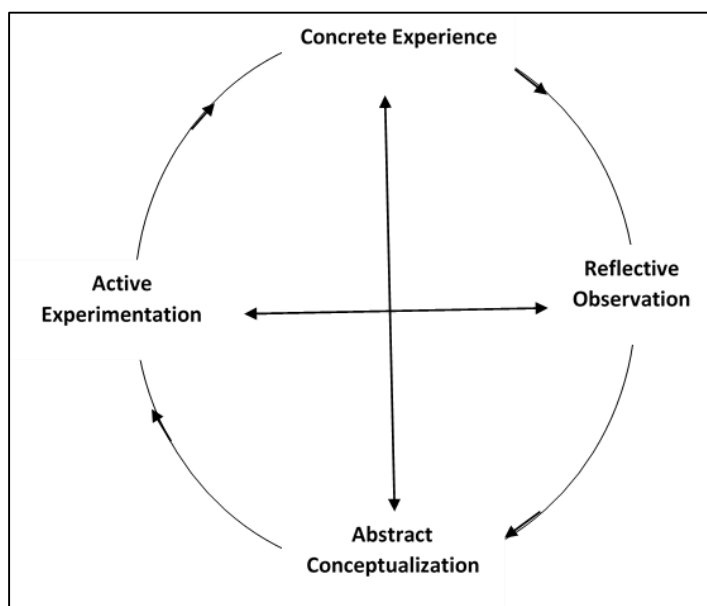


Figure 3: Kolb's (1984) model of the four adaptive learning modes: the structural dimensions underlying the cycle of experiential learning as illustrated in Seaman, 2008, p.5). Reprinted with permission.

Kolb's model has been criticized on an epistemological basis by Fenwick (2003), Miller (2000) and Michelson (1996). In her critique, Michelson (1996) discussed the Enlightenment view of knowledge, when it was thought that the mind processes direct sensory experiences (unmediated access to reality), then extracts and validates the relevant knowledge. The individual uses language to describe what is available for all to see or experience. The assumptions of the Enlightenment view were that experience is transparent and reason is universal. Individuals will see the same thing wherever they are situated. Thus, each "knower" is interchangeable with all other knowers. This view presumes that individuals are not impacted by their emotions, political and social positions, or place in history. Michelson argued that Kolb's theory was representative

of most adult education that also adhered to the Enlightenment view of knowledge. Michelson asserted that post-modernist, feminist, and anti-racist theories have challenged the Enlightenment view because they see experience and language as being influenced and organized by “ideology, language, and material history” (p. 190). The idea that reason is the only means to knowledge is challenged by critics, because they believe that knowledge can also be arrived at through emotion, the body, and manual labor.

Relationship between experiential learning and self-directed learning. Fenwick (2001, 2003) saw a relationship between experiential learning and self-directed learning, as well as lifelong learning and situated learning. Although the exact nature of the relationships was not elaborated, the point was made that when learners, of their own volition, find and engage in learning experiences and reflect on them, they are engaging in self-directed learning. Fenwick also noted that there is not apparent contradiction to the idea that experiential learning can be an integral part of a learner’s lifelong pursuit of knowledge, both for professional and personal reasons, and for post-modern thinkers, experiential learning is by definition “situated”.

Experiential learning in the workplace. One goal of the use or promotion of experiential learning in business organizations is to change attitudes and behaviors to make organizations more effective by creating safety and openness, allowing employees to experiment and learn through their experiences. Chisholm, Harris, Northwood, and Johrendt (2009) examined how experiential learning theories could contribute to lifelong learning practices that are now required in work-based learning. Their analysis of the literature showed that it is valuable to link the development of work-based learning to theories related to experiential learning. They further elaborated that learning that results from action in the workplace involves challenging of assumptions, in-depth reflective analysis, and developing open-mindedness, which leads to

finding new ways to solve work-related problems. Experiential learning is a desirable component of a workplace's learning initiatives because individuals can achieve "...transformational changes to their thinking and understanding, thus providing for continuous professional development independent of any specific academic discipline" (Chisholm et al., 2009, p. 329). Piercy (2013) evaluated learning in the business context and concluded that "experiential learning approaches offer major benefits for teaching contemporary management practices such as cross-functional and team-based working" (p. 202). In his study, he analyzed "... the effectiveness of one experiential learning approach, 'the production game'" (p. 202). The intervention was introduced in 2004 and was used in four management classes over two years. Piercy found "...in-course assessment, examination and overall marks all significantly improved after the introduction of the exercise" (p. 209). The results showed positive perceptions of the simulation game.

Fenwick (2001) and Piercy (2013) discussed Schon's interest in critical reflection in the workplace, with Piercy describing the three levels of reflection that Schon coined: "knowing-in-action (learning from doing); reflection-in-action (on-the-spot reflection when you can still change events); and reflection-on-action (thinking back to how events unfolded and learning from them)" (p. 203). These authors see managing self-change as a necessary skill for employees to have and for businesses to create a knowledgeable workforce.

Lewis and Williams (1994) reported that U.S. companies invested substantial amounts of money (collectively in the billions) toward training employees, including management training. The authors asserted that business and industry are turning more towards models of experiential learning because experiential learning provides a mechanism to meet an increased need for employees to examine their own actions and acquire self-knowledge. Lewis and Williams

discussed several applications of experiential learning in the workplace. The commonality of the applications is that they integrated thought, action, and reflection. As noted by the authors problems that can occur with experiential learning in the workplace are that the learning process can be time consuming and the process can be risky to employees because their professional philosophies and practices can be called into question. Lewis and Williams concluded that due to the rapidly changing nature of the workplace, traditional instructional and assessment practices are being challenged; it is important that employees are encouraged to extract meaning from their experiences (rather than passively receive training) and that they share collaboratively with others what they have learned.

Criticisms of experiential learning theory. Seaman (2008) called attention to the fact that the experiential learning models have in common a “stepwise process” that goes from experience, to reflection, to learning. He argued that this approach may be inadequate to explain “...the complex cultural, social, and physical processes during experience” (p. 3) and that there is too much of a focus on the cognitive processes of the individual. Bass (2012) in discussing how learning theories can be applied to science instruction for adults, objected that embodied knowing (“...using the body and special senses to learn about the world and oneself...” (p. 17) is often overlooked and that it is important to acknowledge that the body mind connection can enhance learning.

Kirshner, Sweller, and Clark (2006) believed that minimal guidance during instruction does not work and that experiential-based teaching methods fail because “... cognitive load theory suggests that the free exploration of a highly complex environment may generate a heavy working memory load that is detrimental to learning. This suggestion is particularly important in the case of novice learners, who lack proper schemas to integrate the new information with their

prior knowledge” (p. 80). Hmelo-Silver, Duncan, and Chinn (2007) wrote a response to Kirschner, Sweller, and Clark where they asserted that Kirschner et al. “...have mistakenly conflated PBL [problem-based learning] and IL [inquiry learning] with discovery learning” (p. 99). And yet they “... agree with Kirschner et al. (2006) that there is little evidence to suggest that unguided and experientially-based approaches foster learning” (p.100); however, they view problem-based and inquiry learning as being heavily guided through anchoring the instruction to appropriate contexts and through the use of scaffolding. Hmelo-Silver et al. concluded that “even in this limited review of research on PBL and IL, it is clear that the claim that PBL and IL ‘does not work’ is not well supported, and, in fact, there is support for the alternative” (p. 105).

Usher and Solomon (1999) argued that prevailing experiential learning models are too limited to address the “...complex socio-cultural and economic conditions of the present” (para. 1). They believe that the conceptualization of experience to date has been that it is a resource to be accessed by an individual and unitary self that systematically reflects on that experience. This then leads to acquisition of a knowledge that is “...stripped of history, specificity and locating context...” (Sect: We Have Ways of Making You Reflect; para. 2). They contrast this conception of experience with another, more radical one, where the goal is attainment of social change and “...liberation from dominant meaning systems and structures” (Sect: ‘Acting up’ – critical practices in postmodernity; para. 4). Here experience cannot be mastered, normalized or managed. Seaman (2008) concurred with Usher and Solomon – “As the radically autonomous learner and the simple directness of experience are called into question, reflection as the central act of knowledge production in experiential programs is destabilized and the chronology of ‘experience-reflect-learn’ is not easily maintained as a basic principle of learning” (p. 11). Seaman saw a need to understand mutuality and reciprocity in learning, something the current

theories have not done. Seaman also noted that the influential authors of the prevailing theories of experiential learning have said that their claims are not supported by research, and yet their work has been considered foundational.

Fenwick (2001) offered descriptions of four different theoretical perspectives toward the nature of experiential learning that have arisen in response to the aforementioned criticisms and which have the potential to enhance and move forward the theoretic underpinnings of experiential learning:

1. The interference/psychoanalytic orientation that directs attention to the complex dynamics of desire.
2. The participation/situative orientation that directs attention to the need to have learners experience and practice in authentic conditions and become members of a community of practice.
3. The resistance/critical culture orientation that directs attention to critically questioning their experiences and how power impacts their experiences.
4. The co-emergent/enactivist orientation that directs attention to the learning that emerges from relationships among systems and subsystems, not just the learning that occurs in the minds of the individual. "Learning is doing is being" (p. 52).

The need for new learning theories and models that support personal learning environments.

New learning theories and models will be necessary for PLE designers to utilize due to limitations of the traditional learning theories that were created prior to the advent of internet/Web 2.0 technologies that open up global, networked learning. An example of one such model is an innovative learning paradigm called Pedagogy 2 (McLoughlin & Lee, 2008), which focuses on desired learning outcomes in response to connectivity enabled by Web 2.0 and social

software. Figure 4 shows that Pedagogy 2 occurs at the intersection of personalization, participation, and productivity.

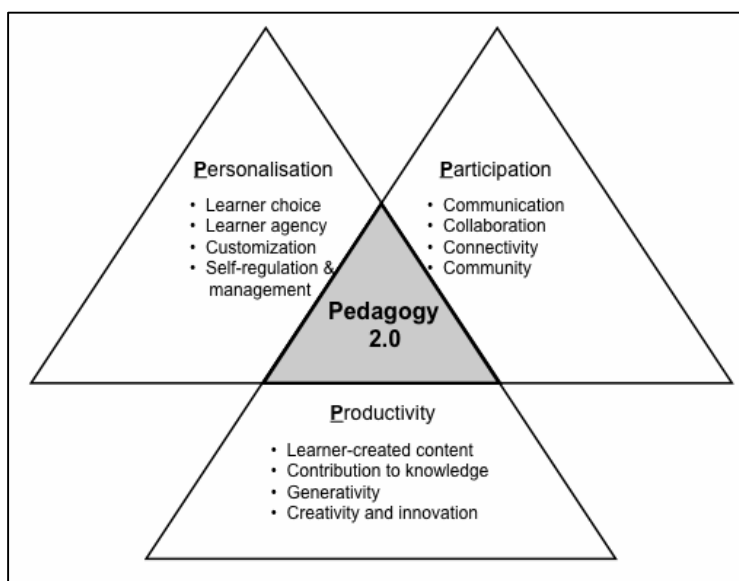


Figure 4. An innovative learning paradigm created to give guidance to the development of teaching and learning strategies in response to the new learning landscape of Web 2.0 (McLoughlin & Lee, 2008, p.16). Reprinted with permission.

The researchers envisioned that as learners take charge of and personalize their learning process and collaborate via connecting with others, they will be able to generate creative and innovative new knowledge.

The development of connectivism. Other educators and researchers, such as Siemens (2004) were also responding to the emerging global connectivity that McLoughlin and Lee (2008) responded to when they defined Pedagogy 2. Siemens in his seminal article, “Connectivism: A Learning Theory for the Digital Age” articulated what he viewed as new trends in learning such as the need for lifelong learning, the increasingly important role of informal learning, the increased attention being paid to the link between learning of individuals and learning in organizations (now the practice of knowledge management), the pressure on

employees to change fields in a lifetime, and the importance of being able to locate necessary information in a timely fashion. He also noted that "...increasingly, content co-creation and recreation (building on and using the content created by others to create something new) are becoming the norm for online participants" (Siemens & Tittenberger, 2009, p. 3). For Siemens (2006b) growth in the complexity of knowledge means that theorists need to expand their concept of the learning process from what happens internally in individuals to include the "... capacity for learning [that] resides in the connections we form with people and information, often mediated or facilitated with technology (p. 11)." This required an assumption that there exists a form of external knowledge (and knowing) that is separate from and at least as important as internal knowledge and knowing. This also required a shift in the concept of learning from one that is primarily task-focused to one that is "actionable knowledge", which Siemens (2004) defined as learning that occurs in the space between knowledge and meaning-making. Kop & Hill (2008) cite Kerr as contending that the distinction between internal and external knowledge had already been articulated in social constructivism, so contrary to the implication in connectivism, it is not a new idea. Even though Siemens did not reference distributed cognition in his work, distributed cognition also looks at "...the representation of knowledge both inside the heads of individuals and in the world...; the propagation of knowledge between different individuals and artifacts..." (Nardi, 1996, p. 77).

Although the established learning theories hold different ideas on how learning occurs (e.g., behaviorism: learning occurs through reinforcement, cognitivism: learning occurs through information processing, and constructivism: learning occurs through active creation of meaning-making), Siemens (2004) felt that what they had in common was the premise that learning occurs inside of people, thereby promoting the "principality" of brain-based learning. What was missing

for Siemens was an accounting of “...the learning that occurs outside of people (i.e. learning that is stored and manipulated by technology....as well as learning that happens within organizations (Sect: Limitations of Behaviorism, Cognitivism, and Constructivism, para: 1, 2).” He noted that the traditional learning theories do not contribute to understanding value judgments that need to be made in “knowledge-rich” environments (Bell, 2010). Siemens (2005) developed his ideas into what he views as a theory that is in contrast to the aforementioned established learning theories, a theory that “...presents learning as a connection/network-forming process” (p.5).

Siemens (2004) felt that a learning theory that can respond to the new trends in learning needed to be able to address such questions as

- How do we stay current in an information ecology?
- What is the impact of network and complexity theory on learning?
- How are learning tasks explained in light of the need for interconnectedness between different fields of knowledge? and
- How do learning theories accommodate the fact that technology can now perform many of the cognitive learning tasks related to memory such as storage and retrieval of information? (para: Limitations of Behaviorism, Cognitivism, and Constructivism)

Siemens (2006b) needed a theory that would respond to networks that form between people, groups, and systems; the cycle of knowledge development between people and organizations; and the recognition that complete knowledge can no longer reside within individuals. “We are exposed to an overwhelming amount of information—requiring continually greater levels of specialization in our organizations. It is here—where knowledge growth exceeds our ability to cope—that new theories of knowledge and learning are needed” (Siemens, 2006b, p. 9). Downes (2005) added his voice to that of Siemens and elucidated his germinal ideas about connectivism in his blog, where he placed an emphasis on what he called connective

knowledge, which he views as a “...distinct and new kind of knowledge” (p. 1). For Downes (2012), if we accept the idea that knowledge is distributed across a network of connections, then “...learning consists of the ability to construct and traverse those networks” (p. 9). He also believes that the broader theory of networks informs connectivism, which for him is an instance of network theory.

Siemens elaborated and expounded on connectivism through “...blog posts at <http://halfanhour.blogspot.com/> and <http://www.connectivism.ca/>, a large number of presentations at conferences and workshops [see <http://www.elearnspace.org/presentations.htm> and <http://www.downes.ca/me/presentations.htm>], and through two instances of massive open online courses (MOOCs) titled *Connectivism and Connective Knowledge*, held in 2008 [CCK08 <http://www.elearnspace.org/blog/2008/10/30/connectivism-course-cck08/>] and 2009 [CCK09 <http://lrc.umanitoba.ca/connectivism/?p=198>]” (Bell, 2010, p. 102). Although not enough research has been conducted on connectivism to determine the validity of its constructs, connectivism has been cited in more than 500 published research articles.

The ideas that Siemens and Downes have brought together have created an interest and discourse on connectivism among educators and researchers, especially in debating whether connectivism can be considered a learning theory for the digital age (Kop & Hill, 2008). Both Downes (2006) and Siemens (2004) consider connectivism to be a network theory of learning. Downes asserted that there exists support for connectivism in philosophy, mathematical computation, and in research on mental phenomena (where research is finding that the brain operates more like a social network than a computer).

What is connectivism? Connectivism concerns itself with networks (internal/neural, external/social, nodes, and connections), knowledge (personal and social/distributed), and

learning. Connectivism is "...the view that knowledge and cognition are distributed across networks of people and technology and learning is the process of connecting, growing, and navigating those networks (Siemens & Tittenberger, 2009, p. 11). "The personal network an individual has created (which can include blogs, trusted experts, communities, ...plays a vital role in his/her ability to make sense of changes and trends" (p. 10). Siemens (2004) integrated principles derived from "chaos, network, complexity and self-organization theories (para: Connectivism)."

Chaos theory. The Merriam Webster Dictionary (n.d.) defined chaos as "the inherent unpredictability in the behavior of a complex natural system (such as the atmosphere, boiling water, or the beating heart)." Chaos theory, as defined by the Society for Chaos Theory in Psychology and Life Sciences on their website, is as follows:

Chaos theory is one of a set of approaches to study nonlinear phenomena. Specifically, chaos is a particular nonlinear dynamic wherein seemingly random events are actually predictable from simple deterministic equations. Thus, a phenomenon that appears locally unpredictable may indeed be globally stable, exhibit clear boundaries and display sensitivity to initial conditions. Small differences in initial states eventually compound to produce markedly different end states later on in time. The latter property is also known as The Butterfly Effect. (Sect: Chaos and Complexity Resources for Students and Teachers: Para. What is Chaos Theory?)

Downes (2012) viewed chaotic systems as having multiple mutually dependent variables where the long-term impact of a single variable could not be determined; he gave the weather system and ecology as examples. Virtually all networks are chaotic by definition, and so it is for connectivism, which is an instance of network theory. Chaos theory addressed a core belief of connectivism: that learning is not orderly or predictable. Instead, it is complex and multifaceted, thereby making a simplistic, mechanistic conceptualization of learning obsolete. Even though understanding a learner's experience on an individual level cannot be reduced to simple

understanding, patterns that emerge from larger networks of learners can be detected and understood. For Siemens (2004) “Chaos, as a science, recognizes the connection of everything to everything” (Sect: An Alternative Theory), meaning that for learners to develop understanding, they must recognize patterns that exist, but are not obvious within the connections, thus the learner uncovers the existing meaning.

Complexity theory. Complexity theory informed connectivism by providing a set of assumptions that could be applied to the process of learning that matched connectivism’s conceptualization of learning, which is that the process of learning is complex with numerous interacting elements producing varying outcomes. Theoretically, in connectivism, numerous and diverse learners interact in an open system, giving and receiving feedback, resulting in constant change and evolution in thinking (emergence), which constitutes a complex process.

Holland (1992) defined complex adaptive systems as “...systems [that] change and reorganize their component parts to adapt themselves to the problems posed by their surroundings” (p. 18). Examples of these systems are ecologies, the central nervous system, ecosystems, and the brain. A pivotal characteristic of a complex adaptive system is the “...ability of the parts to adapt or learn, [and these] ...systems also exhibit an aggregate behavior that is not simply derived from the actions of the parts” (p. 19). Complex adaptive systems are not static. “They continue to evolve, and they steadily exhibit new forms of emergent behavior. History and context play a critical role...” (p. 20).

Fenwick (2003) viewed complexity theory as focusing

. . . on the *relationships* binding humans and non-humans (persons, material objects, mediating tools, environments, ideas) together in multiple fluctuations in complex systems. All complex adaptive systems in which human beings are implicated learn, whether at micro-levels such as immune systems or at macro-levels such as weather patterns, a forest or the stock market. . . . learning is thus cast as continuous invention and exploration, produced through the relations among

consciousness, identity, action and interaction, objects and structural dynamics of complex systems. (pp. 130-131).

Network theory. Siemens (2004) stated that "...a network can simply be defined as connections between entities" (Sect: Networks, Small Worlds, Weak Ties: para 1). Siemens (2005) later changed entities to nodes and explained that a network is an aggregation of nodes, with at least two required to be considered a network. Nodes are loosely defined as "...thoughts, feelings, interactions with others, and new data and information" (p. 6). A connection is any type of link between nodes. For Siemens "...connections are the key to network learning [and]...learning is the act of encoding and organizing nodes to facilitate data, information, and knowledge flow" (p. 6). Networks are changing constantly, forming and breaking down. In Siemens's idea of networks, people always are moving among numerous networks and "...are constantly acting upon and being acted upon" (p. 21). In these networks, placing an emphasis for the learner on navigation of the network is important rather than on simply presenting information to learners. Siemens stipulated that, "networked learning is a subset of connectivism (p. 23)," the exact inverse of the position taken by Downes (2012).

Siemens and Tittenberger (2009) explained that networks occur on three levels: (a) the physiological level (brain neural networks), (b) the conceptual level (where key concepts in a particular field are networked together, forming structures that provide more advanced conceptual understandings), and (c) the external level (through the use of Web 2.0 technologies such as blogs, wikis, etc.). Learners are "networked" on all three levels concurrently. The networks on all three levels have similar attributes, but nodes are different at each level. A neuronal node is a neuron in the brain. A conceptual node is an idea or a collection of ideas. On the external level, nodes are people and information sources.

Downes (2006) asserted that any network contains three elements: (a) entities (things that are connected and send and receive signals), (b) connections (the link or channel between entities), and (c) signals (messages sent between entities). Context is important because signals are interpreted within the context of the entity. Salience, according to Downes, referred to re-activation of previously activated connections, and when signals were salient they facilitated meaning-making. Patterns within networks that emerge and are recognized by learners become salient to them. When these salient patterns are encountered repeatedly, they form the basis of memory. Downes (2006) surmised that “to know” is based on organization and connectedness in the brain. “Whether something counts as ‘knowledge’ rather than, say, ‘belief’ or ‘speculation,’ depends less on the state of the world, and more on the strength or degree of connectedness between the entities” (p. 6). Downes (2012) separated personal knowledge from social knowledge, and interestingly went one-step further by positing that individuals use their social networks (communications between people) to create internal, personal, neural networks. This occurs in his view, because “...we evaluate whether a person has developed the appropriate neural network, the appropriate personal knowledge, by their performance overall, in a community” (Downes, 2012, p. 104). Downes noted that Siemens might not agree with him on this point, as Siemens was more interested in social learning theory as it applied to connectivism in general, not just connectivist knowledge. Downes defined learning as the reconfiguring among connections that happens when “a settled, harmonious network” was disrupted by new input.

One problem with social networks that led to criticism of connectionism is the phenomena of negative outcomes. People in communities have done terrible things together, for example the mass killings in Rwanda. Siemens does not really address this as a possible outcome in his theorizing. Downes (2005) explained that these negative outcomes were a result

of “cascade phenomena,” like dominoes where one signal goes from one entity to the next without restraint. He posited that these negative types of cascade phenomena can be stopped when networks are formed within certain constraints.

Self-organization theories. In a connectivist learning environment, learners must have access to systems that are open and they must be able to impose organization on to these environments. The self-directed learning and personal learning environment sections of this proposal address a number of important developments, ideas, and theories that fall under this rubric.

Knowledge in connectivism. Siemens (2006b) suggested that traditional definitions of knowledge are no longer adequate. He sees a shift from knowledge as a product that is categorized and placed in hierarchies to knowledge as a process, located in networks and systems. “If knowledge exists in external structures of similar nature, as it exists physically within our minds (distributed neurologically), then it is possible to ascribe knowledge and learning attributes to the distributed nature of networks formed between people” (p. 29). For Siemens, distributed knowledge is the same as connective knowledge: the knowledge that results from connections. Thus identifying patterns becomes essential for understanding as compared to knowing particular things. Siemens noted that Downes (2005, 2012) offered a non-traditional view of knowledge that was aligned with connectivism as well.

Downes (2012) agreed with Siemens that distributed knowledge is an essential concept of connectivism, and that knowledge is connections between neurons (i.e., human knowledge) and between humans and artifacts (i.e., social knowledge). Where they disagree, is that Downes does not believe that “the truth” is inherent in any object or structure, whereas Siemens, as quoted by Downes, does think that there is a “fact of the matter”. Siemens (2006 a) described learning

“...that orders and recognizes patterns formed by existing information and knowledge (p. 22), whereas Downes (2012) does not believe that knowledge exists alone, but rather that knowledge emerges from the relationship between individuals and the properties of entities/objects/structures. In contrast to the cognitivist concept of knowledge (reasoning through a sequence of steps), and constructivist knowledge (making or building knowledge), Downes asserted that connectivist knowledge consists of connection forming.

Bouchard (2011) agreed with Downes that in Web 2.0, networked, learning environments, where learner control and self-direction are an important aspect, the learner has to figure out their process of learning and determine the meaning and value of the knowledge they find during their communications with others. Unlike Downes, Bouchard did not believe the knowledge that is found or created is a “new” type of knowledge that arises from these networked interactions. Instead, for Bouchard, knowledge in networked environments is the familiar dialectic knowledge that springs from people talking to each other socially, which has existed since the time of Socrates. “One must be careful, however, not to confuse the more mature concepts of fluid and relative knowledge, which learners gradually develop through dialog and exchange, with some kind of epistemological revolution mandated by the new networked environment itself” (p. 299). Through the dialectic process, individuals are simply achieving mature stages of cognitive processing, something already identified by psychologists.

Learning in connectivism. For Downes (2012) learning is the creation of connections, the removal of connections, or the adjustment of the strengths of connections. This type of learning requires “...immersion in an environment, discovery, and communication---a process of pattern recognition rather than hypothesis and theory formation” (p.11). For Siemens (2006a), networked learning occurs on two levels. The first is in the neural connections that are made in

the brain and the second is in the connections that are formed through human activity resulting in social networks.

Siemens (2004) integrated ideas from the aforementioned theories (chaos, complexity, network, and self-organization) and derived the following principles of connectivism:

Principle 1: Learning and knowledge rests in diversity of opinions.

Principle 2: Learning is a process of connecting specialized nodes or information sources.

Principle 3: Learning may reside in non-human appliances.

Principle 4: Capacity to know more is more critical than what is currently known.

Principle 5: Nurturing and maintaining connections is needed to facilitate continual learning.

Principle 6: Ability to see connections between fields, ideas, and concepts is a core skill.

Principle 7: Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.

Principle 8: Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision. (Siemens, 2004, para: Connectivism; Siemens, 2005, p.23-24).

Criticisms. Even though Siemens (2004) freely admitted that his theory is not new or even innovative, and that he pulled together elements of existing theories (identified above), he has received criticism from others who argue that connectivism is not a theory (Kerr, 2007) and that connectivism is really a phenomenon instead of a theory (Bell, 2010). Kerr counters that there are other existing theories that account for distributed cognition and that connectivism is too generalized. Kerr and Bouchard (2011) noted that the fact that people learn through conversation, communication, and collaboration is not new, it is just that the internet allows for it on a much grander scale.

Bell (2010) provided a definition of what a theory is and then applied each point of the definition to connectivism. He concluded that connectivism is not sufficient to inform learning, is not rigorous, and overreaches as an attempt to be a learning theory for the digital age and that there are other theories that can explain the networked nature of learning, such as social constructivism and actor-network theory. Bell made the point that connectivism made a “big splash” in the blogosphere, but has not received attention in scholarly works. “Connectivism exists as an influential phenomenon that inspires teachers and learners to make changes in their practice, but will not be built as a theory without significant qualitative studies to inform its development within the context of other theories” (Bell, 2010, p. 112).

Anderson and Dron (2011) question whether a connectivist learning environment is even conducive to the achievement of learning goals. They find that most work in this area has been speculative and theoretical in nature, and reports that are based on experience have equivocal results.

In their critical analysis of connectivism, Kop and Hill (2008) concluded that “A paradigm shift, indeed, may be occurring in educational theory, and a new epistemology may be emerging, but it does not seem that connectivism’s contributions to the new paradigm warrant it to be treated as a separate learning theory in its own right” (p. 11). Kop and Hill pair epistemologies and learning theories in the following manner: objectivism and behaviorism; pragmatism and cognitivism; interpretivism and constructivism; and distributed knowledge and connectionism. These authors believe that Downes’ elucidation of the “...epistemological framework for distributed knowledge...provides a strong philosophical basis for the connectivist learning framework” (p. 7), and they recommend further studies. Boitshwarelo (2011) noted that

connectivism “...recognizes the ever-changing nature of information and the need to adapt accordingly in order to resolve the disharmony introduced by such change” (p. 169).

Despite the aforementioned criticisms, there are those who are taken with the theory of connectivism, such as Pettenati and Cigognini (2007) who repurposed their own theoretical models on online collaboration and knowledge construction to work together with the theory of connectivism: forming a new conceptualization of how one can have an effective connectivist learning experience (Figure 5). These authors have articulated four stages of learning (awareness and receptivity; connection forming and selection filtering; contribution and involvement; and reflection and metacognition) and five enabling conditions (basic skills; generation and support to motivation; meaning perception; group culture; and social climate). Pettenati and Cigognini see this updated model as being used by designers of personal learning environments to make sure that necessary conditions exist to maximize a learner having an effective knowledge flow process when engaged in individualized learning, and to design connectivist-learning activities.

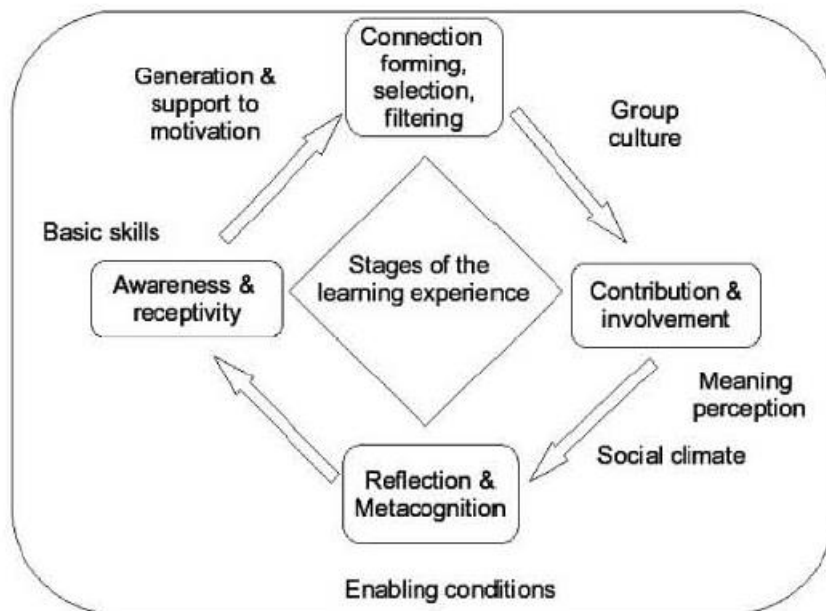


Figure 5. Model of knowledge process in a connectivist environment (Pettenati & Cigognini, 2007, p. 53, Reprinted by permission of IGI Global, copyright owner).

Questions and challenges to the adoption of PLEs by organizations.

As with any emerging concept, such as the PLE under discussion, there are questions and challenges that need to be thought through and resolved as part of the evolution, adoption, and refinement of a developing approach that is responding to a new need; in this case, the need is for employees in organizations to be able to quickly respond and adapt to rapidly changing, global environments by navigating knowledge acquisition and information exchange using 21st Century learning skills. What can be seen as advantages to PLEs can also be seen as disadvantages. For example employees using their own PLEs instead of the company LMS would make it difficult to structure learning among employees the way an LMS can provide that structure (Wilson, et al., 2007). Increased numbers of tools creates complexity. The more tools the harder it becomes to manage them, especially when one is integrating the tools. “For example, because every learner’s PLN [personal learning network, a term sometimes used

interchangeably with PLE in the literature] is different, providing training and support is much more complex and expensive than providing support for an LMS with its vertically integrated stack of common tools. Moreover, CIOs and others with responsibility for institutional IT worry about... privacy issues, system reliability, and data continuity.” (Mott, 2010, Choosing Between the LMS and the PLE, Para. 1). With limited institutional control over the data being exchanged in PLEs, potential security and data exposure problems for organizations become a concern. “Organizations are afraid of losing control of what their employees learn” (Rubio, Galán, Sánchez, & Delgado, 2011, p. 5). Haskins (2007) saw the political potential of PLEs to allow users (workers) to “see patterns of abuse, exploitation, and neglect in the workplace. PLEs undermine the imposed, top-down, command and control kind of power” (para. 4). Employees making these types of discoveries could be perceived as a threat to their company.

Corporate training departments would have to support the philosophy of learner-centered learning to back employees using PLEs. They would also need to assist employees in developing the skills that are necessary to build and use PLEs. This could seem overwhelming for training departments who might believe that “developing the ability of employees to use an LMS appears less daunting than developing their ability to use ten or fifteen different tools” (Siemens, personal communication, 2011). An argument can be made that the artifacts created by employees should be owned by them and not the company—how will that be handled? Due to the newness of this concept, there are no PLE “standards” at this time. This leaves room for significant ethical and legal challenges, for example: how will issues of privacy and plagiarism be handled, and how will shared authorship (i.e., when an employee co-creates something with a person outside of the company) be managed in terms of copyright laws.

Martindale and Dowdy (2010) realized that if a company decided to incorporate the use of PLEs into their existing learning structure, it would be difficult for training departments to figure out how to integrate their employee's PLEs with their organization's LMSs, because the LMS vendors may not want to open up their systems. For those employees who do not like taking responsibility for planning and implementing their own learning, the formal courses an LMS provides may be easier for them to use.

Questions and challenges to the adoption of PLEs by employees.

Utilizing the internet/Web 2.0 technologies to search, read, mark for future reference, review, analyze, aggregate, store, retrieve, evaluate, blog, twitter, email, participate in discussion boards, network, etc. can be complicated and tiring, which can contribute to fatigue and resignation before meeting one's learning goal(s). It can be difficult to take in all of the found information and apply it to one's own work-related problem (Wilson, et al., 2007).

Not everyone wants to learn independently. The learning process in PLEs requires fluency in information literacy skills and the need to be able to recognize authoritative sources from noise. Independent organizational skills for researching, storing, and managing information are also required. "Not all employees will necessarily want to manage their own learning environment and content" (Rubio, Galán, Sánchez, & Delgado, 2011, p. 5). How are learners supposed to figure out the most efficient way to negotiate the vastness of the online world to find the resources that are of value to them? The learner has to constantly adapt to and coordinate different and changing technologies. "The rate at which Web 2.0 applications arrive, expand, and sometimes disappear creates a challenge to learners looking for new components for their PLEs" (Martindale, & Dowdy, 2010, p. 9). Martindale and Dowdy questioned how employees are to evaluate the utility of their PLE and the outcomes of their learning. Additionally, the

development process of creating a PLE is unique to each person, which can test a supporting organization. “The needs, requirements, and experiences of using a PLE will be different for each learner, which makes the planning and development of a PLE that serves as aid to each possible learner a challenge” (Kop & Fournier, 2011, p. 96).

Arguments for the adoption of PLEs.

The aforementioned challenges and questions could be viewed as diminishing the exciting possibilities that PLEs can offer, however, as previously explained a primary advantage to use of PLEs is that giving learners’ ownership of coordinating which technologies they use and control of the content they create, allows them to be independent, individualized, and versatile in how they find, create, and share information and knowledge. Learners in PLEs are self-driven, and the tools learners use to access different services and information can serve them in their personal (non-work related) learning efforts as well. PLEs can best accommodate the interconnectedness and fragmentation of knowledge in both the personal and professional spheres.

In the case of workplace use of PLEs, the network of peers and experts employees can draw on expands beyond the company’s pool of employees, increasing the diversity of experience and knowledge into which employees can tap. Employees can access more diverse and varied learning resources (Wilson et al., 2007), thereby allowing them to engage in cross-organizational learning. Through PLEs, employees can have continuous access to information and knowledge, which in an LMS environment is often made unavailable after a course ends.

Contrary to Martindale and Dowdy (2010), Mott (2010) saw the “almost limitless variety and functionality of tools” as a strength of the PLE, and noted that frequently those tools are free

through open sources. He also made the point that learners do not have to be registered in an official course to be able to interact, share, and connect with others during their learning.

Nonaka (1994) addressed the knowledge creation process in organizations and posited that due to the increasing importance of knowledge, organizations should create knowledge in addition to processing information and that such knowledge creation “is associated to the social interaction between individuals within the organization who share and develop knowledge” (p. 15). It is important for organizations to provide a context for such creativity. Carmean (2008) suggested that organizations could show they support independent knowledge acquisition by using social media, recognizing and rewarding networked knowledge acquisition, providing time for employees to learn and reflect, promoting open access to colleagues, providing mechanisms for open and informal communications, and creating a culture that supports curiosity, independence, and empowerment. Carmean believed that if an organization adopts such practices, encourages group processes, and allows employees to use Web 2.0 tools, then they will be laying the foundation for employees to adopt and implement PLEs. “At its core, the notion of open content is to take advantage of the Internet as a global dissemination platform for collective knowledge and wisdom, and to design learning experiences that maximize the use of it” (Johnson, Levine, Smith, & Stone, 2010, p. 13).

Learning organizations.

A complicated question that organizations need to consider is whether or not a PLE should remain the sole domain of the learner or should it be incorporated into the institutional infrastructure. When employees are creative in finding resources from which to learn and apply that learning to their work, they add value to an organization. The capacity for workers to add knowledge to the organization they work for is largely determined by their capabilities as self-

directed learners and if a company is a “learning organization” then it will create practices that promote employees self-directed learning (Confessore & Kops, 1998). Confessore and Kops defined a learning organization as “an environment in which organizational learning is structured so that teamwork, collaboration, creativity, and knowledge processes have a collective meaning and value” (p. 366). They reference Watkins and Marsick’s (1993) identification of imperatives for a learning organization, one of which is the creation of continuous learning opportunities. Confessore and Kops go on to say that providing opportunities and situations for individual learning is a key characteristic of a learning organization.

Clardy (2000) adds a cautionary note, however, by pointing out that the gains organizations make from facilitating employee self-directed learning can be offset when an employee uses the organizational support to fulfill personal goals rather than organizational ones, which can cause a loss of time and commitment to the organization. Cross (2007) summarized the goal of a learning organization:

We aim to create a learnscape where workers can easily find the people and information they need, learning is fluid and new ideas flow freely, corporate citizens live and work by the organization’s values, people know the best way to get things done, workers spend more time creating value than handling exceptions, and everyone finds their work challenging and fulfilling. (p. 65)

Models of PLEs.

In his blog, Wilson (2005) created an image of what he saw as the future of the virtual learning environment (VLE), the UK term for what Americans term a learning management system (LMS). Wilson was responding to the increasing use of newer Web 2.0 technologies by individuals, which at that time was not being supported by organizational LMSs in both the academic and the business worlds. What Wilson envisioned has since become the prototype for imaging PLEs (See Appendix A). Building on his visualization, Wilson et al. (2006) proposed an

alternative design to the course-centric organizational model for educational systems, which included both formal and informal learning, and responded to the need to design for lifelong learning and personalization of learning that is responsive to the global ecology. Wilson's design called for: opening up and coordinating a wide range of services offered by organizations and individuals that learners can access to support their learning goals; both the consumption and production of information and knowledge by learners; active sharing of resources in place of protection of resources; both a personal and a global scope of interactions and connections; and mechanisms that support effective organization of information. In effect, Wilson described a PLE.

Drexler (2010) developed a PLE model called The Networked Student (See Appendix B), which is a visual representation of what a PLE looks like based on her research question: what are the processes students go through as they design a PLE. Drexler concluded that one of the most important design implications in her study was the need for deliberate scaffolding in a networked learning approach, and the use of strategic guidance. Drexler identified the following processes as important scaffolds to provide to learners engaged in building PLEs, and that is how to: organize content, deal with technology problems, collaborate with others, synthesize and create knowledge, and take responsibility and control for learning.

In his much cited paper on Personal Learning Environments, Harmelen (2006) discussed dimensions that form PLEs. These dimensions included variation in pedagogy; collaboration; a closed versus open system; degree of personalization in scope, functionality, and interface; locus of control; single or multiple institutional connectivity; type of communication path (server, hybrid, or peer-to-peer); online and offline usage; content packaging; and compatibility of

applications. These dimensions can be used as a taxonomy and consulted when an individual or agency is working on developing a PLE.

Pettenati and Cigognini (2007) provided a knowledge flow model that highlighted the stages of learning in a connectivist environment such as a PLE. The four stages of learning are: (a) awareness and receptivity (learners become aware of knowledge resources and tools), (b) connection forming and selection filtering (learners begin to use tools to create and form a personal network of people and contents that become resources), (c) contribution and involvement (learners make contributions to the learning network creating reciprocal relationships and shared understandings), and (d) reflection and metacognition (learners reflect on the knowledge processes and products, reflect on themselves and evaluate themselves). In this model, the stages of learning can only occur if certain enabling conditions are present: “the acquisition of basic technological as well as online-communication skills...motivation...a sense of positive group membership... [and] a positive social climate” (pp. 53-54).

Scott Leslie began a collection of images visualizing Personal Learning Environments/Networks created by individuals that have been continued by the community at large since 2008. See Appendix C for three different visual representations (concept maps) of individual PLEs.

Summary

Although no single, agreed upon definition of a PLE has been developed, the following definition comes closest to the meaning that was the phenomenon of study for this research project.

A PLE is comprised of all the different tools we use in our everyday life for learning. Many of these tools will be based on software...that lets people rendezvous, connect, or collaborate by uses of a computer network. It supports

networks of people, content and services that are more adaptable and responsive to changing needs and goals. (Attwell, 2007, p. 4)

PLEs are “not an [software] application but rather a new approach to the use of new technologies for learning....PLEs can provide a more holistic learning environments, bringing together sources and contexts for learning hitherto separate...[where] students learn how to take responsibility for their own learning” (p. 7). The capabilities of the new internet/Web 2.0 technologies allow learners to read, create, and publish learning content; engage in dialogue and collaborate with each other; and build learning communities that have common interests and goals (Watwood & Nugent, 2011).

Self-directed learning and personal learning environments.

Self-direction as viewed by Candy (1991) is in alignment with the emerging views of PLEs, where self-direction is

...a product of the interaction between the person and the environment [as compared to a personal quality or attribute and where] ... knowledge is recognized as tentative, evanescent, and socially constructed [as compared to fixed and enduring]; learning is defined as a qualitative shift in how phenomena are viewed [as compared to a process of acquiring knowledge and skills from outside of oneself]; and individuals are seen in a complex and mutually interdependent relationship with their environments [as compared to independent of their social and cultural norms] (p. 246).

Brookfield (1984) critiqued research on self-directed learning as being too focused on the individual and not paying attention to the social settings in which self-directed learning occurs; “The importance of learning networks and informal learning exchanges has been forgotten” (p. 67). Candy, too, felt that Knowles’ work was missing the idea that self-directed learning also needs to “account for the social nature of learning and the socially constructed nature of knowledge” (p. 88), an idea that is congruent with the concept of PLEs. For Candy, all learning is self-directed, “...while much of it is at the same time a social activity---the appropriation of

socially constructed meaning systems” (p. xix). The study of PLEs as one type of self-directed learning addressed this concern because PLEs tend to incorporate, and can rely on, the social aspects of learning to a high degree. Self-directed learning is what occurs in personal learning environments.

Zimmerman (1989) noted that for social cognitive theorists, self-regulated learning is not only determined by personal processes, but rather environmental and behavioral events are assumed to have a role, and that these three influences are interdependent. Zimmerman cited social cognitive theorist, Bandura, as delineating the important sub-processes of self-regulation: self-observation (monitoring one’s own performance), self-judgment (comparing one’s performance to a standard or a goal), and self-reaction (such as goal setting and metacognitive planning). These processes may play an important role for learners engaged with their PLEs, since PLEs require self-regulated learning.

Andragogy, heutagogy, and SDL.

As mentioned earlier, Knowles was one of the first educators to contribute a definition and a prescription for self-directed learning. Knowles’s (1975) book was essentially a how-to manual on helping individuals and teachers adopt self-directed learning practices. His writing on this topic was directly connected to his first assumption of adult learners (identified in the preceding section on andragogy): that they are able to direct their own learning. Knowles was ahead of his time in recognizing that the world was changing rapidly and this change would necessitate a radical change “...from teaching knowledge to developing skills of inquiry in learners” (p. 15). This is now considered a fundamental 21st century skill required by today’s learners. Knowles quite dramatically stated that self-directed learning “...was a necessity for survival of the human race” (p. 16). The concept of heutagogy advances andragogy by placing

the emphasis on learning that does not involve instruction. The learning activities that occur in PLEs fit heutagogic principles in that the learner decides their own learning goal, learning activities and strategies, as well as assessing their own progress.

Social learning theory as it applies to PLEs.

Observational learning is a foundational concept of social learning theory. A person who is using a personal learning environment to acquire new skills related to processes and procedures unfamiliar to them must independently locate the resources they need, and learn through observation. For example, building a PLE involves complex behaviors, which means that a learner intent on building a PLE, and who does not know how to do so, would benefit from modeling after others who have that experience. Models for building PLEs could be found among other individuals within the learner's organization who are using a PLE; through using the internet to connect with expert scholars researching PLEs; through use of online contacts in social media or communities of practice; or through educational endeavors such as the international conferences and massive open online courses (MOOCs) on PLEs. Social learning theory also addresses processes involved in how learners measure their progress, which is a critical skill required of learners who are using their own personal learning environment to achieve a goal.

PLEs and constructivist principles.

PLEs reflect the following constructivist instructional principles in that: learning activities are anchored to a larger task or problem; the learner has ownership of the problem, as well as the process they want to use to develop a solution; there is opportunity for the learner to interact with others through social media or internet networks, where they can be exposed to alternative and diverse views; and they have an opportunity to reflect on what they learned and how they learned it (Savery & Duffy, 2001). From a constructivist perspective, the learner should be active in choosing the problem they want to learn about or solve, and the learning activities should be relevant to the environment in which the learning will be applied (Kanuka &

Anderson, 1999). The architecture of a PLE is consistent with this perspective because learners are responsible for identifying their learning goal and for developing strategies to meet their goal. Employees of this study were asked to identify a relevant work-related problem they wanted to resolve and to use the PLE they developed to engage in learning activities (while in their work environment) to reach their goal.

Constructivism has at its core the central question: how do learners engage in personal and socially co-constructed meaning-making (Jonassen, Peck, & Wilson, 1999)? A PLE is by its nature “personal” to the learner; this study examined how participants personally created their PLEs and constructed meaning, therefore the emphasis was placed on personal meaning-making, but attention was also paid to social learning activities the participants engaged in. Just as in personal learning environments, in constructivist learning environments, learners must “...develop skills in articulating, reflecting on, and evaluating what they know; setting goals for themselves (determining what is important to know) and regulating their activities and effort to achieve those goals; and collaborating and sharing with others...” (Jonassen et al., 1999, p. 220). Situated learning occurs when apprentices or workers learn how to do tasks that are real to their work environments and when learning activities occur in varied contexts in order to improve transfer of skills. For this study, an assumption was that personal learning environments were already being formed by supervisor/manager-level employees while in their work environment, through their use of internet/Web 2.0 technologies and were operating within varied learning contexts (e.g., real-time context, virtual context, social context, etc.).

Experiential learning and PLEs.

PLEs can bring together various types of learning (e.g., formal and informal learning, self-directed learning, and experiential learning) that can occur in educational institutions, in

workplace settings, or individually for personal learning. The internet/Web 2.0 technologies used to construct and navigate PLEs make it possible for learners, through use of their PLEs, to have conversations, dialogue, collaborate, as well as share and receive knowledge from others who share their interests. They are able to access a variety of representations and ideas that they “experience” on a social level, which is situated in their unique learning context.

Learning in a PLE is self-directed and parallels independent experiential learning in that learners are expected to take initiative for their own learning, figure out the necessary steps to learn, reflect on their learning, and engage in activities that lead to knowledge creation. As with experiential learning, learning in a PLE is entirely authentic. Experiential learning opportunities are embedded in PLEs. Learning through experience to use Web 2.0 tools is one such opportunity. Opportunities also exist for socio-experiential learning, and learning through virtual games, problem-based scenarios, and virtual reality spaces, all of which can be accessed within the PLE.

Connectivism and PLEs.

Siemens (2004) articulated a trend he detected in organizational learning: the increasing emphasis on knowledge management for individual employees and the organization. He recognized that in today’s complex learning environments, a need exists for a new way to conceptualize learning; one that considers that knowledge changes rapidly and often is located outside of an individual. He theorized that individuals could access knowledge through forming connections with each other, with groups, with systems, and with information and data sources. Being able to navigate the networks formed by these connections is, according to Siemens, critical in order for learners to be successful. The use of internet/Web 2.0 technologies within PLEs affords learners many opportunities to find “nodes” of human contacts (i.e., social

connections) and objects of knowledge. It is an ideal platform for connective learning. Web 2.0 technologies especially enhance learners' abilities to find, create, and share knowledge through social means. In a PLE, after having located information sources a learner must then search for patterns to determine how useful the information is to them. The more "connected" the learner is, the more effective, current, and rich the flow of knowledge and learning will be.

Conclusion.

Although criticisms and challenges are associated with the use of PLEs, there are also compelling reasons for an organization to adopt PLEs within their learning structure, especially if they have the goal of being a learning organization. Implementing PLEs can increase complexity for managing employee learning, increase the need for training and support on technologies, create privacy issues, require that employees be fluent in information literacy skills and motivated for self-directed learning, and create a potential for institutional authority to be undermined. Doing so can also allow employees to quickly respond to changing organizational needs and changing technologies, be more self-managed and self-organized in their use of technology for learning, have continuous access to diverse resources, and be creative in knowledge creation.

CHAPTER 3: METHODOLOGY

Introduction

Chapter 3 presents an overview of the methods that were used to collect the data and address the research questions and propositions developed for this study. The topics that are included are the research design, research setting, participants, data collection procedures, instrumentation, trustworthiness, subjectivities statement, and data analysis procedures. Each of these topics are discussed separately.

Research Purpose

The purpose of this exploratory/descriptive, mixed-methods case study was to understand and describe the life-world and lived experiences of supervisors/manager-level employees, who worked in an urban hospital system, as they approached the development and use of personal learning environments (PLEs) to solve work-related problems or for professional development. For this study, PLE generally was defined as the Internet/Web 2.0 technologies and strategies subjects used to solve-work-related learning goals or for professional development.

Research Questions

The following research questions guided this study and were in the context of employees building/using their PLEs to accomplish work-related learning goals or for professional development.

Question 1: How did employees construct their PLEs?

- What internet/Web 2.0 technologies and/or applications were used by employees for:
 - finding information?
 - managing information (store, retrieve, classify)?
 - building and using networks to collaborate?

- sharing information and knowledge with others?

Question 2: What triggered an employee to construct a PLE?

Question 3: How did employees use their PLEs?

- With what frequency did employees utilize their PLEs?
- What strategies did employees use through their PLE to:
 - critically analyze information?
 - make decisions about the information found?
 - create knowledge?
 - to self-evaluate whether their PLE was effective in accomplishing their work-related learning goal(s)?

Research Design

Mixed method.

As the study of PLEs is in its infancy, there was not enough research from which to infer specific variables, thus providing a rationale for conducting an exploratory study. The mixed-methods design was selected as neither the quantitative nor the qualitative approach alone was considered sufficient to develop a rich, deep, and detailed understanding of the phenomenon of PLEs used in the workplace (Ivankova, Creswell, & Stick, 2006). The mixed method design was also considered appropriate since existing research on this topic was not found from which to develop or confirm a hypothesis. The mixed-method design encompassed the dual goals of this study, which were to (a) quantitatively measure, explain, and describe relationships among variables and (b) qualitatively understand phenomena in a particular setting. The study focused on the process as well as the outcomes; with an emphasis on the employees' perceptions of their experiences using Internet/Web 2.0 technologies to solve work-related learning goals. This study

collected and analyzed both quantitative data (a self-developed and piloted survey) and qualitative data (semi-structured interviews, participant worksheets, participant illustrations, and researcher journal notes, field notes, and memos).

Using both approaches allowed for compensation of the weaknesses of each research approach. Qualitative research allows for the voices of the participants to be heard (unlike quantitative research) and quantitative research allows greater objectivity to counter the personal interpretations and possible biases of the researcher, while also strengthening arguments for generalizability. Since the first phase of the study involved collecting and analyzing quantitative data and the second phase involved collecting and analyzing qualitative data, (which was related to the outcomes data from the first phase), this design met the definition of a sequential explanatory design (Ivankova et al., 2006).

Case study.

A case study explores an issue within a bounded system, setting, or context and "...is a good approach when the inquirer has clearly identifiable cases with boundaries and seeks to provide an in depth understanding of the cases..." (Creswell, 2013, p. 74). The boundary of this case study is a group of supervisor/manager-level employees who had enrolled or participated in an urban hospital's management training program (the Leadership Academy). "In general case studies are the preferred strategy when 'how' or 'why' questions are being posed...and when the focus is on a contemporary phenomenon within some real life context" (Yin, 2003, p. 1). The questions posed for this study were both why and how the identified group of employees used internet/Web 2.0 technologies and learning strategies to build personal learning environments (a contemporary phenomenon) within the real life context of their workplace. An objective of this study was to capture how the study participants approached their learning in the everyday

context of their work. “The case study focuses on holistic description and explanation” (Merriam, 2009, p. 43). Case studies can be exploratory and descriptive, have a dual quantitative and qualitative approaches, and involve multiple sources of data (Creswell, 2013; Yin, 2003). For this case study, triangulation was achieved with evidence collected through a survey, interviews, artifacts (e.g., illustrations created by participants), and documentation regarding the hospital’s social media usage policy. A chain of evidence linked the research questions to questions asked in the survey and interviews, data collected (Qualtrics database, SPSS file, interview transcripts, coding memos, schemas and code taxonomy, researcher journal of methodological events/issues), and conclusions (Yin, 2003). “...The most important advantage presented by using multiple sources of evidence is the development of *converging lines of inquiry*...” (Yin, 2003, p. 98).

Quantitative research.

The goal of this study’s electronic survey was to explore the research questions in a broad way (by maximizing the number of respondents who could be reached), investigate associations between data variables, and provide a description of the population who was being studied. The survey allowed for a view of naturally occurring behaviors and attitudes related to the purpose of the study that existed at the time data was collected.

Characteristics of qualitative research.

Qualitative research looks into the meaning that individuals attribute to a problem or phenomenon. An important characteristic of qualitative research is acquiring understanding from the participant’s viewpoint rather than the researcher’s (Merriam, 2009, p. 14). Data are collected in settings that are natural to the people who are being studied. The voices of participants and reflections of the researcher are key contributing elements to reporting what is discovered. A

qualitative approach was selected because participants were studied in the context of their work environment, little is known about the phenomenon of workplace personal learning environments, and there were no definitive hypotheses in the research literature at the time this study was conducted (Patton, 2002). Principles from the social constructivist approach were used in that a complexity of views was sought based on the participants' descriptions of their experiences, including their interactions with others both internal and external to the organization (Creswell, 2013).

Interviews. Interviews allowed this researcher to put behaviors that were identified in surveys in a context and provided further explication of participants' motives and strategies. A goal of interviewing was to give the reader a deeper understanding of experiences of study participants and to connect readers to the participants' experiences (Seidman, 1998). Although this research was not a phenomenological study, approaches to the interview process were drawn from the framework as described by Seidman

- The participants were asked to provide “their point of view---their ‘subjective understanding’”. (p. 17)
- Participants were asked “...to reconstruct their experience via reflection...”.(p. 17)
- “...The role of the instrument, the human interviewer” (p. 26) was recognized and affirmed.

Semi-structured interviews simultaneously continued exploration of the direction explored in the survey, while making room for unstructured, deeper exploration of the same agenda. One purpose of a semi-structured interview was “...to find *patterns* within *cases* (individual respondents or events) and *themes* (factors and variables that *cut across multiple cases*) in a qualitative data set” (Schensul & LeCompte, 2013, p. 172). The same open-ended

questions were asked of each participant, but then allowances were made for flexibility in the way responses were explored by this researcher. For analysis, the focus was on finding dominant themes that appeared in most of the participants' responses, yet themes that varied from the dominant ones also were noted. "Semi-structured interviews are best suited for exploring and delineating factors and subfactors and their association..." (Schensul & LeCompte, 2013, p. 175) that supported the intent of this study: exploration of factors associated with the use of personal learning environments by supervisor/manager-level employees.

Qualitative research also makes use of existing documents and researcher generated documents. For this study, existing documents about the internet usage policy of the hospital system were reviewed. As part of the interview process, participants were asked to use a worksheet prepared by the researcher to help them track activities in which they were engaged while working on the learning goal they chose. They were also asked to create an illustration of their PLE and were given examples of PLE illustrations to assist them.

Design of data collection.

The potential research participants who met the criteria for inclusion in the study were asked to complete a self-administered survey. Those who completed the survey were asked (via a question embedded at the end of the survey) if they would like to volunteer to participate in the following activities: one group informational meeting and a face-to-face interview (spaced two to six weeks apart), assignment of a task, completion of an Employee PLE Worksheet, and creation of a PLE concept map. Figure 6 illustrates the use of instruments for this study.

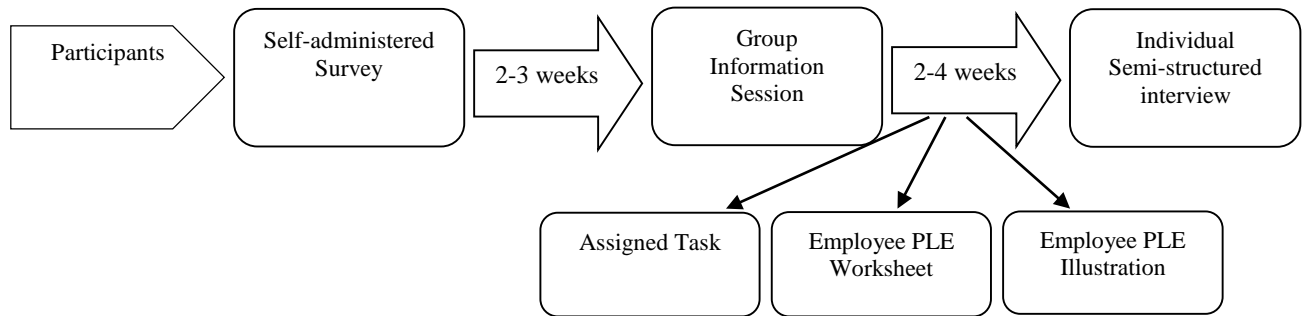


Figure 6: Research Design for Data Collection Instruments

Research Setting

The hospital health system used in this study was a nonprofit network of hospitals, medical centers, and insurance company located throughout Southeastern Michigan and is involved in medical research and education. This hospital system operates a 1,200-doctor medical group, as well as outpatient clinics, nursing homes, hospice, and a home health care network. At the time of the study, the system employed more than 23,000 people, with 17,489 full-time employees. Included in the employees were approximately 3,600 nurses and 3,900 allied health professionals. More than 102,000 patients were admitted to their hospitals annually.

The researcher served as an instructional designer intern during the summer of 2011 for the hospital system, developing online classes for the hospital's university learning management system. During that time, the researcher became aware of the Leadership Academy run by the hospital's university for newly hired supervisors and managers, as well as for employees newly promoted to managerial positions. This researcher approached the manager of the hospital's Leadership Academy to inquire about the potential interest in having the supervisors/managers

who were going through or had gone through the Leadership Academy participate in a research study on PLEs, and received a positive response.

- The sites for the group information meetings were the corporate headquarter located in Detroit and a medical office building in a suburb of Detroit.
- The site of data collection for interviews was the corporate headquarters for the hospital system, as well as two hospital locations (Detroit and a suburb of Detroit), and three medical center locations in three different suburbs of Detroit.

Participants

Population.

The population of this study was defined as supervisor/management-level employees who had participated in hospital leadership training programs. These employees were either in direct medical treatment positions or in support/administrative positions. With the increased complexity of the health care system in the United States, supervisors/managers in most large hospital systems have to be able to respond in a timely manner to multiple and multi-faceted changes in the health care system, including service delivery and reporting requirements using technology.

Sample and sampling techniques.

Purposive sampling was used in this study. This sampling technique is a non-probabilistic strategy that selects participants based on meeting the inclusion criteria for the study. The unit of analysis for this study was the group of research participants: employees of the hospital system who were managers/supervisors and had been enrolled in, participated in, or graduated from the hospital system's Leadership Academy. This sample did not include MDs who were supervisor/managers because they had a separate leadership training program. The

supervisor/manager-level employees were selected as a purposeful sample because their work often involved the need to analyze and solve problems in a large, multidisciplinary health organization and they were potentially rich sources of information about PLEs in the workplace. By recruiting from all supervisor/manager-level employees who had participated in the hospital's leadership training program, it was assumed that those who took the survey, and later agreed to be interviewed would constitute typical cases. Diversity in the characteristics of the individuals was not sought because the goal of this study was to find common experiences and themes.

Sample size.

- N for survey = 1005 supervisor/manager employees who attended or have completed the Leadership Academy
- Survey respondents:
 - A total of 171 participants started the survey, with 58 removed due to noncompletion of a sufficient number of items for analysis. The final response rate of 113 participants was 11.2%.
- Interview: Participants were solicited from supervisor/manager-level employees who opened the survey and checked the consent (embedded at the end of survey) that indicated their agreement to be included in the interview process
 - Thirty-seven participants who took the survey indicated a willingness to participate in a face-to-face interview. Of those, 25 indicated an intent to attend one of the four group informational meetings. Seventeen participants actually attended the group informational meetings. Two of those who attended the meetings dropped out stating they did not have the time to devote to the required task, and one person was ineligible because they had resigned from employment

with the hospital. Fourteen interview appointments were scheduled, but two did not follow through with the assigned tasks and dropped out due to busy schedules.

- Twelve participants completed the interview process, which was 32% of those who first indicated a willingness to participate in the interview process and 7% of those who completed the survey. The researcher withdrew one participant from the study because of lack of comprehension and follow through on the requested task. The qualitative analysis was based on 11 participants.

The sample size should be “sufficient numbers to reflect the range of participants and sites that make up the population...” (Seidman, 1998, p. 58), and saturation of information should be achieved, meaning that the interviewer starts to hear the same information, which was achieved for this study. Interview participants worked at a variety of locations including corporate headquarters, two hospitals, two medical centers, and one insurance site, with some participants working at multiple sites.

Data Collection Procedures

Following approval from the Wayne State University Institutional Review Board (IRB), the researcher began the data collection process. The Director of Organizational and HR Development at the health system sent an email communication on January 26, 2015 inviting the supervisor/manager-level employees identified as having enrolled in, participated in, or completed the leadership training program (N = 1,005) to take a survey. An anonymized link to the survey was included in the email message. The informed research consent information was presented when the survey was opened. To take the survey, the participant had to click on the first answer choice that stated “By clicking this button, I am indicating that I have read the above Research Consent information and I am willing to take this survey.” Qualtrics was used for

survey data collection from the participants. The code numbers for the participants were assigned by the Qualtrics program, and were not linked to participants' names.

Participants were asked to respond to the survey within two weeks of receiving the invitation email with the link to the survey. Two follow-up email reminders for the survey were sent on February 2, 2015 and February 10, 2015. The anonymized link to the survey was included in the reminder emails. The survey was closed after three weeks on February 13, 2015.

Participants who reached the end of the survey were asked via a question embedded in the survey, if they would be willing to volunteer to participate in an interview process that included a group informational meeting, the completion of a task, and an interview. The participants who responded affirmatively were taken to a separate survey where they were asked to provide their names, phone numbers, and email addresses to allow the researcher to contact them and make arrangements for the group meetings and the individual interviews. The researcher contacted the interviewees via email and via a Doodle group event "poll" (that did not require registration and allowed people to take the poll anonymously) to set up the group information meetings based on the respondents' preferences for meeting times and locations. The individuals who attended the group information meetings and expressed an interest in being interviewed were given the Informed Consent Forms (See Appendix E). After signing the consent forms, they were asked to retain one copy for their records. Individual interview meeting times and locations were agreed upon before leaving the meeting. Refer to Table 2 for a listing of the data collection methods related to the research questions.

Table 2

Research Data Collection Methods

Research Question	Primary Data Collection Method	Secondary Data Collection Method
Question 1: How do employees construct their PLEs? • What internet/Web 2.0 technologies and/or applications are used by employees for: ◦ finding information? ◦ managing information (store, retrieve, classify)? ◦ building and using networks to collaborate? ◦ sharing information and knowledge with others?	A survey was administered to employees who were managers/supervisors who were currently enrolled in or had participated in the Leadership Academy, via the hospital email system	Answers to semi-structured interview questions PLE illustrations completed by employees over the course of the interview process Employee PLE Worksheets completed over the course of the interview process
Question 2: What triggers an employee to construct a PLE?	Survey	Answers to semi-structured interview questions
Question 3: How do employees use their PLEs? • With what frequency do employees utilize their PLEs? • What strategies do employees use through their PLE to: ◦ critically analyze information? ◦ make decisions about the information found? ◦ create knowledge? ◦ self-evaluate whether their PLE is effective in accomplishing their work-related learning goal(s)?	Survey	Answers to semi-structured interview questions PLE illustrations completed by employees over the course of the interview process Employee PLE Worksheets completed over the course of the interview process

Instrumentation**Survey instrument.**

The survey instrument was developed to investigate attitudes or opinions not readily observable (such as thought processes used to evaluate information), and was best suited for the initial data collection method in this study (Nardi, 2006). The 37 items on the survey (26 survey questions plus 11 demographic questions) used different response formats (e.g., Likert-scaled, multiple response, and forced choice) and open-ended questions (to allow respondents to

elaborate on their responses or to contribute information they thought was of value, but was not directly asked for). The items were categorized as follows

- understanding of employer's Web 2.0 policies;
- internet and Web 2.0 technologies they used to seek, organize, create, share, and evaluate information and knowledge;
- familiarity with using social network sites for solving work-related problems;
- communications with others inside or outside of their company;
- types of technology devices used and what influenced choices;
- level of satisfaction with Web 2.0 technologies;
- processes and activities that defined learning goals and evaluated the quality of learning;
- uses of information/knowledge gained from use of Web 2.0 technologies; and
- demographics.

The questions developed for the survey were informed by research, as well as informal nonscientific information found on the internet, such as blogs, brief surveys, and internet articles on the topic of PLEs or social media (Bartlett & Kotrlik, 1999; Caffarella & O'Donnell, 1991; Confessore & Kops, 1998; De La Calzada & Dekhtyar, n.d.; Metzger, 2007; Nandi, Chan & Balbo, 2009; Rubio, Galán, Sánchez, & Delgado, 2011; Stipp, 1997; Straka, Kleinman & Stokl, 1994). The questions for the survey were formulated according to what the literature revealed as key dimensions in constructing surveys (Cox & Cox, 2008; McConnel, 2003; Nardi, 2006; Sue & Ritter, 2007).

The survey was administered via the hospital system intranet, utilizing a third party survey administrator (Qualtrics) that allowed for basic analytics on the responses to the survey

questions. Those who participated in the survey were given the option to be entered into a raffle for a \$25 gift card. Four gift cards were awarded. The raffle was accessed through a second prize-entry survey (for which the link was embedded at the end of the original survey to maintain confidentiality of the survey responders) that collected respondents' contact information. Those who completed the prize-entry survey were placed in the pool from which winners were selected. Randomness in picking winners was assured by using a random sequence generator (www.random.org). Expectations were established for when the survey was to be closed and when the winner would be selected and notified.

Refer to Appendix D for a copy of the survey instrument. Table 3 presents the research questions and the survey items that were used to address each question.

Table 3

Research Questions and Associated Survey Items

Research Questions	Survey Items
Question 1: How do employees construct their PLEs? • What internet/Web 2.0 technologies and/or applications are used by employees for: <ul style="list-style-type: none"> ◦ finding information? ◦ managing information (store, retrieve, classify)? ◦ building and using networks to collaborate? ◦ sharing information and knowledge with others? 	7, 8, 9, 10, 11, 12, 13, 14, 15, 16
Question 2: What triggers an employee to construct a PLE?	17
Question 3: How do employees use their PLEs? • With what frequency do employees utilize their PLEs? • What strategies do employees use through their PLE to: <ul style="list-style-type: none"> ◦ critically analyze information? ◦ make decisions about the information found? ◦ create knowledge? ◦ self-evaluate whether their PLE is effective in accomplishing their work-related learning goal(s)? 	18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29

Reliability. Reliability means that one obtains consistent responses when repeated measurements are made of the same unchanged object or event. The Likert scaled items were tested for internal consistency using Cronbach's alpha coefficients. To be considered reliable, the alpha coefficients needed to be greater than .70. Alpha coefficients greater than .70 were considered as strong evidence of internal consistency. If the alpha coefficients were below .70, the survey items were reviewed to determine ways to improve the reliability. Table 4 presents the Cronbach alpha coefficients that were obtained for sections on the survey that used Likert-scaled response formats.

Table 4

Cronbach Alpha Coefficients for Survey Sections using Likert-Scaled Response Formats

Survey Section	Cronbach Alpha
Influence use of internet/Web 2.0 technology	.81
Usefulness of internet/Web 2.0 tools	.86
Reasons for using internet/Web 2.0 technology	.90
Judge quality of learning	.62
Credibility of information found on internet/Web 2.0 technology	.84
Evaluating quality of websites	.82
Evaluating quality of WIKI	.89
Evaluating quality of blogs	.44
Evaluating quality of discussion boards	.72
Confidence in ability and skills	.91
Learning actions of internet/Web 2.0 technologies	.66

The alpha coefficients ranged from .91 for confidence in ability and skills to .44 for evaluating quality of blogs. The reasons for the discrepancy were due to the number of items on the section and the number of responses to the items. For example, evaluating quality of blogs

had 4 items and 16 respondents, while confidence in ability and skills had 3 items and 86 respondents. Based on these findings, the survey had adequate reliability for the present study.

Validity. Construct validity is concerned with the extent to which a measurement measures what it intends to measure. Face validity occurs when others agree that what is being measured does measure the construct of interest, in this case PLEs. An expert panel of three people studying or theorizing about PLEs reviewed the survey items for face validity and survey design. The experts were asked to indicate if any of the items needed to be revised or eliminated because they did not meet the criteria for assessing PLE experiences. They were also asked to indicate any additional items that they thought would add to the validity of the survey in measuring PLEs. Changes suggested by the majority of the expert panel were incorporated into the survey prior to distributing it for a pilot test.

Pilot test. A pilot test was used to determine the content validity of the survey and to maximize the chance that the target participants would understand the questions. Twenty participants who were friends or work associates of the researcher were asked to complete the survey. While completing the survey, they were asked to indicate any items that had ambiguous wording, were confusing, unintelligible, biased, or difficult to answer. They were also asked to record the time required to respond to all survey items. The researcher reviewed the responses and made changes to reflect the majority of the comments.

Group information meetings and semi-structured interviews.

The research questions were addressed through interviews of supervisor/manager-level employees to explore, explicate, and develop an in-depth, contextualized understanding of the research questions. Additionally, the task assignment that was part of the interview process allowed for exploration of more immediate, relevant aspects of the activities/actions that

supervisor/manager-level employees used as they completed their task within the social and environmental context of their workspace.

Survey responders who expressed an interest in being interviewed met with the researcher twice. They first met with the researcher for a group information session where they were assigned the task of developing a learning goal that could help them solve a work-related problem, and to use internet/Web 2.0 technologies to meet their goals. The subsequent semi-structured interviews included a list of questions that were asked of all participants. Follow-up probing questions were used to elicit in-depth responses and clarify responses. The participants were asked to provide detailed reports of their personal learning environments.

Group information meetings. Thirty-seven participants who completed the survey indicated a willingness to participate in the interview process. They were contacted via email and then a Doodle “poll” to determine the best days/times/locations for the meetings. Of those contacted, 25 indicated an intent to attend a group information meeting. Four separate meetings were scheduled to accommodate the high number of responders. To make access convenient for potential volunteers, two meeting locations were selected: one was at corporate headquarters in Detroit and the other was at a medical office building located in a suburb of Detroit. A protocol for the information meetings was developed (see Appendix E) and followed for each meeting, to maximize consistency and minimize misunderstandings about the instructions for the task. Volunteers were asked to complete before their individual interview date. Seventeen participants attended the four meetings.

At the start of the group information sessions, the interviewer attempted to put the participants at ease and explained the research and interview procedure. They were told that the purpose of this study was to find out how they would develop and use a PLE to solve a work-

related problem. Volunteers were asked to identify a work-related learning goal on which they could focus for the next two weeks of the study. Over the two weeks that they were working on their learning goal, they were instructed to note: (a) which internet/Web 2.0 technologies/applications they used in the process, (b) how many work hours they devoted to working on their learning goal each week, (c) which devices they used, and (d) how they evaluated their progress as they worked toward their goal. The participants were given a handout, the Employee PLE Worksheet (see Appendix G) that included a definition of a PLE, a reminder of what to note as they worked, lists of technology devices and internet/Web 2.0 technologies/applications, a reminder to attach their PLE Illustration, and to log the number of hours they worked on the project. The participants were shown several illustrations of PLEs (see Appendix C) and given an illustration (see Appendix C1) as a reference when creating their own illustrations. They were told that the Employee PLE Worksheet (see Appendix G) was designed to help them with the instructions and they were encouraged to use the worksheet over the next two weeks. The participants were asked to create an illustration of their PLE (similar to the ones they were shown and the one they were given to keep) as they worked on their learning goal. They were told that they could illustrate their PLE manually or electronically by computer and organize it visually in a way that made sense to them.

The participants were given two copies of the informed consent form, which was read aloud at each meeting in case there were volunteers with compromised reading abilities. The volunteers were encouraged to ask any questions regarding their involvement. If they had no concerns and were willing to go through the interview process, they were asked to sign the consent. They retained a copy of the consent for their records in case they developed questions or concerns about the research.

The researcher maintained field notes on the meetings and documented the questions that were asked at each meeting. The questions that volunteers asked, and the answers given by the researcher, were compiled into a handout (see Appendix E2) that was given to volunteers at subsequent meetings to provide consistent information for each group of volunteers at their informational meetings.

- The first group information meeting was scheduled on 2/27/2015 (in a conference room at corporate headquarters). Eight of 11 scheduled volunteers arrived. After going over the information, the nature of the task, and the illustration, volunteers were encouraged to ask questions.
- Questions from the volunteers at this meeting were focused on what would constitute a learning goal and whether they needed to come up with one in addition to their regular workload. Group discussion then ensued where group members gave each other examples of what they thought of for themselves in terms of a learning goal—the members seemed to find this helpful.
- All 8 participants signed the consent form and were given copies. Individual interview appointments were established at the conclusion of the meeting.
- The second meeting was held on 3/3/2015 (in a conference room that was in the medical building attached to a hospital located in a suburb of Detroit). Three volunteers were present. They were given the same information as described above, only for this meeting the volunteers took turns reading the consent form out loud, after which they signed the consent form and retained one copy.
- Two main themes to the questions were: what learning goal was OK and their lack of recognition of the example internet/Web 2.0 applications shown in the

PLE illustration. They were assured that the particular applications on the paper were only for illustration purposes and that they were not expected to know or use those applications. It was explained that the researcher was interested in what they are already doing and there was no expectation that they learn new tools/applications.

- One volunteer expressed concern about possibly getting in trouble for using the internet to go to social media sites, such as YouTube. She had not done that while at work and was not sure her computer would allow her to go there on the internet. It was explained that to get her company to agree to partner in this research project, they were told about the research design and that participants would be asked to track what they are doing on the internet. She was also told that the reason that participants were asked to identify a work-related learning goal was so that what they did would be related to their jobs and not for personal use. She was also told that if she had any additional concerns and needed to talk to the researcher further she could.
- The third and fourth meetings were held on 3/6/2015 (in a conference room at corporate headquarters) at two different times. For the first meeting time, only one participant attended. The volunteer was given the research information based on the protocol and read the consent form on his own. He did not have any questions. He consented to be in the study.
- For the second meeting time on 3/6/2015, five volunteers attended. One volunteer stated immediately after reading the informed consent form that she was not interested in participating and left the meeting. Another volunteer stated that she

would be leaving the hospital system by the end of the week. The study information was given, after which the consent form was read aloud. Questions from this group also focused on what type of learning goal would be appropriate for the study.

Semi-structured interviews. Twelve participants were interviewed. At the beginning of each interview, the participants were reminded of the purpose of the study as explained at the group information meetings. They were asked for verbal permission to record the interview digitally. Participants were given a sheet to complete that asked for demographic data (See Appendix E5). After answering the interview questions, notes that were made on the Employee PLE Worksheets were reviewed by the interviewer and the participants. Participants were asked to discuss their PLE illustration. At the conclusion of the interviews, participants were debriefed about any questions or concerns they had regarding their participation in the study, and were informed that they would be sent a copy of the transcript of their interview to review. They were asked to return the transcript within five working days if any changes were necessary to correct or add to their responses. Transcripts that were not returned were considered correct as written. Participants who completed the interview process were offered a personalized work environment plan/process to help improve their work performance using internet/Web 2.0 technologies. None of the participants requested a plan, but several participants asked questions about and discussed various tools/applications that were listed on their worksheet.

An interview protocol was developed (see Appendix E4) to enable the researcher to ask the same questions of each participant, to have consistency in the interview process, and to allow the interviewer some latitude to adapt questions to respond to participants' leads. The interview protocol provided a written list of the predetermined, semi-structured questions that were related specifically to the research questions. Although the questions were predetermined, allowances

were made for flexibility through probing follow-up questions. The questions were constructed to follow guidelines for creating good structured interview questions as detailed by Schensul and LeCompte, (2013). Two questions were adapted from interview questions (1 and 2) asked in a dissertation study about the effects of interactive technology on informal learning and performance (Boileau, 2011).

The semi-structured interview questions covered the following areas:

- how participants
 - perceived their company's internet/Web 2.0 policies;
 - picked their particular learning goal, and what they learned in the process of working on it;
 - located and stored information, made decisions about how to use information, created knowledge, collaborated and built networks, and shared and disseminated information;
 - determined which tools to use for particular purposes;
 - analyzed the relevance and quality of the information they found;
 - judged the quality of their learning;
 - participants diagnosed their learning needs and developed professionally relevant learning goals;
- what positively influenced participants to try new internet/Web 2.0 technologies; and
- what influenced participants to use internet/Web 2.0 technologies to solve some work-related problems, but not others.

Validity and reliability of the interview instruments.

Internal validity or credibility of the interview responses. The researcher took notes during the interviews (in addition to recording) and read back the notes to interviewees during the interview to summarize what they had said. They were asked to provide any corrections or additional comments during the summarizing and immediate feedback regarding the accuracy of the notes about what they had reported. The summary statements made by the researcher and the participant responses to these summary readings were digitally recorded along with the rest of the interview and later transcribed. The summary statement transcriptions served as a means for cross checking (during coding) with interview responses to semi-structured questions. The digitally taped interviews were transcribed by an independent transcriber. Field notes that reflected the researcher's observations, opinions, and summaries were written following each interview. Internal validity was enhanced using triangulation by using more than one source of data (i.e., surveys, interviews, PLE illustrations, participant worksheet notes, field notes written right after group interview meetings, field notes written during and right after interviews, researcher journal entries, and researcher memos while coding). In addition to interview questions that asked specific questions, interview participants were asked to provide a general, global description of the learning goals they chose and their approaches to completing them. The responses to the global questions also served as a means for cross checking with responses to the semi-structured interview questions. The following is a list of transcribed data sources that were compared and contrasted to cross check for consistencies or inconsistencies:

- answers to specific interview questions,
- participant comments regarding the researcher's summary statements,
- participants' general global descriptions,

- descriptions provided about the PLE illustrations,
- comments made about the PLE Employee worksheets used, and
- typed (not transcribed) field notes made following the interviews

External validity or transferability of the findings. Although qualitative findings may not be generalizable to a broader population, readers of the present study may find the results have applicability to other similar situations where supervisors/managers use the internet/Web 2.0 technologies to solve work-related problems. Researchers interested in understanding the use of internet/Web 2.0 technologies as a basis for developing personal learning environments could use findings of the present study as a basis for further study. Therefore, results of this study may have implications beyond this specific study.

The researcher's assumptions and biases are made evident through the subjectivities statement. Field notes and memos that detailed how the data were collected and other pertinent information that may reflect on responses to the interview questions will be maintained for seven years.

Research questions and data sources.

Table 5 describes the research questions and propositions. In addition, the data sources that were used to address the research questions and propositions are included in the table.

Table 5

Research Questions, Propositions, and the Relevant Data to Address the Questions

Research Questions and Propositions	Relevant Data
<p>Question 1: How do employees construct their PLEs?</p> <ul style="list-style-type: none"> • What internet/Web 2.0 technologies and/or applications are used by employees for: <ul style="list-style-type: none"> ◦ finding information? ◦ managing information (store, retrieve, classify)? ◦ building and using networks to collaborate? ◦ sharing information and knowledge with others? <p>A. Level of self-reported total use of internet/Web 2.0 technologies and/or applications can be predicted by personal characteristics, including: age, educational level, years worked for the organization, years in current position, and participation in formal training.</p> <p>B. Level of self-reported total use of internet/Web 2.0 technologies and/or applications is related to respondents' perceptions of employer's policies regarding use of Web 2.0 technologies at work.</p> <p>C. Self-reported level of use of social network sites can be predicted by level of self-reported total use of internet/Web 2.0 technologies and/or applications and by personal characteristics, including: age, educational level, years worked for the organization, years in present position, and participation in formal training.</p> <p>D. Level of satisfaction with internet/Web 2.0 technologies and/or applications can be predicted by personal characteristics, including: age, educational level, years worked for the organization, and years in current position.</p> <p>E. Communication with experts inside of the organization can be predicted by personal characteristics, including: age, educational level, years worked for the organization, and years in current position.</p> <p>F. Communication with experts inside of the organization is related to participants' perceptions of employer's policies regarding use of Web 2.0 technologies and/or applications at work.</p> <p>G. Communication with experts outside of the organization can be predicted from personal characteristics, including: age, educational level, years worked for the organization, and years in current position.</p> <p>H. Communication with experts outside of the organization is related to participants' perceptions of employer's policies regarding use of Web 2.0 technologies and/or applications at work.</p>	<p>Survey Data</p> <ul style="list-style-type: none"> • Perceptions of employer's policies regarding use of Web 2.0 at work • Self-reported level of use of social network sites (level of expertise) • Types of devices being used by employees to access their PLEs • Specific internet/Web 2.0 technologies and applications used by employees for: <ul style="list-style-type: none"> ◦ Finding, critically analyzing, and managing information (store, retrieve, classify) ◦ Communicating, collaborating, building networks ◦ Sharing and disseminating information and knowledge with others • Use of Internet/Web 2.0 technologies to communicate with experts inside or outside of the organization • Which Internet/Web 2.0 technology characteristics influence choices of specific applications • The perceived usefulness of various categories of tools/applications • Methods used to document or demonstrate accomplishment of learning goals • Degree of satisfaction with Web 2.0 technologies for solving work-related problems • What would increase level of satisfaction with Web 2.0 technologies <p>Interview Data</p> <ul style="list-style-type: none"> • Descriptions of how participants constructed their PLE to solve the learning goal they developed • Descriptions about what applications and strategies participants used to: <ul style="list-style-type: none"> ◦ Find, critically analyze, and manage information ◦ Communicate, collaborate, build networks ◦ Share and disseminate information and knowledge with others • Rationales participants had for choosing the tools/applications they did to solve their learning goal • Explanations of the PLE illustrations that participants created • Information gained from how participants used the Employee PLE worksheets

Research Questions and Propositions	Relevant Data
<p>Question 2: What triggers an employee to construct a PLE?</p>	<p>Survey Data</p> <ul style="list-style-type: none"> • Reasons/rationale employees give for choosing to use Internet/Web 2.0 technologies to meet job related learning goals or for professional development <p>Interview Data</p> <ul style="list-style-type: none"> • What, in general, positively influences employees to try Internet/Web 2.0 technologies and applications at work to solve work-related problems or for professional development • What has moved employees to initiate use of Internet/Web 2.0 technologies to solve some work-related problems, but not others
<p>Question 3: How do employees use their PLEs?</p> <ul style="list-style-type: none"> • With what frequency do employees utilize their PLEs? • What strategies do employees use through their PLE to: <ul style="list-style-type: none"> ◦ critically analyze information? ◦ make decisions about the information found? ◦ create knowledge? ◦ self-evaluate whether their PLE is effective in accomplishing their work-related learning goal(s)? <p>A. Employee level of confidence in their abilities to use internet/Web 2.0 technologies and/or applications can be predicted from use of social network sites, total use of internet tools, and personal characteristics, including: age, educational level, years worked for the organization, years in present position, and number of formal trainings attended.</p> <p>B. Perceived credibility of internet/Web 2.0 technologies and/or applications can be predicted by personal characteristics: age, educational level, number of formal trainings attended.</p> <p>C. Whether employees use internal or external criteria to determine mastery of the learning goal can be predicted by personal characteristics: years worked for the organization, years in current position, job title, and number of formal trainings attended.</p> <p>D. Methods used by employees to document and/or demonstrate their accomplishments on their learning goals or for professional development can be predicted by personal characteristics, including: age, educational level, years worked for the organization, and number of formal trainings attended.</p>	<p>Survey Data</p> <ul style="list-style-type: none"> • Self-reported total use of internet/Web 2.0 technologies • How employees judge the quality of their learning as they use Internet/Web 2.0 technologies to solve a work-related problem or for professional development • The amount of credibility they would give to professional information or advice found on various Internet/Web2.o applications • How employees evaluate the quality of: websites, wikis, blogs, discussion boards • What criteria employees use to decide if they have achieved a learning goal • How confident they are in their ability and skills to use, critically analyze, and apply information they find using Internet/Web 2.0 technologies • Actions employees take when learning new materials • What learning activities employees engage in when solving a work-related learning goal or for professional development • The frequency with which employees use/apply the information/knowledge they discovered while using Internet/Web 2.0 technologies to solve work-related problems <p>Interview Data</p> <ul style="list-style-type: none"> • How participants evaluated the relevance of the information/knowledge they found while working on their learning goal • How participants analyzed whether the Internet/Web 2.0 technologies they were using were effective • How participants judged the quality of their learning as they used their PLE to solve their learning goal • In general, how participants identify a learning need

Research Questions and Propositions	Relevant Data
	and professionally relevant learning goals <ul style="list-style-type: none"> • Whether participants believed they created knowledge, and if yes, what kind

Anticipated ethical issues.

Creswell (2013) identified possible ethical issues in qualitative research as problems with informed consent procedures, deceptive or covert activities, compromised confidentiality of the participants, risks of the research outweighing the benefits, and participant requests that go beyond social norms. None of these occurred in this study. Several interview participants reported being glad they participated because they were exposed to and learned about internet/Web 2.0 technologies of which they were previously unaware.

Trustworthiness

Determining the trustworthiness of qualitative research is similar to determining the reliability and validity used in quantitative research. Guba (1981) developed four criteria that have been employed by researchers to assure the trustworthiness of qualitative research:

1. Credibility (in preference to internal validity)
2. Transferability (in preference to external validity/generalizability)
3. Dependability (in preference to reliability)
4. Confirmability (in preference to objectivity; p. 64).

Credibility is defined as the extent to which the findings of the study reflect reality. For both Lincoln (1995) and Guba (1981) credibility is important in verifying trustworthiness. To address the rigor of this qualitative study, established guidelines were followed to ensure the trustworthiness of the research process. The major components of trustworthiness as defined by Guba, and elaborated on by Morrow (2005) and Shenton (2004), were used to guide the

processes in this study. Table 6 presents the provisions for addressing trustworthiness in this study. Regarding case studies, “it is the reader, not the researcher who determines what can apply to his or her context” (Merriam, 2009, p. 51).

Table 6

Provisions that Address Criteria for Trustworthiness

Criteria for Trustworthiness	Steps to achieve the criteria	Steps that were taken in this study
<p>Credibility (Internal validity) = correspondence of the findings with reality, validity of the data, systematic rigor of fieldwork procedures</p>	<ul style="list-style-type: none"> • Prolonged engagement with participants • Persistent observation in the field • Researcher reflection (researcher understands how his or her own experiences and understanding of the world affect the research process) <ul style="list-style-type: none"> ▪ Participant checks, validation, or co-analysis ▪ Researcher’s interpretations reflect the interviewees’ meanings • Thick descriptions of participant’s experiences as well as the context in which those experiences occur 	<ul style="list-style-type: none"> • Twelve participants were seen for a 30 minute group meeting in a central location to where they worked within the hospital system, and were interviewed two to four weeks later in their workplace with the average interview length being 49 minutes • Researcher kept field notes for each group information meeting and for each interview • Researcher kept a researcher journal for reflection on the process, and on the researcher’s reactions to the study processes to remove researcher bias as much as possible • The researcher regularly reviewed field notes and made reflective commentary as to the effectiveness of the techniques being employed • Researcher consulted regularly with a research consultant throughout data analysis • Researcher sent each interviewee their transcript for member checking • Researcher worked to accurately present the interviewee’s meanings by obtaining information in a variety of ways that could be cross checked: interviewees answers to specific semi-structured questions, interviewees’ responses to summary statements read to them from the researcher’s notes taken during the interviews, interviewees’ global descriptions

Criteria for Trustworthiness	Steps to achieve the criteria	Steps that were taken in this study
<p>Transferability (External validity) = generalizability</p>	<ul style="list-style-type: none"> • Sufficient information about the self (researcher as instrument) • Sufficient information about the research context, processes, participants, and researcher-participant relationships 	<p>of how they went about solving their task, interviewees illustrations of their process, and interviewees notes on their worksheets</p> <ul style="list-style-type: none"> • Relevant documents related to the organization's policy on internet/social media were obtained and reviewed to develop familiarity with the organizational context • The researcher has submitted a subjectivity statement providing information about the researcher as an instrument • Contextual information about the study site is provided in Chapter 3 • Information is provided in Chapter 4 about the number of participants, the data collection methods used, the number and length of the data collection sessions
<p>Dependability (Reliability) = stability ,triangulation, reliability of coding and pattern analysis</p>	<ul style="list-style-type: none"> • The processes through which findings are derived is made explicit • Carefully track the emerging research design • Audit trail: detailed chronology of research activities and processes; influences on the data collection and analysis; emerging themes, categories, or models; analytic memos 	<ul style="list-style-type: none"> • Sufficient information has been provided in this Chapter about how the research design was planned and executed, and about how the data was gathered so that this study could be replicated • A self-evaluation of the effectiveness of the process of inquiry was made through reflections in the researcher's journal • An audit trail was created with the documents that detailed the research activities (researcher journal and field notes), memos made during data analysis, documents showing the line-by-line formatting of each interview and the list of interview statements that corresponded to each interview question (for development of schemas and codes), and a code taxonomy detailing the categories and sub-categories that were created

Criteria for Trustworthiness	Steps to achieve the criteria	Steps that were taken in this study
Confirmability (Objectivity) = distanced and neutral observer, minimizing bias, objectivity of the inquirer	<ul style="list-style-type: none"> • Findings should be as objective as possible and reflect the situation being researched rather than the beliefs, theories, or biases of the researcher • Bracketing: Making one's implicit assumptions and biases overt, and setting them aside to avoid undue influence on the research process 	<ul style="list-style-type: none"> • Triangulation of evidence gathering was achieved by the study collecting data through a survey, interviews, and illustrations • Reflective commentary was made in notes on possible beliefs, assumptions, and biases that surfaced during the study process and those were used to suspend researcher biases so as not influence the data gathering or analysis • Limitations of the study methods were noted • Regular reviews were conducted with a research/statistician consultant
Adequacy of data	<ul style="list-style-type: none"> • Adequate amounts of evidence <ul style="list-style-type: none"> ◦ Recommend approximately 20 participants ◦ Data are gathered to the point of redundancy ◦ Purposeful sampling • Adequate variety in kinds of evidence <ul style="list-style-type: none"> ◦ Use of multiple data sources 	<ul style="list-style-type: none"> • Multiple data sources were collected: surveys, interviews, field notes, participant worksheets and participant illustrations • There were 11 interviews • The sampling was purposeful to achieve a normative sample and to achieve a criteria sample of employees who use the internet/Web 2.0 technologies to solve work-related problems • Interview responses were being repeated—so some redundancy was achieved

Note: The criteria and steps to ensure trustworthiness were taken from Shenton (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, 22, pp. 63 – 75. Morrow (2005). Quality and trustworthiness in qualitative research in counseling psychology. *Journal of Counseling Psychology*, 52 (2), pp. 250 – 260.

Subjectivities Statement

In qualitative research, the researcher is seen as the primary instrument and it is generally understood that the researcher will have biases and “subjectivities” that will consciously or unconsciously infuse themselves into the research process. “...It is important to identify them and monitor them as to how they may be shaping the collection and interpretation of data”

(Merriam, 2009, p. 15).

My epistemology, "... the branch of philosophy that studies knowledge and examines the nature of understanding how knowledge is derived, verified, validated, and tested" (Simon & Goes, 2013, p. 24), fits the interpretative /constructive categorization and is informed by phenomenological philosophy. "Interpretative research...assumes that reality is socially constructed, [and]...there are multiple realities, or interpretations, of a single event" (Merriam, 2009, p. 8). A central tenet of social constructivism is that people socially construct their worlds, which is in alignment with interpretative research. It follows from these epistemologies that the primary goal of research is to try to understand the phenomena under study from the unique perspectives of those engaged in the activities being examined. To facilitate this goal, the researcher needs to reflect on their investigative process, put aside preconceptions, and be aware of a priori assumptions that might interfere with looking at the first hand experiences of those who are being studied.

My theoretical framework is constructivism. Jonassen (1991) viewed the paradigm shift in the field of learning psychology as a shift from an objectivist philosophy where "...knowing and learning are processes for representing and mirroring reality..." to a constructivist philosophy where "...knowing is a process of actively interpreting and constructing individual knowledge and representations" (p. 5). Because everyone has different experiences, there can be multiple realities on a subjective basis. Connectivist ideas about knowledge being co-created through connections with others and resources also influenced the theoretical lens through which this study was viewed.

The culture we live in both defines and limits how we derive meaning from our experiences. To get at the essence of what is studied requires that we deliberately examine our own viewpoint and understandings and not let them obfuscate how we view what we are

exploring. I believed the best way to search for the experience of the study participants who were developing and using PLEs was to go to them directly and ask how they were creating their PLEs, while doing my best to suspend assumptions I had about PLEs within work settings.

My assumptions were derived from my role as a professional graduate student studying instructional technologies, my experience while interning as an instructional designer for a large hospital health system, and my experience with creating and using my own personal learning environment to meet personal learning goals. The personal assumptions I had entering into this research study were

- Advances in technology will move workplace education forward.
- Employees respond positively to a company environment that develops and supports a culture of learning, rather than only offering training with top-down content.
- Allowing people to use newer technologies (such as Web 2.0 and social media) to further their workplace education will advance a culture of learning.
- Adults like to take charge of their learning and to access information and knowledge resources immediately when possible.
- Adults can be productively self-directed in their workplace education.
- Adults like working on problems together and helping each other.

My attitudes, biases, and understandings of PLEs prior to conducting the study were

- PLEs are a modern manifestation of self-directed learning.
- Employees are already creating and using PLEs without naming them as such.
- PLEs are constantly adapting and changing in response to evolving technologies.
- PLEs are a necessary component of workplace education.

- Employees would benefit from organizational support to maximally develop and use PLEs.

I realized that study participants might not hold the same positive attitudes and beliefs about PLEs that I held, or may have had undesirable experiences trying to use internet/Web 2.0 technologies for educating themselves in the workplace. I also realized that there may be challenges and difficulties associated with PLEs in the workplace that I had not considered. To accommodate these possibilities, I committed to listening to study participants as objectively as possible, with the goal of keeping an unbiased and open receptivity to what study participants shared. To assist with monitoring for biases and bracketing, I kept a research journal, field notes during data collection, and made memos during data analysis.

Data Analysis Procedures

This case study achieved “high quality analysis” by attending to all evidence, keeping interpretation separate from presented results, and exploring for and being open to alternative interpretations (Yin, 2003). The data collected was analyzed in ways that did not prejudice their subjective character.

The quantitative portion of the data analysis used IBM-SPSS ver. 23 to summarize the responses. The first section of the quantitative data analysis addressed the research questions by providing descriptive data using frequency distributions and measures of central tendency and dispersion. The remainder of the quantitative analyses (correlational analysis and multiple regression) addressed the research question propositions developed for the study. The data were analyzed to ascertain if the propositions were valid.

Analysis of the structured, specific research questions.

The qualitative data analysis used for the semi-structured questions that were related to specific research questions was the five-step data analysis process as outlined by Ruona (2005): “1) sensing themes, 2) constant comparisons, 3) recursiveness, 4) inductive and deductive thinking, and 5) interpretation to generate meaning” (pp. 236-238). To facilitate the data analysis of the interviews, the data were examined for patterns and themes to help answer the research questions. The data were categorized through a coding process that focused on information provided in sentences and paragraphs. Coding individual words may result in loss of context, while coding by sentences and paragraphs may be too general. A data reduction process was used to focus on what was meaningful.

All interview transcripts were analyzed for each research question. Each individual interview transcript was assigned a participant code number and was formatted in a table in a Word document, and set up such that every row contained a sentence, and the rows were separated by who spoke (interviewer versus participant) as detailed in Ruona (2005). Each table had six columns labeled Code, ID (of speaker), question number (referring to the research question), turn number (or line number), data (where the text was located), and notes (for making memos “as you go” about the coding process). All 11 tables were then copied and in the second set of tables the data were prepared for line-by-line analysis with minor editing, formatting by deleting words such as uh, ummm, um hmm, etc., removal of identifiers, and identifying meaningful segments (a sentence, a paragraph, a phrase). Responses that could be broken down further were divided and paced in separate rows and then the rows were renumbered. A master list was created with each interview question. For every table in the second set of tables, the lines of text in each row that were coded for a particular question number were copied and pasted into

the master list under the corresponding question number. That way each question had the corresponding responses from each participant listed directly below the question. These responses were further segmented as needed. Those lines were carefully analyzed for categories and themes. Each concept or theme that emerged from a participant's response was compared to concepts and themes that emerged from previous responses, made by either the same participant or other participants, to see if they were alike or different. If the concept or theme was unique, it was considered a category and assigned a code. The codes representing categories and subcategories (which represented the answers to the research questions) were edited as the system evolved and were listed on a separate document that made a preliminary code taxonomy. An iterative process of review was used to edit the coding system to reflect categories that were mutually exclusive and were at the same level of abstraction, as well as for generating meaning, until the final coding hierarchy was achieved. The researcher's thoughts and ideas about the coding process and emerging concepts and themes were documented in field notes for coding in a separate Word document. Themes that emerged were then explored for connections to each other and to the literature. Themes and patterns in the data were identified through either content analysis or thematic analysis, and at times both.

Analysis of the global, open-ended interview questions and PLE illustrations.

The two questions that asked for a global description of how participants chose their learning goal and how they went about reaching their goal (the interview task assigned for them to work on) were analyzed following Creswell's (2013) suggested 6-step approach developed by Moustakas to analyze qualitative data:

1. A description of the phenomenon being studied, PLEs, was created that was accessed by both the researcher and the participants. The description was written on the

- participant worksheets. The researcher disclosed personal experiences with the phenomenon through the subjectivities statement that allowed the researcher to bracket personal assumptions and biases, and focused on the participants' interview responses regarding their experiences with PLEs.
2. The researcher read the interviews to find statements that explained how the participants experienced the use of internet/Web 2.0 technologies as part of their PLE, and to find statements about the strategies they used to meet their goals. A list of statements that were relevant to the topic were established, with each statement given equal weight. Redundant statements were eliminated.
 3. Using the list of statements, categories were created and the statements were grouped within these categories. These categories were then subdivided into subcategories.
 4. A description of the participants' experiences using their PLE was developed to explain how their experiences affected their perceptions of using their unique personal learning environment to solve their work-related learning goal.
 5. A description was produced of how the participants experienced their PLEs, focusing on the context in which their PLEs were used.
 6. Steps 4 and 5 were combined to reflect one of the conclusions of the study.

CHAPTER 4: RESULTS

Chapter 4 presents results of the data analysis used to describe the sample and address the research questions established for the study. The chapter is divided into three parts. The first part provides a description of the sample who completed the survey using a combination of frequency distributions and measures of central tendency and dispersion. The second part addresses survey results related to the research questions. The third section provides a summary of the interviews and themes that emerged from the responses to the interview questions.

This study examined the status of adoption of PLEs and important factors that contribute to the adoption process by employees in a local area healthcare organization. The customs and practices of supervisor/manager-level employees who use internet/Web 2.0 tools to solve work related problems were examined, as well as how employees designed the architecture of their PLEs.

The survey was administered using Qualtrics software through Wayne State University. A total of 1,005 managers and supervisors at a large healthcare system who were enrolled or had completed the Leadership Academy were invited to participate in the study. Of this number, 171 started the survey and 58 participants were removed due to noncompletion of a sufficient number of items for analysis. The final response rate for the 113 participants was 11.2%.

Description of the Sample

The participants completed a demographic section of the survey that obtained information regarding their personal and professional characteristics. The personal characteristics were summarized using frequency distributions for presentation in Table 7.

Table 7

Frequency Distributions – Personal Characteristics (N = 113)

Personal Characteristics	Number	Percentage
Gender		
Male	22	24.7
Female	67	75.3
Missing	24	
Race/Ethnicity		
African American/Black	16	18.0
American Indian/Alaskan Native	1	1.1
Asian/Pacific Islander	4	4.5
Caucasian/White	65	73.0
Hispanic/Spanish/Latino	1	1.1
Multiethnic	2	2.2
Missing	24	

The majority of the participants (n = 67, 75.3%) reported their gender as female, with 22 (24.7%) indicating their gender was male. Twenty-four of the participants did not provide a response to this question.

The largest group of participants (n = 65, 73.0%) indicated their race/ethnicity was Caucasian/White and 16 (18.0%) reported their race/ethnicity as African American/Black. Twenty-four participants did not provide a response to this question.

The participants provided their age on the survey. Their responses were summarized using descriptive statistics. Table 8 presents results of this analysis.

Table 8

Descriptive Statistics – Age of Participants (N = 113)

Mean	SD	Median	Range	
			Minimum	Maximum
47.72	9.63	48	27	64
Missing 40				

The mean age of the participants was 47.72 (SD = 9.63), with a median age of 48 years. The participants ranged in age from 27 to 64 years. Forty participants did not provide their age on the survey.

The participants provided their professional characteristics on the survey. Their responses were summarized using frequency distributions. Table 9 presents results of this analysis.

Table 9

Frequency Distributions – Professional Characteristics (N = 113)

Professional Characteristics	Number	Percentage
Highest Degree		
High school diploma or equivalent	5	5.6
Associate's degree	8	9.0
Bachelor's degree	33	37.1
Master's degree	35	39.4
Professional degree (e.g., MD, DDS, JD, DD, DVM)	6	6.7
Other	2	2.2
Missing	24	
Job Classification		
Medical	26	29.2
Administrative	51	57.3
Technical	11	12.4
Other	1	1.1
Missing	24	
Job Title		
Manager	36	41.4
Supervisor	21	24.2
Director	15	17.2
Counsel, consultant, coordinator	6	6.9
Corporate	2	2.3
Lead technologist	1	1.1
Team leader	1	1.1
No category	5	5.8
Missing	26	
Participated in Formal, Structured, Facilitator-Led Training		
Yes	82	93.2
No	6	6.8
Missing	25	

The largest group of participants (n = 35, 39.4%) reported they had completed master's degrees, with 33 (37.1%) having obtained a bachelor's degree. Six (6.7%) of the participants had

professional degrees. The two (2.2%) participants, who indicated other, reported they had some college and a certificate. Twenty-four participants did not provide a response to this question.

Fifty-one (57.3%) of the participants worked in administrative positions, with 26 (29.2%) indicating their job classifications were medical. Eleven (12.4%) participants were in technical jobs and 1 (1.1%) participant was working in security. Twenty-four participants did not provide a response to this question.

The largest group of participants were classified as managers ($n = 36$, 41.4%), followed by supervisors ($n = 21$, 24.2%) and directors ($n = 15$, 17.2%). Six (6.9%) participants had job titles that were classified as counsel, consultant, or coordinator, while 2 (2.3%) were in corporate positions. Five (5.8%) of the participants had job titles (e.g., registered nurse – quality, staff RN, police sergeant) that could not be classified directly. Twenty-six participants did not provide their job title on the survey.

The majority of the participants ($n = 82$, 93.2%) reported they had attended formal, structured, facilitator led training. Six (6.8%) of the participants had not attended this type of training. Eight participants did not provide a response to this question.

The participants were asked to indicate the length of time since they had graduated from college. Their responses were summarized using descriptive statistics for presentation in Table 10.

Table 10

Descriptive Statistics – Years since Graduation from College (N = 113)

Mean	SD	Median	Range	
			Minimum	Maximum
17.30	10.63	16.50	2.00	39.00

Missing 67

The mean number of years since college was 17.30 (SD = 10.63) years, with a median of 16.50 years. The range of years since graduation was from 2.00 to 39.00 years. Sixty-seven participants did not provide a response to this question.

The participants were asked to provide their professional work experiences on the survey. Their responses were summarized using descriptive statistics. Table 11 presents results of this analysis.

Table 11

Descriptive Statistics – Work Experiences of Participants (N = 113)

Work Experience	N	Mean	SD	Median	Range	
					Minimum	Maximum
Years worked at company	90	8.52	7.12	5.00	0.60	34.00
Years in present position	81	5.54	6.89	3.00	1.00	35.00
Times participated in formal training	74	3.91	3.25	3.00	1.00	20.00

The mean number of years participants had worked for the company was 8.52 (SD = 7.12) years, with a median of 5.00 years. The range of time worked for the company was from 0.60 to 34 years. Twenty-three participants did not provide a response to this question.

The range of years in their present position was from 1.00 to 35 years, with a median of 3.00 years. The mean number of years in their present position was 5.54 (SD = 6.89) years. Thirty-two participants did not provide a response to this question.

The participants were asked to report the number of times they had participated in formal training. The mean number of times was 3.91 (SD = 3.25) times, with a median of 3.00 times. The range of times participating in formal training was from 1 to 20. Thirty-nine participants did not provide a response to this item.

Survey Results Related to the Research Questions

Three research questions were developed for this study. Each of these questions has subquestions associated with them. The results of the statistical analyses used to address these questions are presented in this section.

Research question 1: How do employees construct their PLEs?

- What internet/Web 2.0 technologies and/or applications are used by employees for:
 - finding information?
 - managing information (store, retrieve, classify)?
 - building and using networks to collaborate?
 - sharing information and knowledge with others?

Use of Social Network Sites

The participants were asked to indicate if they used social network sites and to indicate reasons why they were not using them. Their responses were summarized using frequency distributions. The results of these analyses are presented in Table 12.

Table 12

Frequency Distributions – Use of Social Networking Sites (N = 113)

Use of Social Networking Sites	Number	Percentage
I do not use them	32	28.3
I am curious about social network sites, but have not used them yet	12	10.6
I am using social network sites and consider myself a beginner	28	24.8
I use social network sites regularly	36	31.9
I consider myself an expert at using social network sites to effectively achieve results	5	4.4
Reasons for not using social networking sites		
For personal use, not at work	10	22.2
No need/not interested	9	20.0
Access denied/discouraged by company	5	11.2
Cautious regarding privacy/exposure	5	11.2
Of questionable value or helpfulness	4	8.9
Do not know how	4	8.9
Use search engines not social media	2	4.4
Network with others directly	2	4.4
Did not think of it	2	4.4
Did not have time	2	4.4

The largest group of participants (n = 36, 31.9%) indicated they used social network sites regularly, with 5 (4.4%) considering themselves as experts in using these sites. Thirty-two (28.3%) of the participants did not use social network sites and 12 (10.6%) indicated they were curious about them, but have not used them. Twenty-eight (24.8%) of the participants reported they used social network sites and considered themselves as beginners.

When asked why they were not using social network sites, the participants who were not using them indicated that social network sites were for personal use and not at work (n = 10, 22.2%), no need/not interested (n = 9, 20.0%), access denied/discouraged by company (n = 5, 11.2%), and cautious regarding privacy/exposure (n = 5, 11.2%). Other reasons for not using social networking sites included of questionable value or helpfulness (n = 4, 8.9%), do not know how (n = 4, 8.9%), use search engines not social media (n = 2, 4.4%), network with others directly (n = 2, 4.4%), did not think of it (n = 2, 4.4%), and did not have time (n = 2, 4.4%).

Perceptions of Employer Policies for Web 2.0 Technology

The participants were asked to indicate their employer's policies regarding Web-2.0 technology. Their responses were summarized using frequency distributions for presentation in Table 13.

Table 13

Frequency Distributions – Perceptions of Employer Policies for Web 2.0 Technology (N = 113)

Use of Social Networking Sites	Number	Percentage
My employer prohibits access to Web 2.0 technologies	18	16.1
My employer allows limited access to Web 2.0 technologies	54	48.1
My employer encourages the use of Web 2.0 technologies	15	13.4
My position requires the use of Web 2.0 technologies	7	6.3
I do not know what my employer's policies are about Web 2.0 technologies.	18	16.1
Total	112	100.0
Missing 1		

The largest group of participants (n = 54, 48.1%) reported their employer allowed limited access to Web 2.0 technologies, with 18 (16.1%) indicating their employer prohibits access to Web 2.0 technologies. Another 18 (16.1%) participants did not know what their employer's policies regarding Web 2.0 technologies were. One participant did not provide a response to this question.

Use of Internet/Web 2.0 Tools

The participants were asked to think about their use of Internet technology over the past three months and indicate what particular purpose for which they used it. Their positive responses were summarized using frequency distributions. Table 14 presents results of this analysis.

Table 14

Frequency Distributions: Use of Internet Tools (N = 113)

Tools	<u>Find Information</u>		<u>Store, Retrieve, Classify Information</u>		<u>Build Network & Collaborate</u>		<u>Create Knowledge</u>		<u>Share Knowledge</u>	
	n	%	n	%	n	%	n	%	n	%
Information resources	89	78.8	26	23.0	29	25.7	34	30.1	54	47.8
Search engines	92	81.4	25	22.1	18	15.9	29	25.7	39	34.5
VOIP	18	15.9	4	3.5	8	7.1	7	6.2	14	12.4
Email	80	70.8	59	52.2	62	54.9	47	41.6	80	70.8
Skype	8	7.1	3	2.7	4	3.5	1	0.9	5	4.4
Instant Message	31	27.4	9	8.0	20	17.7	14	12.4	28	24.8
Online course	67	59.3	22	19.5	11	9.7	26	23.0	30	26.5
Other	3	2.7	1	0.9	2	1.8	2	1.8	5	4.4

The participants were most likely to find information using search engines (n = 92, 81.4%), information resources such as web pages, electronic books, online news journals, online professional publications, audio books, podcasts, and digital video (n = 89, 78.8%), and email (n = 80, 70.8%). Email (n = 59, 52.2%) was the tool that was used most often to store, retrieve, and classify information. The participants indicated that email (n = 62, 54.9%) was the tool used to build networks, and collaborate. Email (n = 47, 41.6%), information resources n = 34, 30.1%), and search engines (n = 29, 25.7%) were the internet tools used to create knowledge. The largest group of participants (n = 80, 70.8%) indicated they used email to share knowledge.

The participants were asked to indicate which Web 2.0 technology tools they used in their jobs. Their positive responses were summarized using frequency distributions. Table 15 presents results of this analysis.

Table 15

Frequency Distributions: Use of Web 2.0 Tools (N = 113)

Tools	<u>Find Information</u>		<u>Store, Retrieve, Classify Information</u>		<u>Build Network & Collaborate</u>		<u>Create Knowledge</u>		<u>Share Knowledge</u>	
	n	%	n	%	n	%	n	%	n	%
Social bookmarking	8	7.1	6	5.3	1	0.9	3	2.7	3	2.7
Brainstorming	7	6.2	6	5.3	2	1.8	3	2.7	3	2.7
List serv	32	28.3	15	13.3	24	21.2	11	9.7	23	20.4
Chat room	6	5.3	1	0.9	7	6.2	3	2.7	6	5.3
Blogs	35	31.0	7	6.2	12	10.6	10	8.8	18	15.9
Google +	25	22.1	5	4.4	6	5.3	5	4.4	11	9.7
Discussion board	6	5.3	2	1.8	2	1.8	1	0.9	3	2.7
Podcast	41	36.3	9	8.0	27	23.9	15	13.3	28	24.8
Online video	29	25.7	13	11.5	12	10.6	13	11.5	21	18.6
SlideShare	40	35.4	28	24.8	21	18.6	28	24.8	31	27.4
Online office apps	26	23.0	7	6.2	3	2.7	6	5.3	10	8.8
Image and video host	62	54.9	12	10.6	11	9.7	16	14.2	37	32.7
Wikis	41	36.3	17	15.0	28	24.8	20	17.7	33	29.2
Facebook	12	10.6	3	2.7	8	7.1	5	4.4	10	8.8
Twitter	53	46.9	19	16.8	46	40.7	23	20.4	38	33.6
Linkedin	27	23.9	8	7.1	7	6.2	8	7.1	8	7.1
MOOCS	13	11.5	2	1.8	4	3.5	4	3.5	5	4.4
Online educ games	2	1.8	1	0.9	2	1.8	1	0.9	2	1.8
Virtual worlds	43	38.1	8	7.1	6	5.3	7	6.2	15	13.3
Other	0	0.0	0	0.0	1	0.9	1	0.9	1	0.9

The participants in the study were most likely to use image and video host (n = 62, 54.9%), Twitter (n = 53, 46.9%), virtual worlds (n = 43, 38.1%), podcasts (n = 41, 36.3%), Wikis (n = 41, 36.3%), SlideShare (n = 40, 35.4%), blogs (n = 35, 31.0%), list serv (n = 32, 28.3%), and online video (n = 29, 25.7%) to find information. For storing, retrieving and classifying information, the participants were most likely to use SlideShare (n = 28, 24.8%). In building

networks and collaborating, the participants reported they used Twitter (n = 46, 40.7%) and Wikis (24.8%) most often. The participants were most likely to use SlideShare (n = 28, 24.8%) to create knowledge. In sharing knowledge, the participants tended to use Twitter (n = 38, 33.6%), image and video host (n = 37, 32.7%), SlideShare (n = 31, 27.4%), Wikis (n = 33, 29.2%), and podcasts (n = 28, 24.8%). The other Web 2.0 tools also were used, but at rates less than 24.0%).

The participants were asked to indicate the technology devices that they have used over the past three months to accomplish work-related learning goals or for professional development. The participants were asked to indicate all of the technology devices they used and as a result, the number of responses exceeded the number of participants. Their responses were summarized using frequency distributions for presentation in Table 16.

Table 16

Frequency Distributions: Technology Devices Used to Accomplish Work-related Learning Goals or Professional Development

Technology Devices	Number	Percentage
Desktop/Laptop Computer	110	97.3
Smartphone	80	70.8
Tablet/Ebook	67	59.3

Most of the participants (n = 110, 97.3%) indicated they had used a desktop/laptop computer to accomplish work-related learning goals or for professional development. Eighty (70.8%) of the participants used smartphones for this purpose and 67 (59.3%) were using tablets/Ebooks.

Communication with Experts

The participants were asked if they used Internet/Web 2.0 technologies to communicate with experts that were in their profession who were inside of their organization. Their responses were summarized using frequency distributions for presentation in Table 17.

Table 17

Frequency Distributions: Use of Internet/Web 2.0 Technologies to Communicate with Experts in Profession Who Were Inside of Their Organization

Use Internet/Web 2.0 Technologies to Communicate with Experts	Number	Percentage
Yes	54	48.6
No	57	51.4
Total	111	100.0

Missing 2

Fifty-four (48.6%) participants indicated they used Internet/Web 2.0 technologies to communicate with experts in their profession who were inside of their organization. Thirty-one of the participants listed the types of technologies used for these purposes. As some participants may have listed more than one Internet/Web 2.0 technology, the number of responses exceeded the number of respondents who provided an answer to this question. Table 18 presents the Internet/Web 2.0 technologies used.

Table 18

Frequency Distributions: Types of Internet/Web 2.0 Technologies to Communicate with Experts in Profession Who Were Inside of Their Organization

Types of Internet/Web 2.0 Technologies to Communicate with Experts	Number	Percentage
Email	12	31.5
LinkedIn	8	21.0
Facebook	5	13.2
Internal website	3	7.9
SharePoint	3	7.9
Instant messaging	2	5.3
Outlook	2	5.3
Webinar	2	5.3
Lync	1	2.6

The largest group of participants (n = 12, 31.5%) reported they used email to communicate with experts in their profession who were inside of their organizations, with 8 (21.0%) participants indicating they used LinkedIn for this purpose. Five (13.2%) participants were using Facebook and 3 (7.9%) each were using the organization's internal website and SharePoint to communicate with experts in their profession. Two (5.3%) each reported using instant messaging, outlook, and webinars for this purpose and 1 (2.6%) used Lync.

The participants were asked if they used Internet/Web 2.0 technologies to communicate with experts that were in their profession who were outside of their organization. Their responses were summarized using frequency distributions for presentation in Table 19.

Table 19

Frequency Distributions: Use of Internet/Web 2.0 Technologies to Communicate with Experts in Profession Who Were Outside of Their Organization

Use Internet/Web 2.0 Technologies to Communicate with Experts	Number	Percentage
Yes	52	46.8
No	59	53.2
Total	111	100.0

Missing 2

Fifty-two (46.8%) participants indicated they used Internet/Web 2.0 technologies to communicate with experts in their profession who were outside of their organization. Twenty-six of the participants listed the types of technologies used for these purposes. As some participants may have listed more than one Internet/Web 2.0 technology, the number of responses exceeded the number of respondents who provided an answer to this question. Table 20 presents the Internet/Web 2.0 technologies used.

Table 20

Frequency Distributions: Types of Internet/Web 2.0 Technologies to Communicate with Experts in Profession Who Were Outside of Their Organization

Types of Internet/Web 2.0 Technologies to Communicate with Experts	Number	Percentage
LinkedIn	17	31.4
Facebook	9	16.7
Email	7	13.0
Twitter	3	5.6
Box.com	2	3.7
Internet/Website	2	3.7
Listserv	2	3.7
Webinar	2	3.7
Google	2	3.7
Other	8	14.8

The largest group of participants (n = 17, 31.4%) reported they used LinkedIn to communicate with experts in their profession who were outside of their organizations, with 9 (16.7%) participants indicating they used Facebook for this purpose. Seven (13.0%) participants were using email to communicate with experts in their profession who were outside of their organization. Two (5.3%) each reported using Box.com, internet/websites, listserv, webinar, Google for this purpose. Among the 8 (14.8%) participants who used experts in their professions who were outside of the organization, one each reported WetTransfer.com, forums, PowerPoint, BaseCamp, YouTube, PhillipsCare, MemberPlus, and Webconferences.

Influential Characteristics and Categories of Tools/Applications

The participants were asked to indicate the extent that characteristics influenced their use of a specific Internet/Web 2.0 technology or application resource. They were asked to use a 3-point Likert scale, (no influence, some influence, and strong influence) to rate these items. Table 21 presents results of these analyses.

Table 21

Frequency Distributions: Extent that Characteristics Influenced their Use of a Specific Internet/Web 2.0 Technology or Application Resource

Characteristics That Influenced their Use of a Specific Internet/Web 2.0 Technology or Application Resource	Extent of Influence					
	<u>No Influence</u>		<u>Some Influence</u>		<u>Strong Influence</u>	
	n	%	n	%	n	%
Accessibility to resource	9	8.7	41	39.4	54	51.9
Time required to learn	9	8.7	42	40.8	52	50.5
Amount of effort needed	9	8.8	46	45.1	47	46.1
Cost of the resource	19	19.0	41	41.0	40	40.0
Value of the resource	7	7.1	34	34.3	58	58.6
Other	1	12.5	4	50.0	3	37.5

The majority of the participants (n = 54, 51.9%) reported that accessibility to the resource was a strong influence on their use of the technology, with 41 (39.4%) reporting that it had some influence. Nine (8.7%) participants indicated that accessibility to the resource had no influence on their use of a specific internet/Web 2.0 technology or application resource. The time required to learn the Internet/Web 2.0 was a strong influence for 52 (50.5%) of the participants and some influence (n = 42, 40.8%) or no influence (n = 9, 8.7%). Forty-seven (46.1%) of the participants indicated that the amount of effort needed was a strong influence, with 46 (45.1%) indicating this characteristic was of some influence and 9 (8.8%) reporting no influence of the amount of effort needed. The cost of the resource was of no influence to 19 (19.0%) participants, with 41 (41.0%) reporting the cost has some influence, and 40 (40.0%) reporting cost had a strong influence. The value of the resource was a strong influence for 58 (58.6%) of the participants, with 34 (34.3%) reporting some influence, and 7 (7.1%) indicating no influence. Eight participants indicated “other” as their response, with 1 (12.5%) reporting a no influence, 4 (50.0%) indicating a moderate influence, and 3 (37.5%) indicating a strong influence. The open-ended responses indicated that “if the use would violate personal privacy,” “security,” if use violates company social medial policy,” and if use would be inconvenient.

Degree of Usefulness of Certain Categories of Tools/Applications

The participants were asked to indicate the usefulness of each category of tools/applications to meet their work-related learning goals or professional development. The responses to these items were summarized using frequency distributions. Table 22 presents results of this analysis.

Table 22

Frequency Distributions: Usefulness of Each Category of Tools/Applications to Meet Their Work-related Learning Goals or Professional Development

Usefulness of Each Category of Tools/Applications to Meet Their Work-related Learning Goals or Professional Development	Usefulness							
	<u>Do Not Use</u>		<u>Not at all Useful</u>		<u>Somewhat Useful</u>		<u>Very Useful</u>	
	N	%	N	%	N	%	N	%
Collaboration tools	25	22.9	3	2.8	22	20.2	59	54.1
Presentation tools	27	25.2	1	0.9	37	34.6	42	39.3
Communication tools	39	37.5	0	0.0	44	42.3	21	20.2
Social network applications	32	31.1	3	2.9	47	45.6	21	20.4
Organizational tools	48	46.2	8	7.7	33	31.7	15	14.4
Brainstorming tools	68	68.7	7	7.1	13	13.1	11	11.1
MOOCS	65	68.4	8	8.4	13	13.7	9	9.5
Educational online games	69	71.1	12	12.4	13	13.4	3	3.1
Virtual world tools	74	77.1	10	10.4	9	9.4	3	3.1
Other tools	2	66.7	0	0.0	0	0.0	1	33.3

The majority of the respondents (n = 59, 54.1%) indicated that collaboration tools were very useful in meeting their work-related learning goals or for professional development. While 22 (20.2%) indicated that collaboration tools were somewhat useful, 25 (22.9%) indicated that they did not use these tools. Forty-two (39.3%) participants reported that presentation tools were very useful, with 37 (34.6%) indicating these tools were somewhat useful to meet their work-related learning goals or professional development. Twenty-one (20.2%) participants indicated that communication tools were very useful and 44 (42.3%) reported they were somewhat useful. Twenty-one (20.4%) participants considered social network applications to be very useful, while 47 (45.6%) thought they were somewhat useful. Forty-eight (46.2%) participants did not use organizational tools, with 68 (68.7%) indicating they did not use brainstorming tools to meet

their work-related learning goals or professional development. One (33.3%) participant reported “other” tool as very useful, but did not provide an explanation regarding this tool.

Satisfaction with Web 2.0 Technologies

The participants were asked to rate their satisfaction levels with the Web 2.0 technologies that they used to accomplish work-related learning goals or professional development. The responses to this question were summarized using frequency distributions for presentation in Table 23.

Table 23

Frequency Distributions: Satisfaction with Web 2.0 Technologies Used to Accomplish Work-related Learning Goals or Professional Development

Satisfaction with Web 2.0 Technologies Used to Accomplish Work-related Learning Goals or Professional Development	Number	Percentage
Very satisfied	6	5.5
Satisfied	36	32.7
Neither dissatisfied nor satisfied	34	30.9
Dissatisfied	3	2.7
Very dissatisfied	2	1.8
I don't use these types of technologies/applications	29	26.4
Total	110	100.0

Missing 3

Six (5.5%) participants indicated that they were very satisfied with the Web 2.0 technologies they used to accomplish work-related learning goals or professional development, with 36 (32.7%) participants indicating they were satisfied with these technologies. Thirty-four (30.9%) participants were neither dissatisfied nor satisfied with Web 2.0 technologies they used to accomplish work-related learning goals or professional development. Twenty-nine (26.4%) participants reported that they did not use these tools. Three participants did not provide a response to this question.

The participants who were dissatisfied, very dissatisfied, or neither satisfied nor dissatisfied, were asked what they would need to increase their satisfaction in using Web 2.0 technologies to accomplish work-related learning goals or professional development. The open-ended responses were summarized into seven categories for presentation in Table 24.

Table 24

Frequency Distributions: What Would Increase Satisfaction with Using Web 2.0 Technologies to Accomplish Work-related Learning Goals or Professional Development

What Would Increase Satisfaction with Using Web 2.0 Technologies to Accomplish Work-related Learning Goals or Professional Development	Number	Percentage
Company policies are more accepting of use of Web 2.0 technologies	7	28.0
Understand how to use Web 2.0 technologies	4	16.0
If company maintains infrastructure for use, keeps current, or makes more technology available	4	16.0
Understand value/benefits	3	12.0
Lower or eliminate risk of use/privacy worries	3	12.0
Time for use	2	8.0
Peer participation and/or support	2	8.0

The largest number of responses ($n = 7$, 28.0%) was if company policies were more accepting of use of Web 2.0 technologies, followed by 4 (16.0%) indicating that they needed to understand how to use Web 2.0 technologies and the same number reported if company maintained infrastructure for use, kept current, or made more technology available. Three (12.0%) participants each indicated that the risk needed to be lowered or eliminated for using these technologies or if they understood the value/benefits of these technologies. Two (8.0%) reported the company needed to provide time off to use these technologies and 2 (8.0%) thought that peer participation and/or support of use would help increase satisfaction with using these technologies.

Learning Goals

The participants were asked to indicate one or more work-related or professional development learning goals that they had in the past six months or were expected to occur in the next six months. Their open-ended responses were classified into six categories. Table 25 presents results of this analysis.

Table 25

Frequency Distributions – Work-related or Professional Learning Goals (N = 113)

Work-related or professional learning goals	Number	Percentage
Individual goals	34	47.8
Job specific skills	10	29.4
Software/program skills	9	26.5
Professional expertise	8	23.5
Leadership skills	4	11.8
Communication skills	3	8.8
Continuing education, courses, programs, conferences	7	9.9
Development of programs/processes	7	9.9
Formal degree education	6	8.5
Certification	5	7.0
Presentations	1	1.4
No specific learning goals	2	2.8
Other goals that were unrelated to learning	9	12.7
Total	71	100.0

Missing 42

Thirty-four (47.8%) participants reported they had individual learning goals, including 10 (29.4%) who had job specific skills, 9 (26.5%) who had learning goals associated with software/program skills, and 8 (23.5%) who set learning goals for professional expertise. Seven (9.9%) were planning learning goals focusing on continuing education, courses, programs, and conferences, with another 7 (9.9%) reporting their learning goals were directed at the development of programs/processes. Six (8.5%) participants were involved in formal degree

education as their learning goals and 5 (7.0%) had learning goals related to certification. One (1.4%) participant had a learning goal of doing presentations. Two (2.8%) participants reported they had no specific learning goals, while 9 (12.7%) listed items that were not learning goals, but goals for the organization in general. Forty-two participants did not provide a response to this question.

Documentation of Accomplishment of Learning Goal

The participants were asked to indicate how they document their accomplishment of learning goals, solutions to work-related problems, or professional development. The participants were given a list of six forms of documentation and an “other” category and asked to indicate all they used. As a result, the number of responses exceeded the number of participants. Table 26 presents results of these analyses.

Table 26

Frequency Distributions: Ways to Document Their Accomplishment of Learning Goals, Solutions to Work-Related Problems, or Professional Development

<i>Ways to Document Their Accomplishment of Learning Goals, Solutions to Work-Related Problems, or Professional Development</i>	Number	Percentage
Electronic documents	102	90.3
Written document	63	55.8
Photos	35	31.0
Website	21	18.6
E portfolio	11	9.7
Learning management system	3	26.5
Other	4	3.5

The majority of participants (n = 102, 90.3%) reported they used electronic documents to record their accomplishments related to learning goals, solutions to work-related problems, or professional development, with 63 (55.8%) indicating that they used written paper documents for

this purpose. Thirty-five (31.8%) participants used photos to document their accomplishments, while 21 (18.6%) used websites. Four (3.5%) participants listed “other” as a way to document their accomplishments, with email folders, electronic health record systems and performance management systems used for this purpose.

Analysis of Proposition Statements

Eight propositions were developed for Research Question 1. Each of these propositions were analyzed using inferential statistical analyses, either stepwise multiple linear regression analyses or correlation analyses. All decisions on the statistical significance were made using a criterion alpha level of .05.

A. Level of self-reported total use of internet/Web 2.0 technologies and/or applications can be predicted by personal characteristics, including: age, educational level, years worked for the organization, years in current position, and participation in formal training.

The self-reported total use of internet/Web 2.0 technologies and/or applications was used as the dependent variable in stepwise multiple linear regression analysis. The demographic variables, age, educational level, years worked for the company, years in present position, and participation in formal training were used as the independent variables. Table 27 presents results of this analysis.

Table 27

Stepwise Multiple Linear Regression Analysis: Self-Reported Total Use of Internet/Web 2.0 Technologies and/or Applications

Independent Variables	Constant	b	β	ΔR^2	t-value	Sig
Included Variables						
Participation in formal training	31.29	4.47	.37	.16	3.39	.001
Age		-.41	-.24	.06	-2.14	.036
Excluded Variables						
Educational level			-.01		-.06	.956
Years worked at the company			-.09		-.81	.422
Years in present position			-.04		-.33	.741
Multiple R	.46					
Multiple R ²	.22					
F Ratio	9.05					
DF	2, 66					
Sig	<.001					

Two of the independent variables, participation in formal training and age, entered the stepwise multiple linear regression equation, accounting for 22% of the variance in self-reported total use of internet/Web 2.0 technologies and/or applications, $F(2, 66) = 9.05$, $p < .001$. Participation in formal training entered the stepwise multiple linear regression equation first, explaining 16% of the variance in self-reported total use of internet/Web 2.0 technologies and/or applications, $\beta = .37$, $t = 3.39$, $p = .001$. Age entered the equation, accounting for an additional 6% of the variance in self-reported total use of internet/Web 2.0 technologies and/or applications, $\beta = -.24$, $t = -2.14$, $p = .001$. The relationship between participation in formal training was related to self-reported total use of internet/Web 2.0 technologies and/or applications in a positive direction, indicating that increased training in which the participant had attended was associated with greater use of internet/Web 2.0 technologies and/or applications. Age was negatively related to the self-reported use of internet/Web 2.0 technologies and/or applications, indicating that younger participants tended to use these technologies and/or

applications more. The remaining independent variables, educational level, years worked at the company, and years in present position, did not enter the stepwise multiple linear regression equation, indicating they were not statistically significant predictors of self-reported use of internet/Web 2.0 technologies and/or applications.

B. Level of self-reported total use of internet/Web 2.0 technologies and/or applications is related to respondents' perceptions of employer's policies regarding use of Web2.0 technologies at work.

The self-reported total use of internet/Web 2.0 technologies and/or applications was correlated with perceptions of employer policies regarding Web 2.0 technology using Pearson product moment correlations. The obtained correlation of .01 was not statistically significant at an alpha level of .05, indicating perceptions of employer policies were not related to the self-reported total use of internet/Web 2.0 technologies and/or applications.

C. Self-reported level of use of social network sites can be predicted by level of self-reported total use of internet/Web 2.0 technologies and/or applications, and by personal characteristics, including: age, educational level, years worked for the organization, years in present position, and participation in formal training.

Self-reported use of social networking sites was used as the dependent variable in a stepwise multiple linear regression analysis. The demographic variables, age, educational level, years with the company, years in present position, and participation in formal training, were used as the independent variables in this analysis. None of the independent variables entered the stepwise multiple linear regression equation, indicating they were not statistically significant predictors of the use of social networking sites.

D. Level of satisfaction with internet/Web 2.0 technologies and/or applications can be predicted by personal characteristics, including: age, educational level, years worked for the organization, and years in current position.

Stepwise multiple linear regression analysis was used to determine if level of satisfaction with internet/Web 2.0 technologies and/or applications could be predicted from the independent variables, age, educational level, years worked for the organization, and years in present position.

Table 28 presents results of this analysis.

Table 28

Stepwise Multiple Linear Regression Analysis: Self-Reported Satisfaction with Internet/Web 2.0 Technologies and/or Applications

Independent Variables	Constant	b	β	ΔR^2	t-value	Sig
Included Variables						
Age	4.83	-.05	-.27	.07	-2.28	.026
Excluded Variables						
Educational level			-.09		-.72	.473
Years worked at the company			-.14		-1.19	.239
Years in present position			.17		1.35	.180
Multiple R	.27					
Multiple R ²	.07					
F Ratio	5.20					
DF	1, 67					
Sig	.026					

One independent variable, age, entered the stepwise multiple linear regression equation, accounting for 7% of the variance in self-reported satisfaction with Internet/Web 2.0 technologies and/or applications, $F(1, 67) = 5.20$, $p = .026$. The negative relationship between the age of the participant and self-reported satisfaction with internet/Web 2.0 technologies and/or applications indicated that younger participants were more likely to be satisfied with internet/Web 2.0 technologies and/or application than older participants. The remaining independent variables, educational level, years with the company, and years in present position,

did not enter the stepwise multiple linear regression equation, indicating they were not statistically significant predictors of self-reported satisfaction with internet/Web 2.0 technologies and/or applications.

E. Communication with experts inside of the organization can be predicted by personal characteristics, including: age, educational level, years worked for the organization, and years in current position.

Point bi-serial correlations were used to determine if participants' communication with experts inside of the organization could be predicted from age, educational level, years with the organization, and years in present position. Participants' communication with experts inside of the organization was a dichotomous variable indicating they either communicated or did not communicate with these experts. Table 29 presents results of this analysis.

Table 29

Point Bi-serial Correlation Analysis: Communication with Experts Inside of the Organization with Personal Characteristics

Independent Variable	n	r	p
Age	48	.20	.173
Educational level	60	.01	.947
Years worked at the company	60	.20	.120
Years in present position	52	-.11	.438

The obtained correlations between communication with experts inside of the organization and personal characteristics were not statistically significant. These findings indicated that age, educational level, years worked at the company, and years in present position were not related to communicating with experts inside of the organization.

F. Communication with experts inside of the organization is related to participants' perceptions of employer's policies regarding use of internet/Web 2.0 technologies and/or applications at work.

Point bi-serial correlation analyses were used to determine if communication with experts inside of the organization was related to participants' perceptions of employer's policies regarding use of internet/Web 2.0 technologies and/or applications at work. The obtained correlation of .01 ($p = .925$) was not statistically significant, indicating that no relationship existed between communicating with experts inside of the organization and perceptions of employer's policies regarding the use of web2.0 technologies and/or applications at work.

G. Communication with experts outside of the organization can be predicted from personal characteristics, including: age, educational level, years worked for the organization, and years in current position.

Point bi-serial correlations were used to determine if communication with experts outside of the organization could be predicted from demographic characteristics (age, educational level, years worked for the organization, and years in present position). Table 30 presents results of this analysis.

Table 30

Point Bi-serial Correlation Analysis: Communication with Experts Outside of the Organization with Personal Characteristics

Independent Variable	n	r	p
Age	54	.02	.880
Educational level	69	-.19	.114
Years worked at the company	69	.14	.260
Years in present position	61	-.11	.411

The correlations between communication with experts outside of the organization and the demographic characteristics of the participants were not statistically significant. These findings indicated that participants' ages, highest level of education, years worked for the organization, and years in present positions were not predictive of communication with experts outside of the organization.

H. Communication with experts outside of the organization is related to participants' perceptions of employer's policies regarding use of Web 2.0 technologies at work.

The participants' use of internet/Web 2.0 technologies to communicate with experts outside of the organization was correlated with their perceptions of employer policies for Web 2.0 technologies using point bi-serial correlations. The results of this analysis were not statistically significant ($r = .17$, $p = .132$), indicating there was no relationship between the use of internet/Web 2.0 technologies to communicate with experts outside of the organization and perceptions of employer policies on the use of Web 2.0 technology.

Research question 2: What triggers an employee to construct a PLE?

Reasons for Using Internet/Web 2.0 Technologies

The participants were asked to identify reasons they used Internet/Web 2.0 technologies to meet work-related learning goals or for professional development. They responded to the items using a 5-point Likert scale, ranging from strongly agree to strongly disagree. Table 31 presents the descriptive statistics used to summarize the data.

Table 31

Descriptive Statistics: Reasons to Use Internet/Web 2.0 Technologies to Meet Work-related Learning Goals or for Professional Development

Reason	N	M	SD	Median	Range	
					Minimum	Maximum
Can conveniently access information when needed	94	3.96	.82	4.00	1	5
Able to get information quickly . . . on demand	93	3.98	.85	4.00	1	5
Want to direct my own learning . . . have personal control	91	3.86	.90	4.00	1	5
Can repurpose information for other purposes	91	3.74	.88	4.00	1	5
Can combine formal and informal learning	91	3.77	.83	4.00	1	5
Can approach learning in ways that are best suited for me	91	3.95	.85	4.00	1	5
Am comfortable using Internet and Web 2.0 technologies	92	3.73	.97	4.00	1	5
Need to develop specialty knowledge	92	3.64	.89	4.00	1	5
Want to connect with individuals who have the same professional interest	92	3.76	.86	4.00	1	5
Need to respond flexibly to work projects that develop by chance	92	3.76	.86	4.00	1	5
Need to find information when company training was either unavailable or did not meet learning needs	91	3.87	.90	4.00	1	5
Other	6	2.83	.98	3.00	1	4

The mean scores for the 11 items measuring reasons for using Internet/Web 2.0 technologies to meet work-related learning goals or for professional development ranged from 3.64 (SD = .89) for need to develop specialty knowledge to 3.98 (SD = .85) for able to get information quickly . . . on demand. The median scores for each of the items was 4.00, with the actual responses ranging from 1 for strongly disagree to 5 for strongly agree. Other was given as an option. While 6 participants indicated “other,” they did not provide any additional information

regarding what the other reasons for using Internet/Web 2.0 technologies to meet work-related learning goals or for professional development were.

Research question 3. How do employees use their PLEs?

- With what frequency do employees utilize their PLEs?
- What strategies do employees use through their PLE to:
 - critically analyze information?
 - make decisions about the information found?
 - create knowledge?
 - self-evaluate whether their PLE is effective in accomplishing their work-related learning goal(s)?

Judging the Quality of Learning

The participants were asked to indicate how they judged the quality of their learning as they used Internet/Web 2.0 technologies and applications to solve work-related problems or for professional development. The participants responded to the items using a 5-point Likert scale ranging from not true of me to true most of the time. The scores were summarized using descriptive statistics for presentation in Table 32.

Table 32

Descriptive Statistics: Ways to Judge the Quality of Their Learning as They Used Internet/Web 2.0 Technologies and Applications to Solve Work-Related Problems or for Professional Development

Ways to judge the quality of their learning as they used Internet/Web 2.0 technologies and applications to solve work-related problems or for professional development	N	M	SD	Median	Range	
					Minimum	Maximum
Based only on end result (e.g., product that I produce, skills I develop, or an outcome, such as finding answers to my questions)	85	4.01	1.16	4.00	1	5
Consider the process (e.g., amount of time, effort, struggle, deliberation) I go through to judge the quality	84	3.71	1.26	4.00	1	5
Consider myself to be the primary source in judging	84	4.08	1.10	4.00	1	5
I use other sources (e.g., supervisors, customers, coworkers, outside experts)	83	3.36	1.35	4.00	1	5
I judge against a set of predetermined standards	84	3.30	1.29	4.00	1	5
I judge based on a sense of accomplishment I felt at the conclusion of my learning project	84	4.19	.99	4.00	1	5
Other	7	3.57	1.62	4.00	1	5

The mean scores for the six items ranged from 3.30 (SD =1.29) for I judge against a set of predetermined standards to 4.19 (SD = .99) for I judge based on a sense of accomplishment I felt at the conclusion of my learning project. The median scores were all 4.00, with a range from 1 to 5. Seven participants indicated “other” (M = 3.57, SD = 1.62), but offered little in the way of explaining how they judged the quality of their learning as they used Internet/Web 2.0 technologies and applications to solve work-related problems or for professional development.

Credibility Given to Information Found Through Internet/Web 2.0 Technologies

The participants were asked to indicate the amount of credibility (i.e., belief in trustworthiness) they would give to professional information or advice they located on various internet/Web 2.0 technologies. The participants rated each of the items using a 4-point scale ranging from no credibility to a lot of credibility. Their responses were summarized using descriptive statistics. Table 33 presents results of this analysis.

Table 33

Descriptive Statistics: Amount of Credibility (i.e., Belief in Trustworthiness) Participants Gave to Professional Information or Advice They Located on Various Internet/Web 2.0 Technologies

Credibility	N	M	SD	Median	Range	
					Minimum	Maximum
Discussion boards/group forum/Listserv	86	2.59	.60	3.00	1	4
Social media sources (e.g., YouTube, SlideShare, Flickr, Pinterest)	88	2.18	.70	2.00	1	4
Webcasts/podcasts/videocasts/Livecasts	90	2.98	.64	3.00	1	4
On-line courses	90	3.58	.56	4.00	2	4
Social network sites (e.g., Facebook, LinkedIn, Instagram, Google+)	88	2.22	.72	2.00	1	4
Blogs/microblogs (e.g., Twitter)	85	1.94	.70	2.00	1	3
Wiki (e.g., Wikipedia)	87	2.37	.79	2.00	1	4
On-line educational games	85	2.22	.84	2.00	1	4
MOOCS	79	2.63	.88	3.00	1	4
Virtual World (e.g., Second Life)	77	1.87	.71	2.00	1	3
Other	2	1.50	.71	1.50	1	2

The participants had the highest scores for the credibility of on-line courses ($M = 3.58$, $SD = .56$), followed by Webcasts/podcasts/videocasts/Livecasts ($M = 2.98$, $SD = .64$). The lowest mean score was for the credibility of Virtual World ($M = 1.87$, $SD = .71$) and for

blogs/microblogs ($M = 1.94$, $SD = .70$). Two participants indicated “other,” but did not list additional explanations.

Evaluation Criteria for Information Found on Websites, Wikis, Blogs, and Discussion Boards

The participants were asked to indicate how they evaluated the quality of a website. The participants rated the items using a 5-point Likert scale ranging from not true of me most of the time to true most of the time. Their responses were summarized using descriptive statistics.

Table 34 presents results of this analysis.

Table 34

Descriptive Statistics: Evaluating the Quality of a Website

Evaluating the Quality of a Website	N	M	SD	Median	Range	
					Minimum	Maximum
Verifying the author and/or institutional identity of the website	86	4.16	1.08	4.00	1	5
Examining both overt and covert affiliations	81	3.46	1.22	4.00	1	5
Considering the presentation of information on the website	81	4.16	.86	4.00	1	5
Ascertaining the objectivity of the information (i.e. check to see if information presented is fact or opinion or whether there is a conflict of interest)	82	4.20	.92	4.00	1	5
Checking to see how up-to-date the information is	84	4.54	.78	5.00	1	5
Taking note of how in-depth the information is	83	4.23	.85	4.00	2	5
Checking to see if there are any reviews of the site	82	3.94	1.10	4.00	1	5
Purposefully finding and using peer and editorial reviewed resources that are available through universities, schools, libraries, subscription	82	3.71	1.19	4.00	1	5
Verifying information (i.e., compare information found on a website to other websites or to other sources such as newspapers, magazines, books)	84	3.94	1.21	4.00	1	5
Other	5	3.40	1.14	3.00	2	5

The participants generally reported that most of the ways to evaluate the quality of a website were true of them most of the time. Checking to see how up-to-date the information is had the highest mean score ($M = 4.54$, $SD = .78$), followed by taking note of how in-depth the information is ($M = 4.23$, $SD = .85$). The lowest score was for examining both overt and covert affiliations ($M = 3.46$, $SD = 1.22$). Five participants indicated “other,” with one indicating that they asked respected individuals in that field/or subject matter experts to verify information.

The participants were asked if they used Wikis to solve work-related problems or for professional development. The participants rated the items using a 5-point Likert scale ranging from not true of me most of the time to true most of the time. Their responses were summarized using frequency distributions. Table 35 presents results of this analysis.

Table 35

Frequency Distributions: Use Wikis to Solve Work-Related Problems or for Professional Development

Use Wikis to Solve Work-related Problems or for Professional Development	Number	Percentage
No	71	75.5
Yes	23	24.5
Total	94	100.0

Missing 19

The majority of the participants ($N = 71$, 75.5%) did not use Wikis to solve work-related problems or for professional development. Nineteen participants did not provide a response to this question. The participants who indicated they used Wikis to solve work-related problems or for professional development were asked to indicate how they evaluated the quality of the Wikis. The participants rated the items using a 5-point Likert scale ranging from not true of me most of the time to true most of the time. Their responses were summarized using descriptive statistics for presentation in Table 36.

Table 36

Descriptive Statistics: Evaluating the Quality of a Wiki

Evaluating the Quality of a Wiki	N	M	SD	Median	Range	
					Minimum	Maximum
Checking out expertise of the person(s) who authored the Wiki page(s)	20	3.90	1.37	4.00	1	5
Checking out the expertise of the person(s) who reviewed the Wiki page(s)	19	3.42	1.39	4.00	1	5
Looking to see how much collaboration went into creating the Wiki page(s)	20	3.60	1.31	4.00	1	5
Checking to see how many revisions were made to the Wiki page(s)	19	3.32	1.34	4.00	1	5
Seeing how many citations were made in the Wiki page(s)	19	3.79	1.23	4.00	1	5
Looking into the sources of the citations	19	3.63	1.30	4.00	1	5
Seeing whether various aspects of the topic are well balanced	19	4.00	.88	4.00	1	5
Determining if the coverage is neutral (i.e., without bias, recognizes different viewpoints, language is neutral, emphasis on fact)	20	4.30	.92	4.00	1	5

The highest mean score for evaluating the quality of a Wiki was for determining if the coverage was neutral ($M = 4.00$, $SD = .92$), with seeing whether various aspects of the topic are well balanced ($M = 4.00$, $SD = .88$) having the second highest mean score. Checking to see how many revisions were made to the Wiki page(s) had the lowest mean score ($M = 3.32$, $SD = 1.34$). None of the participants indicated “other.”

The participants were asked if they used blogs to solve work-related problems or for professional development. Their responses were summarized using frequency distributions. Table 37 presents the results of this analysis.

Table 37

Frequency Distributions: Use Blogs to Solve Work-Related Problems or for Professional Development

Use Blogs to Solve Work-related Problems or for Professional Development	Number	Percentage
No	77	82.8
Yes	16	17.2
Total	93	100.0

Missing 20

The majority of the participants (N = 77, 82.8%) reported that they did not use blogs to solve work-related problems or for professional development. Twenty participants did not provide a response to this question. The participants who used blogs were asked to indicate how they rated the quality of a blog. The participants rated the items using a 5-point Likert scale ranging from not true of me most of the time to true most of the time. Their responses were summarized using descriptive statistics, with the findings presented in Table 38.

Table 38

Descriptive Statistics: Evaluating the Quality of a Blog

Evaluating the Quality of a Blog	N	M	SD	Median	Range	
					Minimum	Maximum
First impression	16	3.88	1.09	4.00	1	5
Checking on expertise of the author of the blog who is writing about the topic	16	4.00	1.27	4.00	1	5
Seeing if there is a substantive discussion of the topic(s)	16	4.00	1.16	4.00	1	5
Checking to see if the post is cited on other blogs	16	3.06	1.39	3.50	1	5

The participants indicated they evaluated the quality of a blog by checking on the expertise of the author of the blog who is writing about the topic (M = 4.00, SD = 1.27) and seeing if there is a substantive discussion of the topic(s) (M = 4.00, SD = 1.16). The lowest mean

score was for checking to see if the post is cited on other blogs ($M = 3.06$, $SD = 1.39$). One person indicated “other,” but did not provide an explanation of his/her response.

The participants were asked if they used discussion boards to solve work-related problems or for professional development. The responses to this item were summarized using frequency distributions for presentation in Table 39.

Table 39

Frequency Distributions: Use Discussion Boards to Solve Work-Related Problems or for Professional Development

Use Discussion Boards to Solve Work-related Problems or for Professional Development	Number	Percentage
No	69	74.2
Yes	24	25.8
Total	93	100.0

Missing 20

The majority of the participants ($N = 69$, 74.2%) indicated they did not use discussion boards to solve work-related problems or for professional development. The 24 (25.8%) who reported they used discussion boards were asked to indicate how they evaluated the quality of the discussion board posts. Table 40 presents results of this analysis.

Table 40

Descriptive Statistics: Evaluating the Quality of a Discussion Board

Evaluating the Quality of a Discussion Board	N	M	SD	Median	Range	
					Minimum	Maximum
Quality of interaction	22	4.50	.67	5	3	5
Quality of content	22	4.68	.48	5	4	5
Quality by relevance of post	22	4.50	.74	5	4	5
Quality by novelty of post	22	3.95	1.05	5	1	5

The mean score for quality of content was 4.68 (SD = .48), with a median of 5 and a range from 4 to 5. Participants had a mean of 4.50 (SD = .67) for the quality of the interaction on discussion boards. The range of scores on this method to evaluate the quality of discussion boards was 5, with a range from 3 to 5. The mean score for evaluating the quality of discussion boards by the novelty of the post was 3.95 (SD = 1.05), with a median of 5. The range of scores on this method was from 1 to 5.

Criteria Used to Decide Achievement of Learning Goal

The participants were asked to indicate the criteria they used to determine if they had met the learning goal. Their responses were summarized using frequency distributions. Table 41 presents the positive responses to these questions.

Table 41

Frequency Distributions: Criteria Used to Decide Achievement of Learning Goal

Type of Criteria	Number	Percentage
I use criteria that I have developed myself	49	57.0
I use criteria that are defined by peers or others in my profession	21	24.4

Forty-nine (57.0%) participants indicated they used criteria they developed themselves to decide if they achieved their learning goal. Twenty-one (24.4%) of the participants use criteria that are defined by peers or others to decide if they have achieved their learning goal. Sixteen (18.8%) of respondents who use criteria defined by others identified the types of industry or professional standards as shown in Table 42.

Standards for Judging Achievement of Learning Goals

The participants were asked to indicate what standards they used to judge achievement of their learning goal. Their responses were summarized using frequency distributions. Table 40 presents the positive responses to these questions.

Table 42

Frequency Distribution: Types of industry or professional standards used to determine if learning goals have been achieved.

Types of Industry/Professional Standards	Number	Percentage
AHIMA and AAPC	1	.9
American Dietetic Association	1	.9
American Nurses Association	1	.9
ASPAN	1	.9
ASRT and AART	1	.9
Healthcare, Home Infusion, Pharmacy	1	.9
NDNQI	1	.9
Hospital Criteria	1	.9
ONS	1	.9
Professional Nursing and Informatics Standards	1	.9
Another Supervisor or Manager's opinion	1	.9

Eleven participants listed a number of industry and professional standards they used to determine if their learning goals had been met. The remaining 10 participants who indicated they used industry or professional standards did not indicate either the association or the type of standards used to determine if they had met their learning goals.

Confidence in Abilities

The participants were asked to indicate the degree of confidence they had in their abilities and skills to locate, analyze, and use information. Their responses could range from not at all

confident to very confident. The descriptive statistics used to summarize their responses are presented in Table 43.

Table 43

Descriptive Statistics: Degree of Confidence in Ability and Skills to Locate, Analyze, and Use Information (N = 113)

Locate, Analyze, and Use Information	N	M	SD	Median	Range	
					Minimum	Maximum
Use Internet/Web 2.0 tools to locate information to problem-solve a work-related learning goal or for professional development	88	2.88	1.18	3.00	1.00	5.00
Critically analyze the information or knowledge found in a search	87	3.10	1.12	3.00	1.00	5.00
Use the information found by applying to a learning goal or for professional development	87	3.28	1.12	3.00	1.00	5.00

The mean score for using the internet/Web 2.0 tools to locate information to problem solve a work-related learning goals or for professional development was 2.88 (SD = 1.18), with a median of 3.00. The actual scores ranged from 1 (not at all confident) to 5 (very confident). The mean score for the degree of confidence the participants had to critically analyze the information or knowledge found in a search was 3.10 (SD = 1.12), with a median of 3.00. The scores on this item ranged from 1.00 to 5.00. The range of actual scores for the item measuring the use of information found by applying to a learning goal or for professional development ranged from 1 to 5, with a median of 3.00. The mean score for this item was 3.28 (SD = 1.12).

Actions Related to Learning New Materials

Participants were asked what they would do when learning new materials through use of Internet/Web 2.0 technologies to solve work-related problems or for professional development.

The participants rated the list of actionable items using a 5-point Likert scale ranging from not

true of me most of the time to true most of the time. Their responses were summarized using descriptive statistics for presentation in Table 44.

Table 44

Descriptive Statistics: Identifying Actions Taken When Learning New Materials through Use of Internet/Web 2.0 Technologies to Solve Work-Related Problems or for Professional Development

Actions taken	N	M	SD	Median	Range	
					Minimum	Maximum
Discuss the material with supervisors/managers	83	3.72	1.19	4.00	1	5
Consult with colleagues inside the company to verify the usefulness of the information found	82	3.89	.99	4.00	1	5
Make contact with others in the same profession, outside of the company, to verify the usefulness of the information found	82	2.61	1.41	2.00	1	5
Put to use what I discovered independently, without checking with anyone else	82	3.13	1.33	4.00	1	5
Share what I have learned with others (outside of my company) who might benefit	82	3.27	1.38	4.00	1	5
Share what I have learned with others (inside of my company) who might benefit	81	4.27	.91	4.00	1	5
Other	3	2.67	1.53	3.00	1	5

The highest mean score was for taking the action of share what I have learned with others (inside of my company) who might benefit ($M = 4.27$, $SD = .908$), with consult with colleagues inside the company to verify the usefulness of the information found ($M = 3.89$, $SD = .994$) having the second highest mean score. Make contact with others in the same profession, outside of the company, to verify the usefulness of the information found had the lowest mean score ($M = 2.61$, $SD = 1.41$). Three of the participants indicated “other,” but did not provide an explanation.

Learning Activities

The participants were asked to indicate which learning activities they engage in when solving a work-related problem or for professional development. The participants were given a list of 21 activities and an “other” category and asked to indicate all they used. As a result, the number of responses exceeded the number of participants. Table 45 presents results of these analyses.

Table 45

Frequency Distributions: Learning Activities Engaged in to Solve Work-Related Problems, or for Professional Development (N = 113)

Learning Activities to Solve Work-Related Problems, or for Professional Development	Number	Percentage
Accessing email	82	72.6
Accessing the internet	81	71.7
Seeking consultation	61	54.0
Providing consultation	47	41.6
Teaching/presenting	46	40.7
Writing (e.g., blogs, Internet articles)	10	8.8
Mentoring others within your company via the Internet	24	21.2
Mentoring others outside of your company via the Internet	10	8.8
Reading information found on the Internet or on social media sites	61	54.0
Participating in discussion (e.g., social media discussion forums, Listservs, Chat, SKYPE)	22	19.5
Personal note-taking using an Internet or Web 2.0 tool or application	16	14.2
Observation using media found on the Internet (e.g., video, podcasts, photo sites)	34	30.1
Creating and uploading media (e.g., video, podcasts, photos)	12	10.6
Participate in webinars	66	58.4
Provide/present webinars	10	8.8
Accessing social media(e.g., FaceBook, LinkedIn, Twitter)	34	30.1
Passive reading or observing in discussion forums	36	31.9
Actively contribute to discussion forums	7	6.2
Participation in a MOOC (Massive Open Online Course)	6	5.3

Learning Activities to Solve Work-Related Problems, or for Professional Development	Number	Percentage
Participation in an online course offered by your company	58	51.3
Participation in an online course offered by another company or institution (e.g., university)	45	39.8
Other	1	.9

The majority of participants (n = 82, 72.6%) reported they accessed email as a learning activity, which was followed by accessing the internet (n = 81, 71.7%), and participating in webinars (n = 56, 58.4%). The fourth highest learning activity was a tie (n = 61, 54%) between reading information found on the Internet or social media sites, and seeking consultation. Participation in online courses offered by the company (n = 58, 51.3%) came in as the fifth highest learning activity engaged in by participants. The two least reported learning activities by participants were actively contributing to discussion forums (n = 6, 5.3%) and participating in MOOCs (n = 6, 5.3%). One (0.9%) participant reported he/she engaged in another learning activity, specifically committees.

Percent of Information Discovered that is Applied

The participants were asked to indicate the percent of time they used or applied information or knowledge they discovered using Internet/Web 2.0 technologies to solve work-related problems. They were given a list of possible times. The results of the frequency distributions used to summarize their responses are presented in Table 46.

Table 46

Frequency Distributions: How Often Information/Knowledge Discovered while Using Internet/Web 2.0 Technologies Was Used or Applied to Solve Work-Related Learning Goals (N= 113)

Percent of time	Number	Percentage
Less than 10% of the time	20	23.0
10-39% of the time	15	17.2
40-69% of the time	21	24.1
70-100% of the time	31	35.7
Total	87	100.0
Missing 26		

Thirty-one (35.7%) participants indicated they used or applied the information/knowledge they discovered while using Internet/Web 2.0 technologies to solve work-related learning goals 70-100% of the time. Twenty-one (24.1%) of the participants used or applied the information/knowledge they discovered while using Internet/Web 2.0 technologies to solve work-related learning goals 40-69% of the time. Twenty-six participants did not provide a response to this question.

Participants who indicated they used or applied the information/knowledge they discovered while using Internet/Web 2.0 technologies to solve work-related learning goals less than 70-100% of the time were asked to provide a description of what factors interfered with their ability to use or apply the information/knowledge they discovered. Twenty-five of the 56 participants who met these criteria provided descriptions shown in Table 47. Some participants provided more than one response.

Table 47

Frequency Distribution: Factors that Interfere with the Ability to Use or Apply Information/Knowledge Discovered while Using Internet/Web 2.0 Technologies to Solve Work-Related Learning Goals

Interfering Factors	Number	Percentage
Do not use	3	11.0
Do not know how/not comfortable using/lack of knowledge	4	15.0
Lack of relevance/applicability	6	22.0
Company policies/inhibitors outdated/slow equipment or internet connections	7	26.0
Do not have time/time management	2	7.0
Lack of trust of technologies	2	7.0
Prefer traditional methods of getting information	3	11.0

The largest number of responses ($n = 7, 26.0\%$), identified company policies/inhibitors, outdated/slow equipment and/or internet connections as being interfering factors, followed by 6 (22.0%) indicating that lack of relevance/applicability of Internet/Web 2.0 technologies were factors. Four (15.0%) participants indicated that they do not know how/are not comfortable using/or have a lack of knowledge about Internet/Web 2.0 technologies. Three (11.0%) reported that they did not use these technologies, and three (11%) prefer traditional methods of getting information. Two (7.0%) thought that they do not have time or can manage time to use Internet/Web 2.0 technologies and 2 (7%) indicated a lack of trust of these technologies.

Analysis of Proposition Statements

Four propositions were posed to address this research question. These propositions were answered using inferential statistical analyses. All decisions on the statistical significance of the findings were made using a criterion alpha level of .05.

A. Employee level of confidence in their abilities to use internet/Web 2.0 technologies and/or applications can be predicted from use of social network sites, and personal

characteristics, including: use of social networking sites, total use of internet tools, age, educational level, years worked for the organization, years in present position, and participation in formal training.

Stepwise multiple linear regression analysis was used to determine if employees' confidence in their ability to use internet/Web 2.0 technologies could be predicted from use of social networking sites, total use of internet tools, age, educational level, years with the company, years in present position, and participation in formal training. The results of this analysis are presented in Table 48.

Table 48

Stepwise Multiple Linear Regression Analysis: Confidence in Use of Internet/Web 2.0 Technologies

Independent Variables	Constant	b	β	ΔR^2	t-value	Sig
Included Variables						
Total use of internet/Web 2.0 tools	3.92	.03	.38	.20	3.19	.002
Age		-.03	-.26	.06	-2.14	.037
Excluded Variables						
Use of social network sites			-.01		-.02	.983
Educational level			.01		.03	.977
Years worked at the company			.09		.75	.455
Years in present position			.01		.05	.961
Participation in formal training			.14		1.16	.250
Multiple R	.51					
Multiple R ²	.26					
F Ratio	9.66					
DF	2, 55					
Sig	<.001					

Two independent variables, total use of internet/Web 2.0 technologies and age, entered the stepwise multiple linear regression equation, accounting for 26% of the variance in confidence in their use of internet/Web 2.0 tools, $F(2, 55) = 9.66$, $p < .001$. The total use of internet/Web 2.0 tools entered the stepwise multiple linear regression equation first, accounting

for 20% of the variance in confidence in their use of internet/Web 2.0 technologies, $\beta = .38$, $t = 3.19$, $p = .002$. An additional 6% of the variance in confidence in use of internet/Web 2.0 technologies was explained by the age of the participant, $\beta = -.26$, $t = -2.14$, $p = .037$. These findings indicated that participants who used more internet/Web 2.0 tools and those who were younger were more likely to be more confident in their use of internet/Web 2.0 technologies. The remaining independent variables, use of social network sites, educational level, years worked at the company, years in present position, and participation in formal training, did not enter the stepwise multiple linear regression equation as statistically significant predictors of confidence in use of internet/Web 2.0 technologies.

B. Perceived credibility of internet/Web 2.0 technologies and/or applications can be predicted by personal characteristics: age, educational level, number of formal trainings attended.

A stepwise multiple linear regression analysis was used to determine if perceptions of the credibility of internet/Web 2.0 technologies and/or applications could be predicted from age, educational level, years with the company, and years in present position. None of the independent variables entered the stepwise multiple linear regression equation as statistically significant predictors of the perceptions of credibility of internet/Web 2.0 technologies and/or applications.

C. Whether employees use internal or external criteria to determine mastery of the learning goal can be predicted by personal characteristics: years worked for the organization, years in current position, job title, and number of formal trainings attended.

Point bi-serial correlations were used to determine if the type of criteria used to decide if the participant had achieved their learning goals were related to age, educational level, years

worked at the company, years in present position, and participation in formal training. The type of criteria was coded as a dichotomous variable, with a 1 indicating internal and 2 indicating external criteria. Table 49 present results of this analysis.

Table 49

Point Bi-serial Correlation Analysis: Internal or External Criteria to Determine Achievement of the Learning Goal with Personal Characteristics

Independent Variable	n	r	p
Age	71	.12	.341
Educational level	85	-.01	.959
Years worked at the company	86	.02	.887
Years in present position	79	.10	.374
Participation in formal training	72	.19	.117

The results of the point bi-serial correlations provided no evidence of statistically significant relationships between the use of internal or external criteria to determine achievement of the learning goal and personal characteristics. Based on these findings, it appears that personal characteristics were not predicting the use of internal or external criteria to determine achievement of the learning goal.

D. Methods used by employees to document and/or demonstrate their accomplishments on their learning goals or for professional development can be predicted by personal characteristics, including: age, educational level, years worked for the organization, and number of formal trainings attended.

The number of ways used to document and/or demonstrate their accomplishments of learning goals were correlated with the personal demographic characteristics, age, educational level, years worked at the company, years in present position, and participation in formal training, using Pearson product moment correlations. Table 50 presents results of this analysis.

Table 50

Pearson Product Moment Correlations: Document and/or Demonstrate Accomplishments of Learning Goals with Personal Characteristics

Independent Variable	n	r	p
Age	73	-.12	.308
Educational level	89	-.14	.204
Years worked at the company	90	-.08	.440
Years in present position	81	-.05	.670
Participation in formal training	74	.16	.186

The results of the Pearson product moment correlations that were used to examine the relationships between the number of ways that participants documented and/or demonstrated accomplishments of learning goals and their personal characteristics were not statistically significant. These findings did not show that ways to document and/or demonstrate accomplishments of learning goals were related to their personal characteristics.

Interview Results Related to the Research Questions

Demographics.

There were initially 12 interview participants. One participant was removed from the study because they did not comprehend the directions for the task. Of the 11 remaining participants, 10 (91%) were female and 1 (9%) was male. Nine participants were Caucasian (82%), one participant was African-American (9%), and one (9%) participant was Hispanic. The ages ranged from 29 to 62 years, with an average age of 44.5 years. The mean number of years participants worked for the company was 9.59 years, with a range from 3 years to 20 years. The mean number of years worked in their present position was 4.59 years, with a range of 1 year to 15 years. The participants included 4 supervisors, 3 managers, 3 directors, and one upper level administrator. The largest group of participants reported the highest degree earned as a master's

degree (n = 6), with two participants having earned a bachelor's degree, one an associate's degree, one a professional degree, and one a three-year diploma. The year in which degrees were earned ranged from 1976 to 2013. None of the participants was attending college at the time of the interview.

Table 51

Demographic Characteristics of the Interviewees

ID	Gender	Age	Race	Years Worked at Organization	Job Role	Years Worked in Position	Highest Degree	Years degree earned
1	F	59	Caucasian	10.0	Supervisor	4.5	Associate's	1976
2	F	41	Caucasian	12.0	Project Mgr	12.0	Master's	1997
3	F	45	Caucasian	20.0	Manager	2.0	Master's	2000
4	M	56	African American	4.0	Upper Administration	15.0	Proff Deg	1995
5	F	33	Caucasian	11.0	Nurse Mgr	1.0	Bachelor's	2013
6	F	33	Caucasian	5.5	Supervisor	1.0	Master's	2005
7	F	51	Caucasian	9.0	Director	2.0	Bachelor's	1997
9	F	39	Caucasian	17.0	Director	1.0	Master's	2006
10	F	62	Caucasian	5.0	Supervisor	5.0	Master's	1980
11	F	29	Hispanic	3.0	Director	2.0	Master's	2011
12	F	42	Caucasian	9.0	Supervisor	5.0	3 year diploma	2000

Context question: Perception of organization's internet/Web 2.0 policies.

Interview Question: What policies, if any, do you think XX has about the use of Internet/Web 2.0 technologies in the workplace?

The participants were asked to discuss the internet/Web 2.0 policies they thought the hospital health system had for the workplace. The following is a list of the major themes of the participant responses, followed by an elaboration of each theme in the participant's voices:

- Internet/Web 2.0 usage blocked, restricted, or discouraged
- Use encouraged but be cautious
- Possible violation of company policy and monitoring of employee use
- Hampered from effectively using internet/Web 2.0 at work
- No restrictions

Internet/Web 2.0 usage blocked, restricted, or discouraged.

A majority of participants believed that their employer blocked or restricted access to internet/Web 2.0 technologies, for example (“there are certain websites that are blocked,” Interviewee 1; “there are only certain websites I can get on to, I can’t get out to the social media sites,” Interviewee 4). Several participants mentioned a screen message warning that pops up when employees try to access the internet, which they interpreted to mean that the site they were trying to open was not accessible (“sometimes when we are surfing the Internet for information, we do get a pop-up blocker saying it’s not accessible,” Interviewee 9). One participant felt that the block was in place so that employees did not have to read policies about internet use---they simply could not go there.

Several participants thought that the organization did not outright block access, rather it limited access to sites that were either unnecessary or were questionable (“I know they block certain sites, yes, like entertainment, adult content,” Interviewee 5). One participant used her computer during the interview to show the onscreen message. She stated that “it refers you to the HR policy 5.21 electronic business communication and a reminder about HIPAA. When you click ‘I agree’ and it’ll let you go, it doesn’t actually block you, it just gives the warning,” (Interviewee 3). Some participants thought that the health system discouraged both personal use of the internet and use of social media, and that use should only be for work-related purposes

(“you’re supposed to minimize the personal use of the – Internet during work hours,” Interviewee 2; “well the social media policy does state that you know, Internet use and websites and so on should be used for business purposes only,” Interviewee 12).

Use encouraged, but be cautious.

Participants also thought the health system encouraged use of internet/Web 2.0 technologies, but wanted their employees to remember that they were ambassadors of the company and should exercise judgement in how they portrayed the company online (“be conscious of how we’re, you now, describing or portraying XX and its services, like, to work to have a positive stance on those things if we refer to them,” Interviewee 2), and employees should not violate patient confidentiality laws. One participant felt that employees should not give medical advice when using social media, (“that whether it is personal or professional that we’re representing XX, we should not give medical advice, we’re supposed to list the disclaimer with every response that might entail any kind of medical advice, or clearly state that it’s our personal opinion,” Interviewee 12).

Possible violation of company policy and monitoring of employee use.

Participants were worried that they could possibly receive negative consequences either by violating company policies or from the company monitoring their online activities. A number of participants expressed concern that if they were to use these technologies, they might violate any one of a number of policies that might exist on security, confidentiality, appropriate use, and privacy, even though they were not sure about exactly what policies existed or what the policies stated (“Well, let’s see, do we have policies? I know we have policies, most of the ones that I’m familiar with though are connected to confidentiality,” Interviewee 7). One employee indicated that they personally knew of other employees who were disciplined by the company for doing

something that the company found unfavorable on social media (“when somebody does identify themselves as working for XX and then does something maybe...unfavorable for XX, and not necessarily bad or egregious or some big violation of HIPAA or anything like that, but just didn’t reflect XX, perspectives, and as a result of that, I’ve seen people disciplined for it,” Interviewee 12). There was agreement between two participants that the health system actively monitors employee use of internet/ Web 2.0 and Interviewee 5 felt that reports are kept on employee time spent using these technologies and on unusual activity (“they’ll report, or if it’s on, say you have a computer that’s logged on to Facebook for eight hours”). Interviewee 12 expressed the belief that, “if you ‘like’ XX on your site and you list that you’re an employee of XX, then you’re subject to us searching your Facebook and looking at your pictures and making sure you’re not, you know, doing anything you shouldn’t be doing, and that makes me feel very uncomfortable as an employee.”

Hampered from effectively using internet/Web 2.0 at work.

Several participants felt that the aforementioned concerns contributed to their feelings of being hampered from effectively using these technologies at work. They expressed nervousness about venturing onto social media sites and were less inclined to try these technologies (“I mean, if you can’t use it where you spend a lot of your day, then you probably don’t go beyond that to do much to find those sites or to use them, Interviewee 4; “they [professional association listserv] are moving towards using more like a Facebook type of social media and they’re going to restrict it to members, and currently it’s open to anyone who cares to participate so, at any rate, . . . I won’t be able to access that site once they make the change to the more of a social media,” Interviewee 10; “in my opinion of the social media policy, I feel it gets pretty restrictive, and makes me less inclined to use those technologies for work-related purposes, Interviewee 12).

No restrictions.

Interviewee 1 stated “I don’t think there are any restrictions as far as, you know, searching or looking for anything online.”

Participant Learning Goals

As part of the interview process, participants were asked to develop a learning goal that could help them solve a problem related to their job, and to note which internet/Web 2.0 technologies/applications they used in the process and for what purpose they used them. Table 52 lists the individual goals and type of goal (the types match the categories identified in the corresponding survey question---see Table 14).

Table 52

Work-related Learning Goals Chosen by Interview Participants

Interviewee	Work-related Learning Goal	Type of goal
1	how to utilize email more effectively	software/program skill
2	complete a journal article submission to a new journal	professional expertise
3	develop a surgical dashboard	development of program/process
4	create a labor relations strategy for a unit	development of program/process
5	create an award for nursing assistants	development of program/process
6	complete carrier requests and make a case for acquiring needed equipment	development of program/process
7	increase knowledge and application of joint commission regulatory rules to support the hospital for regulatory visits	development of program/process
9	make recommendation to team re: new surgical technology	presentation
10	update checklists for upcoming inspection	development of program/process
11	find telemedicine models for provision of virtual care	development of program/process

Research question 1: How do employees construct their PLEs?

Interview Question 1a. Applications and strategies used to locate/find information

The participants were asked to describe the applications and strategies they used to locate information needed to address their work-related learning goals? The following is a list of the major themes of the participant responses, followed by an elaboration of each theme in the participant's voices:

- Applications
 - Email
 - Search engines
 - Web-based content
- Resources internal and external to the health system
- Strategy: Starting with Google search
 - Strategy: Going to professional organization/association websites
 - Strategy: Contacting colleagues

Applications.

Participants reported using a variety of Internet/Web 2.0 applications including: email applications (e.g., Outlook, “most of my communication is through email,” Interviewee 3), search engines (most popular being Google), Microsoft's SharePoint (“I've used SharePoint to kind of do an overview of the project and things that we're doing, so that other people, like, within our management team can see what, you know, the overall goal is,” Interviewee 6), web-based content such as journal articles, and Web 2.0 technologies (e.g., YouTube [“I went on Internet to use—look at YouTube,” Interviewee 9, “and YouTube itself brought me a lot,” Interviewee 1] Wikipedia [“sometimes I'll search further, like once I'm on the Wiki page I'll

search further,” Interviewee 5], Pinterest, Amazon, and LinkedIn [“I did go to LinkedIn also searching within LinkedIn looking for nurses and/or attorneys that might have the information,” Interviewee 12]).

Resources internal and external to the health system.

Some participants used resources internal to XX such as their intranet data-base (“a lot of it’s internal, especially since it is you know, patient level data,” Interviewee 3), electronic medical record system (EPIC), and their University system. Devices that were used in addition to work computers were mobile phone (to access Pinterest), laptop, tablet, and an iPhone.

Participants also used resources external to XX such as websites XX subscribed to (e.g., EPIC user’s website that has webinars, discussion forums, and slide shows [“Epic does also provide what they call the Epic User Web? So you can go out to the website and you can ask other users of Epic throughout the country,” Interviewee 3]), promotional webcasts from businesses selling medical products, (“And then also the webcast, which was part of their presentation to actually view their technology,” Interviewee 9) vendor websites (e.g., Healthstream, Siemens), and professional organization websites (e.g., American Association of Clinical Chemists, Ambulatory Nursing Association [“I also utilized the—I mentioned the AACC listserv,” Interviewee 10]). Participants engaged in non-online communication including phone conferences, and face-to-face conversations with colleagues inside and outside of XX (“These were face-to-face or telephone,” Interviewee 12).

Strategy: Starting with Google search.

Participants favored strategy was to type key words into a web browser’s search function to follow and explore the listings. Google (the favorite search engine) was used to search websites for academic journals; “objective” sites such as government websites and professional

organizations/associations; websites of other hospitals; specific topics and inspiration: (“I think I Googled telemedicine neurology, specifically and saw what kind of options came up,” Interviewee 11; “Looking for something that applied, and then going back to Google and starting over again,” Interviewee 1; “what would show up from a Google search, and there’s a lot of information out there - - and so I actually from there steered more towards the government sites,” Interviewee 4).

Strategy: Going to professional organization/association websites.

Participants went to websites of professional organizations/associations to find specific information, find guidance about what to do, check the policies/procedures of other hospital members of the organization, and search the organization’s online journal and/or articles. The typical strategy was to start at the homepage and then follow relevant links, “because the ANA website had an article, it was like a journal entry, and then there were some additional links for resources for that particular article, and so I followed those, and that led me to Triage Nurse Association and some of these other telehealth associations, so I followed a couple links, I guess I went back and forth between the two,” Interviewee 12).

Strategy: Contacting colleagues.

Participants also contacted colleagues within XX (team members and XX librarians) and outside the organization (via LinkedIn) to converse and to request information (“I also started emailing XX, our chief nursing officer, the supervisor that was involved in this, you know, for her to send me her article,” Interviewee 12).

Interview Question 1b. Applications and strategies used to store and retrieve information

Participants were asked what applications and strategies they used to store and retrieve the information they found. The following is a list of the major themes of the participant responses, followed by an elaboration of each theme in the participant's voices:

- Applications and strategies
 - Email
 - Folders
 - Other applications
 - The internet
 - Chose not to store
- Challenges identified by participants

Applications and strategies.

Email. A frequently used application was email (e.g., Outlook) where participants would save and/or archive emails that contained important information (e.g., PowerPoint presentations, documents, or web links), email information and links to themselves, and store their emails in email folders by topic ("I mean the emails I received from the Board of Nursing I just have saved," Interviewee 12; "usually I will archive the emails I get from my co-authors and collaborators on these things, I have a lot of filed emails for different projects that I work on," Interviewee 2; "they had sent me an Excel spreadsheet via email, so that's stored in my email as well," Interviewee 9).

Folders. Use of folders was another frequent method, where some participants created folders in their "Favorites," in "My Documents" ("I have in my documents I keep stuff like in a folder there, Interviewee 6), in Word, on their personal drive, on shared drives, and as mentioned in their email application ("Any emails, or any articles that I got from the library I would put in my Outlook resource folder," Interviewee 7; "there's another folder within that main lab folder

that we—that everyone has access to, so I’ll store things in there too if I think someone else might need to access the information,” Interviewee 10).

Other applications. Participants also used Evernote, Microsoft Office Suite applications (e.g., Word [“I usually put it all in Word and then I’ll cut and paste and move things that I want to remember,” Interviewee 7], Excel information [“I put it on my Excel spreadsheets, Interviewee 9], PowerPoint, Publisher), and PDF files to store and retrieve. One participant used an internal application to XX, which was the medical records system. Another participant stored results through an Amazon account.

The internet. Participants also used “Favorites” in their web browser (“what I did store I’d create Favorites in Internet Explorer,” Interviewee 11). One participant archived Facebook messages.

Chose not to store. There were participants who opted to store information on paper by taking notes in Word or Excel that they could sit and read, or use for later study (“I printed out the nomination forms from the other institutions that I had found and printed out their ideas, Interviewee 5). One participant felt they had to print files because they could not access them online when offsite, and another participant just preferred working with paper (“I kill a lot of trees so most of the time [laughs] I would print it,” Interviewee 10). Two participants decided to apply the results of their search at the time they were searching, so there was no need to save what they were doing. Several participants opted not to store what they found because they: felt they had a good memory, could just repeat the searches later using the same key words, were counting on another to do the search as well, and found nothing substantial to save (“was looking for particular information, and there wasn’t . . . anything in there worth storing, if you will,” Interviewee 12).

Challenges identified by participants.

Participants noted that there were some challenges associated with storing and retrieving information. One was difficulty recalling their filing system at a later date, as well as difficulty locating filed resources because the system they used when storing the first time no longer made sense when they went back, or the topic might have “morphed into something else,” Interviewee 7. (“I have a number of sub-folders set up...Sometimes it’s challenging, you think, OK, where did I save that [laughs]?” Interviewee 10). Another was the clutter that resulted from accumulation of emails over time. There was also the problem of accidental duplications of folders due to lack of recall about the names of original folders. This could lead to redundancy and confusion when information was stored in multiple locations.

Interview Question 1c. Applications and strategies used to analyze the information found elaboration: figuring out if it was helpful/accurate

Participants were asked what applications and strategies they used to analyze the information they found. Their responses were primarily focused on the strategies they used rather than the applications. The following is a list of the major themes of the participant responses, followed by an elaboration of each theme in the participant’s voices:

- Strategies
 - Immediate application of results to see what happens
 - Asking themselves evaluative questions
 - Validity of information
 - Checking the credentials of the content authors
 - Noticing the currency of the resources
 - Presuming that certain websites are trustworthy and legitimate
 - Avoiding social media sites such as Wikipedia

- Returning to websites
- Seeking opinions/advice from others internal to XX and external to XX
- Comparing and contrasting

Strategies.

Immediate application of results to see what happens. One participant began using the information they found to see if it fit/worked (“so just having that up while I was watching was helpful to me, that I could kind of follow along with it and do it as I was going,” Interviewee 1).

Asking themselves evaluative questions. Participants asked questions about the information they found, such as what makes common sense related to the question (“I just use some basic critical thinking of what makes sense, what’s common sense related to that topic, does this even make sense,” Interviewee 7); what are the risks/benefits to applying this information; what will my ROI [return on investment] be (“then it makes sense—you know like the cost-benefit analysis of it,” Interviewee 6; “looking what our return on investment would be,” Interviewee 9); is the information the right fit for the specialty area (“so there was a lot of information out there in regards to telemedicine for primary care that may not necessarily translate well into a specialty like neurology,” Interviewee 11); does the information have specific details or is it too generic (“so if it was detailed and provided examples of how people have used certain options, that was helpful,” Interviewee 11); is the organization the same size as ours, is it a rural or city hospital setting (“ you know, if this is a small rural hospital versus an inner city,” Interviewee 7); does the information found make sense to the end goal (“Yeah, had to make sense to the end goal,” Interviewee 5).

Validity of information.

Checking the credentials of the content authors. Participants asked questions such as does

the writer have authority enough to give an opinion (“there could be one surgeon that puts his post up there and I can’t always rely on that as being accurate—I can read it, but then I also have to validate it with other supporting documentation,” Interviewee 9); are the clinicians who are writing certified; what is the author’s degree and/or role in their organization (“what their role is, you know, if they’d said they’ve been doing this for 10 years and this has been their experience—usually they’ll share why they’re an authority enough to give an opinion,” Interviewee 7).

Noticing the currency of the resources. One participant made note of posting dates to be sure the information was current.

Presuming that certain websites are trustworthy and legitimate. Several participants felt that information found on websites belonging to a journal, professional association, or society such as the American Medical Society, or a healthcare association such as the American Medical Association, or another hospital system could be assumed to be trustworthy (“just the fact that it’s the journal’s own website I presume means it’s correct,” Interviewee 2; “that are on a journal website, you know, we have JBJS, which is our *Journal of Bone and Joint Surgery* so that those are evidence-based practices,” Interviewee 9; “A reputable source. Right, either a professional society or health system, or a health care association,” Interviewee 11).

Avoiding social media sites such as Wikipedia. One participant made a practice of avoiding Wikipedia when they wanted to find trustworthy or legitimate information.

Returning to websites. One participant relied on returning to websites to look for further information/validation (“We’d go back and look at the strategies that we saw online and

see how prevalent that was and how it was stated, and that may modify our strategy statement, or that may just simply validate it,” Interviewee 4).

Seeking opinions/advice from others internal to XX and external to XX. Participants also sought advice from others both within the organization (“So collecting all this information and then taking it to my leaders, to say this is what I have found, what are your thoughts, so now there’s further direction,” Interviewee 9) and outside of the organization (“so I reached out to the nursing board when I didn’t find my answers,” Interviewee 12).

Comparing and contrasting. Participants compared information they found to current situations/practices/knowledge by cross-referencing information with patient charts, seeing if recommendations fit with current organization practices (“and then compare it to what our organization is currently doing so that I can get a sense of what they’re recommending, how it fits in,” Interviewee 7), and assessing the sense of what is found against current processes (“I just tried to compare it to our current process, and I guess to me, like it makes sense in my mind,” Interviewee 6). Participants also compared differing opinions of others.

Interview Question 1d. Applications and strategies used to make decisions about how to use the information?

Participants were asked how they made decisions’ about how to use the information they found. Their responses were primarily focused on the strategies they used rather than the applications. The following is a list of the major themes of the participant responses, followed by an elaboration of each theme in the participant’s voices:

- Strategies
 - Made immediate attempts to apply the information
 - Assessed whether the information was relevant

- Selected what to present to others for feedback and collaboration
- Created reports and developed plans of action

Strategies.

Made immediate attempts to apply the information. One participant watched a video, applied the suggestions, and then returning to the video over and over (“the one video talked about categories, one talked about folders, so I just started creating folders to see how that would look to me,” Interviewee 1) and another participant read information to see how it applied to the problem (“I would read each of the requirements and then see how this applied to our manuscript,” Interviewee 2).

Assessed whether the information was relevant. Most participants would see if the information was applicable to their task (“So, if it seemed like something that would help me not have email get buried, then I would try it, Interviewee 1; “I evaluated how useful the information was in relation to what task I was trying to complete,” Interviewee 10). Some compared what they found to current practice, and if it matched what was being done, then they were more likely to use the information (“I would compare what I found to our practice...is it the same instrumentation, is it the same type of specimens, if it was something that matched what we were doing, then I was more likely to adapt it,” Interviewee 10). One participant repurposed the information if it was not applicable to their project (“I would utilize the information for something else,” Interviewee 5).

Selected what to present to others for feedback and collaboration. Several participants would present the information to team members or higher ups (“My CEO... and COO,” Interviewee 9), or end users (physicians, nurses, surgical teams), or physician leaders and then got feedback from those others as to the usefulness of the information presented (“after kind of

revising in the Word document and I would share that with my co-authors and get their blessing on it I guess, or, get their comments and suggestions,” Interviewee 2; “my considerations first are usefulness by the end user, so in this case my customers being the physicians and nurses on the surgical services teams, and then I selected from those the things I thought they would like to see,” Interviewee 3). One participant also collaborated with others to determine common themes to build strategy (“I would use that feedback to then determine common themes that we’d want in our strategy,” Interviewee 4) and collaborated with attorneys (“Then there’s an external validation where we consult with a labor relations consultant and with an attorney,” Interviewee 4).

Created reports and developed plans of action. Participants used the information they found to create summary reports, cost/benefit analysis, spreadsheets, and PowerPoint presentations (“I used that to create my own kind of mini-presentation [in PowerPoint], to share with our physician leaders to discuss what the different options are to help us select what would be the right fit for us,” Interviewee 11; “on my write-up, like trying to put stuff into different categories... a comparison, like this is the system now versus what it could be,” Interviewee 6). One participant developed new position roles/responsibilities and plans for how to help end users (“so I needed to have the knowledge of this role in order to help develop what their role looks like and how they support these different initiatives in the hospital. The way I’m applying this is related to their job role and responsibilities,” Interviewee 7).

Interview Question 1e. Applications and strategies used to create knowledge elaboration: methods used to make something?

Participants were asked how they went about creating knowledge. Their responses were primarily focused on the strategies they used rather than the applications. The following is a list

of major themes, followed by an elaboration of the themes in the participants' voices:

- Tangible product
- Other knowledge actions

Tangible product.

Participants reported creating a variety of products including awards, reports, cost/benefit analyses, key documents that supported the creation of a new job role, and the collection of additional information (“I created a brand new award,” Interviewee 5; “I used their Excel, which they had given me a spreadsheet on what the ROI would be,” Interviewee 9; “I think I am creating knowledge related to this new role and how it supports the hospital,” Interviewee 7; “So, I made sure that my two senior people in the department knew where I kept files and should they have to answer an inspector in my absence they would know where to get the information they needed,” Interviewee 12).

Other knowledge actions.

Participants also engaged in developing strategies, organizing and synthesizing knowledge, sharing knowledge, and raising awareness (“ So we built knowledge around our current labor relations practices and then we built a proposed strategy,” Interviewee 4; “rather than creating, it’s organizing it and grouping things in a more logistical way so that’s more synthesizing than creating,” Interviewee 3; “I think not only sharing that there is an award, which is knowledge in a way, then sharing even the information on bees - - is sharing knowledge as well,” Interviewee 5; “first of all, just creating the knowledge of the fact that this was an issue,” Interviewee 12). The participants reported using Word documents, Excel, and Visio to create knowledge.

Interview Question 1f. Applications and strategies were used to communicate, collaborate, and build networks

Participants were asked what applications and strategies they used to communicate, collaborate, and build networks as they worked on their learning goal. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Means of communication
- Collaboration
- Networking

Means of communication.

The most popular means of communication was email (“I’ll send them a message saying that we want to share something out of Evernote, but then they call and ask if I can just email it to them,” Interviewee 4; “then some emailing of information,” Interviewee 9; “ again, primarily email,” Interviewee 10). One participant made a contribution to a blog (“they were talking about that same practice and I just shared with them what we had done,” Interviewee 4). One participant tried unsuccessfully to use Facebook (“I did post on Facebook to some of my nursing colleagues just hey, nursing colleagues, if any of you know anything about this, can you message me and I didn’t get a response,” Interviewee 12). Several participants used the standard means of phone calls and meetings (“they did come here for a face-to-face meeting,” Interviewee 9).

Collaboration.

A number of participants worked together on a task or project with individuals both internal and external to the health system. Internal collaboration occurred with co-authors on projects (“so that’s something that I had email communications with my co-authors about,” Interviewee 2), teams within and outside of departments (“within our department, we have a data analytics team, that’s helping me now,” Interviewee 6), contacts within the health system (“I

have a lot of contacts within the hospital to get information,” Interviewee 7), physicians/surgeons, health system administrators, and on one occasion the legal department.

Collaboration with others outside of the health system included vendor company representatives (“That would be the regional manager for XX Technology. And the local rep for XX and they had a rep present as well,” Interviewee 9) and an individual from a government agency.

Networking.

Participants made contact with or exchanged information with clinical co-workers from previous jobs, former coworkers, individuals met through the EPIC conference (“Twice a year, there’s so many Epic users in Michigan,” Interviewee 7), individuals met at a professional society conference, attendees met at a vendor-sponsored seminar (“I do attend seminars sponsored by instrument manufacturers on occasion and that’s also an opportunity to network,” Interviewee 10), nursing colleagues, and associates and friends through social media (“I also have a contact, sort of a mutual friend, through Facebook,” Interviewee 12).

Participants expressed certain sentiments about networking. One sentiment was that people tend to go to people they know. Another was that it is easier to network via a webinar than a phone conference. One participant thought that using email to network is not efficient (“email works, but it’s just that it doesn’t put it all in one place, you then take it and put it with your notes, put it with your documents that you’re working on and that’s fine, I mean it just seems to be a little bit inefficient is all,” Interviewee 4).

Interview Question 1g. Applications and strategies used to share and disseminate information and knowledge with others

Participants were asked what applications and strategies they used to share and disseminate information and knowledge with others. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Applications
 - Microsoft Lync
 - Microsoft SharePoint
 - Microsoft Excel
 - Microsoft PowerPoint
 - Email
- Strategies
 - Shared within the organization
- Means of sharing
 - In-person
 - Phone calls
 - Talking
 - Sending information via email
 - Shared drive to store information so that others could access it
 - Live demonstration

Applications.

Participants made use of a variety of applications to share information such as Microsoft Lync, a software application for corporate environments that connects desk top to desk top (“So you can actually share my screen with anybody who’s signed into the Lync session - - so you can see and can demonstrate what the dashboard would look like. We use that a lot,” Interviewee 3; “Well, it can be done in person as well as through LinkedIn [the interviewee later corrected LinkedIn to Lync],” Interviewee 7), Microsoft SharePoint, which is an application that allows users to store, organize, share, and access information (“so putting it on SharePoint via email,” Interviewee 3; “I may just send the link to the documents on SharePoint and the nice thing about

that is everybody can update those documents,” Interviewee 7), email (“and then kind of put it [report] in an email,” Interviewee 6), Excel, and PowerPoint.

Strategies.

Shared within the organization. Participants shared and disseminated information with others who were internal to the hospital health system, such as within departments (“I did share the little tidbit that I learned with a couple people in my department,” Interviewee 1), with team members (“and then shared that with my team,” Interviewee 5), with supervisors and physician leaders (“I did go back and verbally share it with my direct supervisor,” Interviewee 12), at division head meetings, and at leadership groups (“I’ll usually get on the agendas of every leadership group I can possibly get on,” Interviewee 7). There was no discussion of sharing information with anyone outside of the organization.

Means of sharing. There were two primary means of sharing information. The first was sharing in person (“It was in person,” Interviewee 9; “we had met like in person,” Interviewee 5), which was done through phone calls (including teleconferences), “there was a teleconference,” Interviewee 9), meetings, presentations to others within the organization (“I plan to present it at one of our division head meetings,” Interviewee 11), and just sitting down and talking (“Mostly just conversation,” Interviewee 10). The second was sending information such as reports, documents, meeting notes, website links, and an e-newsletter via email (“It was primarily just through emails, or occasionally phone calls, but mostly emails,” Interviewee 10). One participant used a shared drive to store information in a way that others could access it if needed (“all my checklists that I’ve been working on, I put on the shared drive so that they would have access to it as well,” Interviewee 10). One participant conducted live demonstrations that could be viewed

either in person, or through the Lync system (“I may use some of the live environments to share so people can visually see what we’re doing,” Interviewee 7).

Interview Question 1h. Determining which tools to use for particular purposes

Participants were asked how they determined which tools to use for particular purposes or why they picked the tools they did and not others. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Reasons given in favor of using certain tools
 - Convenience and depended on need
 - Positive past experience and “it is the default”
 - Other reasons
- Reasons given for not using certain tools
 - Lack of familiarity with applications/tools
 - Time constraints
 - Employee reticence to read email
 - Other

Reasons given in favor of using certain tools.

Convenience and depended on need. Two reasons given for choosing one or more tools was that it was convenient and that their choice depended on the particular need for which it was being used (“I thought about what it was that I needed, and then would use the tool,” Interviewee 5). There was the convenience of searching the internet (“it can’t possibly be more convenient (laughs) – than searching the Web,” Interviewee 2), which Interviewee 2 thought was less cumbersome than going to the library; using email (“I could go downstairs and talk to them in person, but they might be busy, or that will take longer than sending off an email,” Interviewee 2); watching a webinar at a desk; or using web conferencing so employees did not have to travel to a central location (“we’re too far spread and not everybody can come to one central location, so that pretty much sets that you’re almost always doing a conference line, and web conferencing in to every meeting,” Interviewee 7).

If participants needed to access specific resources like a journal or a professional organization that would determine what they chose to use (“I know there are specific requirements, I know the journal is the one that maintains them and so it only makes sense to go right there to the source,” Interviewee 2; “I always go to the company’s website to get information from there,” Interviewee 9). Other examples of using an application for a specific purpose were going to Wikipedia when a blurb of information was needed; using google images to find an image (“Am I looking for an image to share and then I would do my Google images,” Interviewee 5), using social media if the quest for information was vague (“and my co-authors didn’t have a good sense of that or wanted some additional feedback, then I could take that to more of a social group or listserv or something like that,” Interviewee 2); choosing Pinterest for inspiration; and using the internet for fact finding or for highly specific and reputable information (“I was looking for specifics, my goal was to find legal sites, reputable sites that I recognize, as opposed to, you know, Yahoo blogs,” Interviewee 12).

Positive past experience and “it is the default.” Participants were more likely to choose a tool or an application if they had successfully used it previously (“It worked for me before [laughs],” Interviewee 3), if it felt familiar (“a big part of it is just familiarity with the tools,” Interviewee 4; “I’m very familiar with how to use it, so it was comfortable.,” Interviewee 11), or was an old habit, “Old habits (laughs),” Interviewee 3; “These are things that we’ve done. Always.” Interviewee 9), and if others had used it. Other participants felt the applications they chose were ones they tended to “go to,” with the most frequent “go to” application being Google (“my first thing is to find information, so I always go to Google,” Interviewee 9; “I’ve always used Google, I felt like it produces the kind of results that I’m looking for,” Interviewee 11).

Other reasons. Several participants liked how employees could quickly and easily access information through applications they used. Accessibility also was enhanced by free webinars. Interviewee 11 felt the internet offered current information (“I use the Internet because I feel like it has the most up-to-date information”). One participant thought the organization expected employees to use certain applications (“they also set the expectation that if you’re presenting, you should have something in PowerPoint” Interviewee 7).

Reasons given for not using certain tools.

Lack of familiarity with applications/tools. The dominant reason given for not using Internet/Web 2.0 technologies was lack of familiarity with the applications and tools including never having tried an application to having tried it and failed. Participants also did not know what tools/applications were available and how they might apply to their work (“and there’s a lot of stuff on the sheet [Employee PLE Worksheet], I was like what is that, it’s just more of it I’ve not used before,” Interviewee 6; “I still don’t get what hashtag and Twitter is, and why people use it and what the value in that is,” Interviewee 7).

Time constraints. Another reason for not using certain applications/tools was related to time constraints, in that there might not be enough time to learn how to use the tools (“I just chose not to kind of start down a new learning path at this time because I had the need to get this done,” Interviewee 4), and the perception that applications could be time wasters (“Because it seems like some of these things could be real time wasters if they weren’t used efficiently,” Interviewee 7). Another concern was that there might not be enough time to go to the internet and read information through social media, for example blogs.

Employee reticence to read email. Interviewee 5 did not trust that employees would open up and read information sent to them through email, as opposed to posting information on a

bulletin board where employees were passively exposed to the information. Another participant just assumed emails are not read (“we try to hit things from multiple angles because we know clinicians don’t read email,” Interviewee 7).

Other reasons. Another reason given was not wanting to take a risk of possibly violating confidentiality and privacy rules (“I do have a, I wouldn’t call it a fear, but an overwhelming respect for confidentiality with data, I want to be very careful that I’ve not crossed any of those lines that could put myself or the health system at risk of violation of privacy,” Interviewee 3). One participant simply does not use social media for anything work related and another could not identify a reason for not using or limiting use of Internet/Web 2.0 technologies.

Interview Question 1i. Reflections on tools/strategies used to accomplish goals

Participants were asked to look back on the strategies and the tools they used to accomplish their goals and to reflect on what, if anything, they would have done differently. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Use time differently
- Planned and organized differently
- Chosen a different application/tool
- Searched for more information
- Would not have done anything differently

Use time differently.

Several participants would have liked to have started earlier or used their time differently (“I probably would’ve started a little earlier and spent a lot more time on it,” Interviewee 1; “Start earlier (laughs),” Interviewee 10; “I think maybe dedicating certain amount of time to specific to each topic,” Interviewee 4) or have been able to shorten the time they spent looking for information. One participant wished they could have figured out more quickly what was a

waste of time (“how do you determine which is worth your time, you’re halfway through something before you go this is a waste of my time,” Interviewee 7).

Planned and organized differently.

Interviewee 3 “Probably would’ve put more time into the planning and not jumped right into the development.” Interviewee 5 regretted not having used bookmarks to help with organization stating

I didn’t bookmark my page on bees, so when I go to look for bees — I don’t know necessarily if I pulled it from bees or from honeybees or which Wikipedia page I pulled it from. So if I wanted to re-copy and paste or look for more information in that same text I won’t be able to pull it right back up, I’ll have to go back and search again for it.

Chose a different application/tool.

Interviewee 9 wished for more knowledge of the types of tools that are available to try something that was not already a “go to tool” (“I like to do new things and learn new things and just make life simpler, I mean, if there are tools out here that could make my life easier, that would be great-- like this Diigo, I don’t know what that is.”).

Searched for more information.

Two participants would have searched for more information (“it would have been good to have the cost-benefit analysis, financial-wise, put in there [for his/her project],” Interviewee 6; “the only other thing I could and may still do would be to survey more states, to get maybe a broad idea of each state’s regulations,” Interviewee 12). Interviewee 12 also thought that getting information directly from the legal department at the hospital health system would have been helpful as well.

Would not have done anything differently.

Interviewee 2 concluded, “I don’t really think there’s anything I’d have done especially differently.” Others felt the same way (“I don’t know that I’d do anything differently because I got the end result of what I wanted, so I got the information I needed,” Interviewee 7; “nothing really, I found the information that I was looking for, so I accomplished my goal, so I don’t think I would change anything,” Interviewee 11).

Research question 2: What triggers an employee to construct a PLE?

Interview question 2a. Positive influences for trying internet/Web 2.0 technologies

Participants were asked to reflect on what, in general (not just for the task they had been working on) positively influences them to try internet/Web 2.0 technologies at work to solve work-related problems or for professional development. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Peer influence and expectations
- Internet is easy to use/expedient
- Internet as a good source of information
- Technology is relevant to the task
- Other reasons
 - Cost effectiveness
 - Curiosity
 - Need
 - Not having access to technologies blocked

Peer influence and expectations.

The greatest influence that prompted participants to use internet/Web 2.0 technologies was hearing about or seeing others use an application or technology (“I work with a lot of young people, and it just kind of rubs off (laughs) on you,” Interviewee 1; “Hearing what other people are working with and how they’re able to use it to generate new creative ideas...or what resources they use,” Interviewee 3; “Probably knowledge that others have used it successfully,” Interviewee 2; “probably if it’s recommended to me, so a colleague or someone else has used it, and shares that it’s a good tool, it’s effective, it’s easy to use, then I might try it,” Interviewee 11; “a recommendation from somebody I know,” Interviewee 12). Interviewee 3 captured the spirit of peers modeling for peers, “That’s the kind of peer pressure I get, when I see somebody using Google to answer the question I go OK, I should’ve just Googled it – instead of, you know, knocking on John’s door (laughs).”

Easy to use/expedient.

Participants cited the quick and easy use of these technologies as an important influencing factor (“I’m looking at a computer screen all day, and Google Chrome is up, Google’s there—it just seems like a natural thing, you know, if you have a question or you need to find a website or something that you’d do that,” Interviewee 1; “Yeah, it’s like on demand, I can quickly search whatever it is I want information on,” Interviewee 5; “well, expediency, sometimes. You go to the library, that takes time,” Interviewee 7). Three participants found these technologies to be easy to use, which was influential for them (“and ease of use,” Interviewee 4; “The ease of finding information,” Interviewee 9; “probably the ease of use,” Interviewee 10).

Internet as a good source of information.

Participants also thought that the internet was a good source of information (“I think that they’re a good source of information to give you ideas,” Interviewee 5), where one can be exposed to different viewpoints (“it’s such a broad base, I mean, if you just email a colleague you’re only going to get one perspective, if you use the Internet, you can get a variety of different information,” Interviewee 10). Interviewee 5 also found the internet to be “a good source of information to get ideas.” Interviewee 7 found the internet to be helpful for preparing in advance for meetings (“if there’s something on the topic and I don’t know much about it, I will use it to see if I could get up to par so I can have a decent interaction, conversation about the topic”). Participants found that using the internet was effective and provided up-to-date and applicable information (“in a search engine results...the summary of the information seemed like it was most applicable to answer my question,” Interviewee 12).

Technology is relevant to the task.

It was important to Interviewee 2 that technologies reach the intended audience (“I kind of wait for them to become prominent enough to seem like they have staying power, they’re useful, they’re going to reach an audience that I want to reach”). How well a technology matched with thought process was also a factor (“how, you know, does it fit with how I kind of think about the problem or think about the information,” Interviewee 4). The technology also had to do something for the participant, “I don’t like to waste my time on something that doesn’t provide me any value,” Interviewee 7. Being able to share information was also a factor (“I can get that information, I can give them a link and they can take it and run with it, so I think the ability to share is a great thing too,” Interviewee 9).

Other reasons.

The cost effectiveness of technology was important to Interviewee 10 (“so utilizing that Web 2.0 technology for those people to get their continuing education met is a lot easier and cheaper than sending them to a daylong seminar”). Curiosity also played a role (“I’m curious, I’m always willing to try something new,” Interviewee 7). For Interviewee 3, “the definite influencer is need, you know, when you need to be able to measure something and there isn’t a way to do it, you get rather inventive.” Not having access to these technologies because they might be blocked by the organization was also a factor (“one big part of it is just being able to get to it, so not having it blocked is probably a big access thing,” Interviewee 4).

Interview Question 2b. Reasons for use of internet/Web 2.0 technologies and applications to solve some work-related problems, but not others

Participants were asked to reflect on what, in general (not just for the task they had been working on) moved them to initiate use of internet/Web 2.0 technologies and applications to solve some work-related problems, but not others. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Depended on the nature of the problem
 - Reasons given for using internet/Web 2.0
 - If the problem is one of lacking information or facts
 - To get ideas/inspiration or images/videos to create something new
 - To find information for benchmarking
 - If the problem involves a technical issue, not a people issue
 - To become familiar with topics for which there is a lack of knowledge
 - To survey colleagues
 - Reasons given for not using internet/Web 2.0
 - When the problem involves people issues
 - If the necessary information or tools already exist
 - When it is quicker and easier to ask someone
 - When there is a need for published information
 - When there is problem or a need to access information internal to the health system
- Tends to go to the internet first
- Cost effective and fastest route

Depended on the nature of the problem.

Participants agreed that whether they chose to use internet/Web 2.0 technologies depended on the type of problem they were working on (“I guess it depends on the nature of the problem,” Interviewee 2; “so just depending on the type of problem,” Interviewee 11; “how I determine which technologies I use and when I use them and when I don’t really depends upon the question at hand,” Interviewee 12).

Reasons given for using internet/Web 2.0. Reasons given for using internet/Web 2.0 technologies varied. Interviewee 2 was likelier to look online for “factual kind of resources.” Interviewee 5 thought “if I need to create an idea on my own, you know what I mean, like to create something new, then I’m going to go to the web to do that, but to create all these things, to create boards, to create things to make them want to read what I have requires me to use things on the web...information, or images, or even YouTube videos.” Participant 10 was more inclined to use these technologies for technical issues (“It’s not going to help me with staffing and so forth, but a technical issue, I’m more inclined to do a little research”). Interviewee 12 felt “if it’s familiarizing myself with a disease I don’t know about, or medication reactions, or a process or procedure that we don’t currently have a policy on... then that’s when I’m going outside the system, and using other technologies to find that data.” Interviewee 12 also considers using social media (LinkedIn or Facebook) when “looking for a connection with a particular person that may or may not have an answer.” Interviewee 9 uses the internet “for benchmarking across the nation or across other hospitals our size.”

Reasons given for not using internet/Web 2.0. Interviewee 2 would consider the sensitive nature of dealing with people oriented problems: “If it’s a work-related problem that relates to relationships in the workplace, for example, then I think I need to address those with my co-

workers or my supervisor, because they wouldn't lend themselves to email communication or doing a web search or posting something on Facebook." The same held true for Interviewee 10, "as a supervisor I'm responsible for personnel issues, so if people call in sick and that kind of stuff, going to the Internet is not going to help me with that." Another participant thought it unnecessary to access the internet/Web 2.0 if what was needed was already available ("if the information and the tools are already there for me, I'm not going to need to utilize the internet or the web, you know what I mean--- to look for new ideas or a tool," Interviewee 5. Some participants found it simpler to ask others first ("so right now most things seem like ask first around, you know, colleagues before going to a web technology," Interviewee 3; "unless I think that my colleague at another laboratory, I remember that they had the same problem and I can call them directly and find out how they solved it, then I might do that one-on-one," Interviewee 10). Interviewee 7 trusts the library to hold more substantial information, "when I want something more substantial, that's literature, that's published, then I go to the library." If the information needed was associated with the hospital system, there was the feeling that one could not go on the internet to search for that ("a lot of it's internal, especially since it is patient level data," Interviewee 3; "so for example, if it was something specific to our organization here at XX that I know I wouldn't be able to find online, I might speak to some of my colleagues," Interviewee 11).

Tend to go to the internet first.

Two participants *could not* think of a reason to not use internet/Web 2.0 technologies for any work-related problem ("I'm trying to think of what problem I would not use it on. Probably not too many-- no, I can't think of one," Interviewee 1; "In my current role, I can't really think why I wouldn't use them," Interviewee 7). Interviewee 1 felt that using these technologies is now

“old habit” and Interviewee 7 believed “I’ll probably always go first to the Web, but then if I’m really doing some serious searches then I reach out to the library, as well.”

Cost effective and fastest route.

Some participants thought using internet/Web 2.0 technologies was fast and easy (“I guess, what actually made me use them was the ease of getting to the information, the fact that it’s there and it’s available,” Interviewee 4; “sometimes it just depends on where I know I can quickly find something,” Interviewee 6). Interviewee 4 also was attracted to internet/Web 2.0 technologies because it is “often available at low or no cost” and travel is not involved.

Interviewee 5 is environmentally conscientious “I try to do more things without having to print articles out for them to read, to try to share it through the email so that there’s not so much paper.”

Research question 3: How do employees use their PLEs?

Interview Question 3a. Ways to evaluate the relevance of information or knowledge found

Participants were asked how they evaluated the relevance of the information or knowledge they found as they worked on their goal (i.e. valuable and accurate information as compared to unhelpful or misinformation). The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- If the information was directly related to the goal of solving the problem
- The nature of the information found
- The authority of the resource
- If team/project members thought the information was relevant
- Relied on personal experience to decide
- Cross checking for validation within company practice

If the information was directly related to the goal of solving the problem.

Participants were focused on completing the learning goal they chose for the study, (“if it was directly related to organizing the volumes of email that seemed like the most relevant thing to me because that’s what I was dealing with,” Interviewee 1; “I applied it with the lens of those outcomes I wanted, so what in here gives me information that helps me build out the role, the responsibilities, what the organization needs,” Interviewee 7). One participant was particularly concerned that the information be specifically applicable (“I was looking for something that would fit with our specialty,” Interviewee 11).

The nature of the information found.

Participants had various concerns about the nature of the information such as the amount of information they might have to contend with (“I wanted something that was kind of to the point and not like elaborate... I would look at the amount of information too, because I didn’t have huge, you know, segments of time,” Interviewee 1). One participant wanted to be sure that the information was new to them (“I mean for me, I look at it for what adds to my knowledge, so if there’s something new here that I didn’t already know,” Interviewee 7). Another found the currency of the information to be important (“there was some out-of-date information that I found that wasn’t in line with the current legislations around telemedicine, so making sure that it was up-to-date as well,” Interviewee 11).

The authority of the resource.

Two participants considered the authenticity of the source. They wanted information that was located within trustworthy sites, which meant a journal website or a professional association’s website (“in terms of finding out the journal requirements as I said, it was just very obviously the official journal website, so I knew that I would get correct information there,”

Interviewee 2; “I looked for familiar entities, again nursing groups that I’m familiar with, so associations that I’m familiar with, seeking out the information directly from the Boards of Nursing, which is the licensing board that regulate those rules, and information from an attorney as opposed to a blog,” Interviewee 12).

If team/project members thought the information was relevant.

Participants looked to others for validation that what they located was relevant (“the response of the committee members with whom I was sharing it. They, you know, felt that it was of value to them, or something that they would use as a reference moving forward--- that increased its value for me as well...if it’s not useful to the end user, to the front line staff, then there’s no purpose in it,” Interviewee 3; “If they want it, and if they feel this is going to be a bonus to us---then we’ll move forward with it,” Interviewee 9),” (“asking some people to give me their feel on whether or not it fits in with what we’re doing,” Interviewee 4). One reason a participant looked to others for input was the value they placed in the expertise of their team (“going to them about how do you want to pursue this, is this revision acceptable to portray the project properly... and then certainly my co-authors are the experts on the project that we’re writing about and the experts on what outcome what they want,” Interviewee 2).

Relied on experience to decide.

Two participants relied on their own assessments of what was relevant (“I guess I rely back on my clinical experience and my years of both analytics and clinical work to decide this is something that would’ve been relevant to me,” Interviewee 3). One of the two felt confident to make that assessment because their learning goal for the study was not one of serious professional gravitas (“I guess a lot of it was just my own personal view of it... I’m not trying to do any sort of evidence-based practice or quality or safety initiative,” Interviewee 5).

Cross checking for validation within company practice.

Interviewee 4 wanted to be sure that the information that was located would work with existing documents: “when I went through the internal validation where I actually started to match it up to our contracts, match it up to the things that we want to get done, that’s when I made sure it was relevant.” Another participant wanted to be sure the cost-benefit analysis would be in their favor (“I was looking for something that if we were to implement something like this in our department---would it be something that we can get reimbursed for. Otherwise, it’s not relevant to me,” Interviewee 11).

Interview Question 3b. Evaluation of effectiveness of internet/Web 2.0 applications used to accomplish goals

Participants were asked how they analyzed whether or not the internet/Web 2.0 applications they used were effective (produced the desired effect) in helping them to accomplish their goal? What criteria did they use? The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Evaluated as effective when the supervisor/manager-level employee
 - Could continue to use the results found through the search
 - Was able to recognize what was effective
 - Could rely on past effectiveness of the applications performance
 - Could use the tools/applications to facilitate movement toward the goal
 - Could determine the reliability of the properties of the information

Interviewee 1 felt that tools/applications were effective if they led to information that could be applied and continued to be used (“I think the telling tale will be that I continue to use the strategies that I’ve come up with based on my research and I will stay more organized”).

Interviewee 7 was confident in their ability to discern effective results that were found through

searching the internet (“I got lots of information, but it was pretty obvious to me when I looked for the medical terminology, which one was the one that I was looking for”). Interviewee 2 felt that “email is a very effective tool because it’s been effective in the past, like, they’re [co-authors] good email communicators, —I learned I can expect that”).

Most of the participants decided effectiveness based on whether the tool/application helped them move toward or complete their learning goal (“ If it was something that would move us quickly toward the end product, than it was of higher value than something that would take a lot of work to make useful,” Interviewee 3; “essentially if it brought me to the kind of sites that I was looking for,” Interviewee 11; “but my tools, it was to collect and compile and present, they were effective in what I was looking to do,” Interviewee 9, “well I guess whether or not I reached my goal, because some things just helped me to develop what the end would look like--- what the whole goal needed to be.,” Interviewee 5)

Participants also looked to the reliability, currency, and validity of the information they were able to locate as indicators of tool/application effectiveness (“it was easy to find,” Interviewee 12; “Well, that it’s true data or that it’s like up to date, data,” Interviewee 5; “I guess it was primarily how complete the information was and --- just trying to decide the relevance of the information to our particular laboratory and specific questions on the checklist I was trying to research,” Interviewee 10). Interviewee 12 thought that the degree of detail indicated relevancy (“I mean just if they had the information, and really with all of the most detailed and most specific information that ultimately answered my questions”).

Interview Question 3c. Judging the quality of learning.

Participants were asked how they judged the quality (degree of excellence) of their

learning as they used their PLE. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- If it led to a successful outcome
- When results were presented, the group liked the information or found it to be useful
- Did not learn anything new

If it led to a successful outcome

Participants were concerned about whether the information was accurate, authentic and implementable. However, the majority evaluated the quality of their learning by whether they achieved the end goal they were working on in relation to their learning goal. (“I guess I think it was good quality in the sense that it led me on a series of logical steps that had brought us to a point where we know what our next step needs to be,” Interviewee 2; “a big part of it would be just how confident I felt about the strategy and the ability to have a strategy that’s going to be successful and legal,” Interviewee 4; “I think how it affected the goal or the progress towards the goal,” Interviewee 5; “did what I want to accomplish get done? Yes, it did, so to me that’s valuable,” Interviewee 7; “again I think just whether I had an answer or I didn’t have an answer,” Interviewee 12; “I guess I’d say I judged it by...was I getting accurate information that would be implementable in our department,” Interviewee 11).

When results were presented, the group liked the information or found it to be useful.

A number of participants assessed the quality of learning based on how their results were received by others (“by the usefulness of the dashboard and the reception of the group as to whether they liked it or found it useful,” Interviewee 3; “I’m proud of what I was able to find and compile, and I’m glad that I was able to present it in such a manner that I didn’t get a no,” Interviewee 9). A corollary factor of importance in their assessment of the quality of their

learning was whether the results of their work could be shared with others (“whether I understood what I had read, so if I found a document that was so high-level I didn’t understand it, then I didn’t feel it was particularly useful to me, if I found something that was clearly written and something that I could share with my staff and educate my staff on it, then I felt a little more comfortable with it,” Interviewee 10; “like how well I could explain and communicate it to upper management, like the importance of it,” Interviewee 6)

Did not learn anything new.

Interviewee 9 felt that the results achieved on the learning goal were good, however nothing new was learned in terms of the tools or applications themselves (“I don’t know if I necessarily learned anything new as far as new technology – I didn’t, because I used my same old tools, it just brought to life that I’m using multiple avenues to collect, store, and present information. But again, that’s something that I do every day”).

Interview Question 3d. Diagnoses of learning need(s) at work or for professional development

Participants were asked to reflect on how, in general (not just for the task they had been working on) they diagnose their learning needs at work or for professional development. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Develop a learning need because do not know something or need more information
- Outside services/consultants create awareness that there is something new
- Learning opportunities create learning needs
- Learning needs develop from organizational needs

Develop a learning need because do not know something or need more information.

Interviewee 1 developed a learning need when “I get into a situation where I don’t know something and I feel like I should know it (laughs).” Most participants develop learning needs when they are asked questions or asked for answers by others in their departments or in the organization (“I supposed often enough it’s when someone asks me a question or I encounter a question that I don’t know the answer to,” Interviewee 2; “asked a question I don’t know the answer to... so the questions or comments of people get me started on trying to find the answers,” Interviewee 3; “sometimes the staff will come to me and say, you know, we’re having this problem, how do we resolve it,” Interviewee 10; “When I can’t answer somebody else’s question (laughs),” Interviewee 12;). One participant develops a learning need when during casual conversation they realize that there is a gap in their knowledge (“just talking to a person, they may bring up a topic that I’m not aware of or that I have very little awareness of, and so that gives me an opportunity to go out there and find out more about it,” Interviewee 4). Other participants would come to their own realization that they needed more information to work on a problem or task (“I’m usually good about researching and trying to find out what I need to know. Because if it gets me stuck somewhere, I know I need to figure it out and learn it,” Interviewee 1; “I just realized that I need the additional level of information to proceed with the task in question,” Interviewee 2; “So my own learning needs would be if I have these quality and safety projects that I need to institute, do I need more information on what is evidence-based practice or what other people have done to be successful,” Interviewee 5; “based on any gaps that I identify, so if I’m working on something and discover that I need some more information or I don’t have all the data or whatever it might be that I need to make a decision, then I might do some additional learning,” Interviewee 11). One participant will experiment with a tool or application

that is new to them, but prefer to get training when they do not know how to use it (“how comfortable I am with something, like for example, SharePoint’s kind of newer to me so just playing with it a little bit I kind of have a rough idea, but because it’s newer, I wouldn’t mind taking training on that,” Interviewee 6).

Outside services/consultants create awareness that there is something new.

One participant developed learning needs when new information was received through email communication from service organizations or consultants (“I do get emails from lots of different services and consultants that makes us aware of the change in environment or changing laws, and so that stimulates an interest,” Interviewee 4).

Learning opportunities create learning needs.

In addition to reading emails containing new information, Interviewee 4 also develops learning needs because “a lot of times there are offers to either attend webinars or to explore sites to find out more”). Interviewee 5 also picks up on learning opportunities (“like if I notice other things, like other opportunities in the morning post ... it’s almost like a little newsletter every day or a newspaper, I might see the opportunity to take that if I see a posting for something... say like it’s offering some sort of learning opportunity [laughs]. And take advantage of it.”).

Learning needs develop from organizational needs.

Several participants were very tuned in to the overall needs of the health system and wanted to align their learning needs with those of the organization (“if I see a need that’s not being met, then I need to learn more about what that need is, so maybe it’s a data request or somebody mentioning that maybe our breast screening rates aren’t as high as they should be, well, that’ll start the question I had, well OK, what should they be?,” Interviewee 3; “I just look

in my job for ways that the organization needs support and then that's where I go to get more learning,," Interviewee 7.

Interview Question 3e. Ways to formulate professionally relevant learning goals

Participants were asked to reflect on how, in general (not just for the task they had been working on) they formulate professionally relevant learning goals for themselves. The following is a list of major themes, followed by an elaboration of the themes in the participants' voices:

- Do not think of learning goals consciously
- Goal setting is aligned with organizational goals
- Move from learning need to learning goal
- Goal setting is related to the need to solve a problem

Do not think of learning goals consciously.

Two participants reported that they do not think of having learning goals in a formal, structured way ("I don't know if I think of it that consciously," Interviewee 2; "Gosh, I never thought about it in formal terms like that," Interviewee 3).

Goal setting is aligned with organizational goals.

The hospital health system develops goals that are communicated down to departments and units, which influences how some of interviewees decide on what their goals should be ("The system has goals and the hospital has goals, and then the unit itself has goals, which I set for the unit, and they become my goals and everybody else's goals... So if our unit's not meeting the goals, then I'm not meeting my goals" Interviewee 5; "I usually will tie whatever it is I'm learning to what the strategic objectives are of the hospital or the business," Interviewee 7; "usually there's a bigger goal in mind, I guess we do a process called performance management here where we do goal-setting," Interviewee 2).

Move from learning need to learning goal.

Interviewee 2 thought that in addition to the larger, more formal goal setting that happens within the organization, there is also the less formal process of encountering a need that needs to be met, which then becomes a goal (“I get to a point in my work and realize I can’t go to the next step or go forward without this piece of information or without learning something about this task”). Other participants echoed this theme (“I guess once you figure what the learning need is, formulate what the solution to that would be and turn it into a goal to learn that application or learn the process,” Interviewee 3; “I guess depending on what the learning need is,” Interviewee 11).

Goal setting is related to the need to solve a problem.

Several participants saw goal setting as a natural extension to the need to solve a problem (“I guess I think about the purpose of why I need to know that, so do I need to know that because I have an immediate problem to solve,” Interviewee 10; “is it something I need to know and need to be able to answer,” Interviewee 12; “Well, my learning goal would be gaining the knowledge I need to solve this problem,” Interviewee 1; “I sit back and I just think about, OK, what do I need to learn, what’s the best avenue, the most efficient way to start tackling that question,” Interviewee 9). Interviewee 5 believed that it is not enough to just solve the problem, but that additionally the goal should involve being able to teach the solution to others (“if it’s something that I personally need to learn about and it’s something that’s related to a quality and safety type thing, then I feel like I can turn it into a goal if one, I learn enough to be able to educate my staff about it, and I feel that they even can see the success”).

Closing Thoughts: A desire to learn how to use newer internet/Web 2.0 technologies to make the job easier and a lack of seeing the application of these technologies to the job

Participants were asked at the end of each interview if they had anything they wanted to say or add before the interview ended. Two participants shared important afterthoughts at the conclusion of their interviews, each representing an opposite position. Interviewee 5 represented those participants who were very interested in learning about and adopting newer internet/Web 2.0 technologies, whereas Interviewee 12 represented the minority position of those that did not see much utility in doing so.

Interviewee 5 said that being a part of the study was interesting and stimulated thoughts about the ways in which she used the internet for work. Interviewee 5 expressed an interest in trying more applications than the ones she typically uses such as Facebook or blogs: “I think that there are probably other applications and things out there that I could access more or could have more information on using it, it would be nice if I could just have a blog and post everything on a blog for my staff to look at.” Interviewee 5 felt that being able to use these electronic technologies could help her be more efficient: “so I didn’t have to make so many boards and post so many papers and make so many quality type things, it would be very nice if we could just utilize these types of communication to do that.” Interviewee 5 felt inhibited from accessing or trying these types of technologies because of fear of accidentally violating company policy. “I would be more inclined to utilize some of these opportunities that exist out there if I didn’t fear that I could be putting my job in jeopardy by doing that, because I might say or do something that violated those policies.” There was also frustration that the software tools needed for certain tasks (such as for creating graphics or videos) were not available on her work computer. She shared a story of one such frustrating experience.

I had a lot of difficulty even like, sharing that video with other people, or even like saving it onto my computer because it was restricted, or I didn't have the software, so it was like I created this video, I was able to kind of cut it down so it was just the video that I wanted, but then I couldn't save it to my desktop and share it... I ended up taking a video of it myself and then emailing that to myself and then saving that onto my computer, because then it turned it into a different type of media file, but then I was able to save. It was a lot of trouble to have to do it... I tried to share it with others, but to open it, and then save it, and then open it another way and it's hard to always provide that education.

Interviewee 5 also expressed concern that even if she did take the risk and use these technologies, she was not confident that the intended recipients of her electronic postings/messages would be able to access them through work, and even if the organization allowed access, she questioned how skilled the employees would be at using the technologies. Interviewee 5 saw a need for training in order to become familiar with how to use these newer tools: "most of the things that I know how to do are all self-taught things, so it would be nice if they provided you with different software and then educated you on how to use it." Interviewee 9's closing thoughts echoed this sentiment, "I wonder does XX have teachings on how to do this, because I've attended the Excel classes that they have... and basically what we want is learning the tools that can make our life more efficient."

In contrast to Interviewee 5, Interviewee 12 felt there were a lot of internet/Web 2.0 technologies that are "out there," but did not see how they related to her job: "I think some of those technologies are useful for some of the work-related problems I have, but very few." She particularly could not see a use for YouTube or Twitter.

Global questions.

Interview Question: How did you identify your learning goal and how did you solve it?

Prior to being asked specific interview questions, participants were asked to describe how they identified and then solved their learning goals. There were six readily identifiable steps that

interview participants talked about as they described generally how they went about approaching the goals they chose to work on. The steps are described below.

Step 1: Choosing the work-related learning goal

Step 2: Determining the initial approach

Step 3: Choosing information resources

Step 4: Creating and sharing knowledge and information

Step 5: Incorporating feedback from others

Step 6: Organizing and storing information

Step 1: Choosing the Work-Related Learning Goal

The first step was that participants had to decide what work-related learning goal they were going to choose to work on from the time of the group information meeting they attended until the day they were to be interviewed. Four participants chose their learning goals based on a work problem they were dealing with at the time of the study. Sample problems included wanting to find a more effective way to manage emails (“my biggest frustration at work,” Interviewee 1) and the need to create a strategy for a business unit (“I had a work problem, a work opportunity that came up,” Interviewee 4). Two participants chose their learning goals from work assignments they had at the time of the study; one assignment was to complete a journal article assignment and the other was to develop a dashboard for surgical services. Three participants chose goals that could support organizational priorities (“I felt I could be more supportive if I had more knowledge, so it’s an organizational priority,” Interviewee 7; “I was looking for telemedicine models, as it is a goal here at XX to develop some type of virtual care,” Interviewee 11). One participant’s goal was chosen as a result of a team member making a request for information on new surgical technology. One participant reported thinking in terms of

projects rather than learning goals, so they chose a project they were working on. Three participants talked about the constraint of time; they made their choices based on a goal they thought they could complete within the two week time frame of the interview process.

Step 2: Determining the Initial Approach

The majority of participants elected to start on their learning goals by searching the internet using Google. Those who started that way described following leads from their searches to: videos (“there were some videos that were on the internet, so I did look at those as well,” Interviewee 9); to websites; to Wikipedia (“and like used Wikipedia to see if I could find out the history of nursing assistants,” Interviewee 5); and one person followed a lead to a blog (“and then from there, there were links to blogs,” Interviewee 4).

Two participants did not use the internet or Web 2.0 technologies to work on their learning goals. Interviewee 3 described the following: “so I kind of sketch out on scribbly paper what I think that’ll look like and then start making the contacts for those elements that I need in that dashboard” and then “I get all those pieces from people, or in this case because of the short time frame, I just used the items that I already had from other projects that I work on or other databases I already have.” Interviewee 6 started by putting together a plan that included a cost-benefit analysis with information obtained from another department.

Step 3: Choosing Information Resources

Collectively and individually, participants used multiple sources to locate the necessary information to work on their chosen learning goals. Most participants intentionally looked for information using the more traditional sources found on the internet such as electronic print sources, and websites of professional journals, professional associations, and vendors. One

participant accessed information through a learning module through the organization's learning management system (LMS). Two participants found information from other people.

Three participants located information through Web 2.0 resources such as Wikipedia, a webcast, Pinterest, YouTube video, and a slideshow ("so I hit a couple of those sites and watched some webinars or webcasts," Interviewee 7; "occasionally videos," Interviewee 2).

Step 4: Creating and Sharing Knowledge and Information

Three participants described creating products that would later be shared: an Excel document, a form, and a report. The most popular way to share information or knowledge products was through email communication ("we do a lot of sharing by email," Interviewee 3). Interviewee 3 also mentioned that documents are shared via SharePoint within the organization. One participant printed their documents.

It was common for information or knowledge to be shared in person at meetings ("then pulled up some examples of what I found and shared them with the group," Interviewee 5). Interviewee 3 also described a process of discussion of shared data in meetings.

Step 5: Incorporating Feedback from Others

Three participants discussed the importance of making revisions following feedback received from others after their initial results were presented and shared, and then reviewing changes made in an iterative process. Interviewee 6 "submitted that a couple of times" and Interviewee 5 discussed how "in the end we actually had another meeting and I had thought about some other ideas that we looked at."

Step 6: Organizing and Storing Information

Several participants mentioned how they documented or tracked data or documents. They all used electronic documents including Word and Excel.

Interview Question: What did you learn while engaging in this process?

After globally describing how they approached working on their learning goal, participants were asked what they learned while engaging in their process. Following is the essence of each participant's response as it related to what they learned about the process of using internet/Web 2.0 technologies to pursue their learning goals, rather than the specific results of their particular goal or quest.

Interviewee 1 realized how much they use the internet to solve problems for work. They also learned "When I have a problem I should think of a solution instead of just plowing through" because solutions are out there and "If I take time now, it will save me time later."

Interviewee 2 felt that they were not using a lot of "cutting edge technologies," although having an "electronic environment" was necessary to do their work. They developed a reliance on Google and email over the years as a standard practice in their approach to work, and "have not stretched to try new/different apps" because they did not see the need to.

In a similar vein to Interviewee 2, Interviewee 3 "realized through this process that I lead a very boring life (laughs). I need to do more stuff (laughs)." There was a realization that newer technologies were out there but "I know they have webcasts and podcasts and, you know, chat rooms, and all this stuff and I don't use them." The explanation given for not trying the newer technologies was that this interviewee does not like to "ask for directions."

Interviewee 4 reflected that "from the process I learned that a lot of information is scattered, it's in lots of different places, and so you have to make judgments on which information you give credibility to and that's not always easy to do, I mean, sometimes it requires additional work to really dig into topics to find out if what's there is real." There was a concern about a general lack of "quality checks on what's posted, especially on blogs and on

special interest sites.” One complication was that at times conflicting information could be found, requiring a choice as to what to believe and to use.

Interviewee 5 “did not know if I learned a lot new, I think this is a process very similar to what I do for a lot of projects.” On second thought, Interviewee 5 wondered if it would be beneficial to improve organization of results: “I don’t always, like bookmark my pages, I don’t always do that, so lot of times I end up searching for the same things over again instead of saving what I found in the past.” Then Interviewee 5 decided that it really does not take that much time to search for particular information a second time, and that a second search might even reveal things that were missed during the first search process.

Interviewee 6 spoke about what they learned in relation to the specifics of the project they were working on, rather than on what they learned about the process of using internet/Web 2.0 applications/technologies to solve their work-related learning goal. Even with a follow-up prompt, the focus remained on project results.

Interviewee 7 was reminded that “I get overwhelmed by the amount of information---sometimes its reliability of the information, and the sources that can be a bit of a struggle.” This interviewee felt that blogs could be especially problematic because the credentials of the author of the blog might not be known and then the blogger is just offering their opinion and “it’s always just kind of everybody’s got a different opinion.” On the other hand, this interviewee added, all of the differing opinions could come from credible sources and then how is one supposed to know which one is best. “Sometimes it’s just overwhelming, it’s just too much.” Furthermore, this interviewee struggled with how to discern when enough searching for or reading of information has been done; how does one narrow down the search results so that one’s time can most effectively be spent. “Maybe I could’ve streamlined some of my searches if I

would've been a little bit more capable when it comes to search engines.” Interviewee 7 also reflected that the numerous technologies/applications listed on the Employee PLE Worksheet triggered the recognition that, “I don't think I nearly explored everything here that I could have done.” This interviewee expressed having a lack of familiarity with social bookmarking, Twitter, and chats and wondered if these tools would even be applicable to the problem she was working on. This interviewee would not be comfortable trying one of the unfamiliar tools/applications “unless somebody actually sat down and showed me —first of all they have to show me it was worth my time,” or if they attended a class on how to use an application efficiently also seemed like one way to get more comfortable with trying something new.

Interviewee 9 also felt that they used tools that were already familiar, and being exposed through this study to a listing of numerous tools/applications created a realization: “I guess it was just a realization that to find a simple answer to a question, or to find an answer to a simple question, there are multiple ways in which you get that.”

Interviewee 10 felt that working on the specific learning goal that was chosen, “helped me organize my thoughts, or organize my approach” in order to be better prepared for a possible departmental inspection. There was no mention of having learned anything from the process of completing the study task or anything about Internet/Web 2.0 technologies.

Interviewee 11 came away with an appreciation of the helpfulness of networking. “I guess the biggest thing I learned was there needs to be more actual communication with people who have been doing this [same type of learning goal topic]---so I wish that there was a forum that I could connect to people already in these types of roles similar to mine, to discuss how they've developed some of these options.”

Interviewee 12 was affirmed in working on their chosen learning goal that for this as with other work projects, they first go to Google to look for information and then if they cannot locate what they are searching for “then I have to start reaching out further, and that essentially is what happened.”

Interviewees’ PLE illustrations.

During the group information meetings the participants were PLE Employee Worksheets with the following definition of a Personal Learning Environment:

- A new approach to the use of new technologies for learning
- Learners use a combination of technology devices, Internet Web 2.0 applications, and services
- An approach that lets people connect and collaborate through the use of computers to access professional and/or social networks through the internet
- Flexible use of networks of people, content, and services allow learners to be more adaptable and responsive to changing learning needs and goals
- Learners take responsibility for their own learning by developing learning goals and managing the learning process
- Learners become agents of knowledge: consuming, creating, and sharing knowledge

Participants were shown two examples of PLE Illustrations during the meeting (See Appendix C) and given a third one as a handout to keep as a reference (see Appendix C1). At the information meeting, they were given the following instruction:

As you review these examples of PLEs, keep in mind how they are illustrated because I would like you to create an illustration of your own PLE between now and the next time we meet in two weeks. You may illustrate your PLE manually

(by hand) or electronically (by computer). The important thing is that you include all of the internet/Web 2.0 technologies that you use to solve work related problems and that you organize them visually in a way that makes sense to you.

PLE illustrations made by interview participants

Three interview participants chose to illustrate their PLE by hand drawing (See Appendix F to view the participants' PLE Illustrations). As can be seen in the example PLE Illustration given to participants (Appendix C1), at the center is a square containing the words "What I want to do in my PLE." From the box radiates lines that represent specific tasks or action items such as "share multimedia" and further along each line is the application used to execute the task (for example Flickr). It was this researcher's expectation that the interview participants would try to replicate some version of this example, and that they understood that the illustration represented how they approached learning goals, in general, in the workplace.

Different Understandings of the Purpose of Creating the PLE Illustration.

What became immediately apparent was that three of the participants (Interviewees 6, 7, and 11) approximated the example PLE illustration. See Appendix F for PLE illustrations. Interviewee 11 was the only one that followed the example faithfully, however the drawing was sparse in that only three learning activities and three applications were identified. Interviewee 6 and 7 only deviated in that instead of putting themselves or the words "PLE" in the center of their illustration, they put the learning goal they had chosen.

The remaining illustrations had varied interpretations that deviated from the example illustration. The most common deviation were participants who placed their specific learning goal (work-related problem) they worked on for the study at the center, and then illustrated the project management processes and steps they took to work on the problem (rather than

identifying the learning activities they engaged in). These illustrations also did not demonstrate how the participants go about solving work-related problems in general. Several illustrations (Interviewee1, Interviewee 4, and Interviewee 12) showed various activities and tools/applications, but not in a linearly connected fashion, rather they had configurations that were groupings.

On closer examination of the example PLE Illustration that was provided, it is evident how participants could have differing understandings of what they were to illustrate. The instructions were not specific enough in describing the expectation that the participants base their illustrations on what they do generally when solving work-related problems, rather than what they did for this specific study task. Additionally, during the group information meetings the instructions first focused on participants choosing a work-related learning goal for the study, and then they were given instructions about the PLE illustration, thus making it easy for participants to reach the conclusion that the PLE Illustration was supposed to represent the one learning goal they chose for the study.

Feelings about Creating PLE Illustrations

During individual interviews, participants were asked if they found the process of creating their PLE illustration helpful, or not. Three participants did not find the process to be helpful. (“not helpful personally,” Interviewee 2; “It was difficult to make the PLE Illustration,” Interviewee 5; “There was nothing helpful about creating the illustration,” Interviewee 1). Four participants found helpful aspects to creating their illustrations. Interviewee 3 realized that there are a lot more tools that can be used and felt “encouraged to reach out and explore.” For Interviewee 6 “creating the illustration was helpful because it maps out the different steps I might do when I get started on a new project.” Interviewee 9 had fun using a new software

application to create the illustration. Interviewee 10 felt that it was “kind of interesting to do, wish had more time to play with it.”

Table 53 shows a composite list of the tools and applications used for particular purposes as shown on the illustrations. Applications are listed once even though some of them might have been used by more than one interviewee. The following results are not meant to be a count of the applications used, but rather provide a general idea of what was shown in the illustrations.

Table 53

Tools and Applications Represented in PLE Illustrations

<i>Communicating</i>	<i>Finding information</i>	<i>Ordering products</i>	<i>Organizing/Storing Information</i>	<i>Sharing information</i>	<i>Networking with Others</i>
<ul style="list-style-type: none"> • Email • Phone • Lync • Fax • In-person meetings 	<ul style="list-style-type: none"> • Search Engines • Google • Internet Explorer • Yahoo • Hospital system library • research search engine (CINHAL) • YouTube • Professional journal website • SlideShare • Webinars • Blog searchers • NLRB.gov • CMS.gov • Wikipedia • State Bar of MI website • LinkedIn • Lexis.com (legal database) • CDC website • CNN website • Pinterest • Regulatory association website • Enrolled in 	<ul style="list-style-type: none"> • Amazon • Oriental Trading Company 	<ul style="list-style-type: none"> • Excel • Shared drive • Evernote • Google Docs • PDF docs • Word Doc • PowerPoint • Written documents • Favorites bar 	<ul style="list-style-type: none"> • Sketches on paper • Word Doc • SharePoint • email • Creating • Word Doc • Google Doc • PDF 	<ul style="list-style-type: none"> • FaceBook • Discussion board • Experts within the organization • Professional vendor website discussion forum

<i>Communicating</i>	<i>Finding information</i>	<i>Ordering products</i>	<i>Organizing/Storing Information</i>	<i>Sharing information</i>	<i>Networking with Others</i>
	classes through organization's LMS • Webcast on CAP website • AACC listserv				

All PLE Illustrations submitted by the interviewee participants were reviewed and combined into an aggregate PLE illustration. The interviewees' responses to the interview questions that corresponded to the illustrations were also reviewed and added to the aggregate illustration shown below.

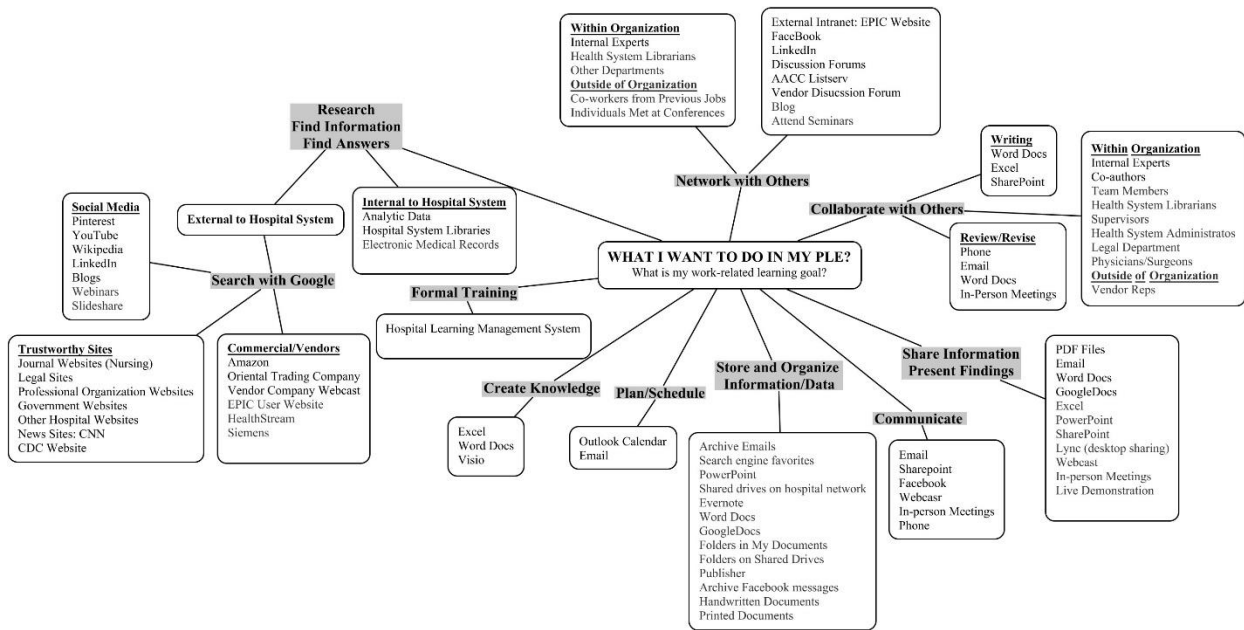


Figure 7. Aggregate PLE Illustration: The Networked Hospital Supervisor/Manager Employee

CHAPTER 5: DISCUSSION

The purpose of this study was to examine adoption of personal learning environments (PLEs) by supervisor/manager-level employees in a hospital health care organization and to explore factors that contribute to the adoption process. The practices and strategies of how these employees used internet/Web 2.0 tools to solve work-related problems were examined, as well as how employees designed the architecture of their PLEs. This chapter discusses significant quantitative and qualitative findings as they relate to the research questions of this exploratory, mixed-methods case study. Limitations of the study, recommendations for further research, implications for practice, and conclusions are addressed.

The research questions were addressed through both the administration of a survey and an interview process, which required interview participants to choose a learning goal related to solving a work-related problem and that they reflect over several weeks on the internet/Web 2.0 tools/applications and strategies they used to work on their goals. This interview process was designed to create conditions for experiential learning as research found that experiential learning could be a positive way to learn when situations were changing or unpredictable (Pietersen, 2002). Continuous change is true for both internet/Web 2.0 technologies and personal learning environments. Participants were given abstract definitions of a personal learning environment and Web 2.0 during group informational meetings. They were then asked to experiment actively with these technologies while developing their personal learning environments. Reflection is an essential component of experiential learning. Participants were asked to reflect on their direct experiences as they happened and to reflect later as they looked back on their experiences while being interviewed. One of the interview questions specifically asked participants to view the choices they made critically and to think about what other choices

they could have made. Thus, the process in which the participants engaged followed Kolb's (1984) model of the four adaptive learning modes (see Figure 3). The experiential learning framework created for this study also established a constructivist learning environment, where the focus was on an identified authentic problem of which the learner took ownership and wanted to be engaged in solving.

Research Question 1: How do Employees Construct their PLEs?

Contextual factors.

The environment in which employees work can influence the decisions and choices made by employees in how they manage work-related problems using internet/Web 2.0 technologies. In this study, two factors played a role. One was the employees' perceptions of organizational support for their use of internet/Web 2.0 technologies. A second factor was the privacy and confidentiality rules specific to the healthcare industry, particularly Health Insurance Portability and Accountability Act (HIPAA) regulations.

These factors intersected in that there was a perception by these supervisor/manager-level employees that the organization had strict policies about internet/Web 2.0 use, in part to protect patient confidentiality and privacy. The participants perceived that violation of the policies could result in negative consequences including job termination. The majority of interview participants supported survey respondents (where 64.2% believed that their employer either prohibited or limited access to Web 2.0 technologies). Interview participants voiced strong suspicions that their use of the internet was monitored by the hospital health system and that restricted access hampered their ability to explore and use the newer Web 2.0 technologies. They believed they could get in trouble for accidentally violating company policies about which they were not very clear, even though the hospital health system flashes a warning message that contains links to

internet usage policies, each time an employee opens the internet on their computer. One interview participant described receiving conflicting messages from the organization. One message (derived from meetings with the marketing department) was that employees were encouraged to establish a social media presence and to interact on the organization's Facebook site. In contrast, the other message (derived from personal experience) was that there could be punitive repercussions if the organization perceived inappropriate use of social media. Few survey participants (13.4%) thought their employer encouraged use of Web 2.0 technologies. Some interviewees thought that use was supported, but employees had to be cautious. These perceptions had inhibiting effects on these supervisor/manager-level employees willingness to use Web 2.0 technologies, including social media.

This finding of an inhibitory effect was in contrast to Boileau's (2011) finding that suggested knowledge workers of a Canadian-based marketing company perceived that no explicit rules were in place regarding the use of interactive technologies in the workplace (even though both formal and informal rules did in fact exist). Workers also perceived that those in authority were supportive of their use of interactive technologies, which Boileau viewed as a positive explicit social influence. Boileau found that behavioral intention (in this case to use interactive technologies) was "strongly affected by implicit and explicit social influence, manifest in the workplace culture and environment" (p. 126).

Downes (2007a) discussed the importance of the environment having openness in communications so learners could be actively engaged in their PLEs, especially in developing social networks and communities. Carmean (2008) encouraged organizations to promote open access to other professionals as one way to lay a supportive foundation for use of PLEs.

Literacy skills as a factor.

Confidence in one's internet/Web 2.0, social media literacy skills (e.g., "critical thinking, reflective thinking" [Kop & Fournier, 2011, p.94] and aggregating and extracting important information and determining what information is authentic [Siemens & Tittenberger, 2009]) are essential for development and use of PLEs. Slightly over 60% of survey participants were confident or very or extremely confident in their ability to use internet/Web 2.0 technologies to find information, leaving almost 40% of participants who were not confident or only somewhat confident. A third of survey participants indicated they were not at all or only somewhat confident that they could critically analyze the information they found, whereas the other two-thirds were confident to extremely confident in their critical analysis ability. Almost three-quarters of survey participants felt confident that they would be able to apply the information they found to a work-related problem. Overall level of confidence was positively significantly correlated with self-reported total use of internet/Web 2.0 technologies. The more supervisor/manager-level employees reported using these technologies, the more confident they were about utilizing them for various purposes. Results indicated a significant negative correlation between the age of respondents and their level of confidence, meaning younger respondents tended to be more confident in their overall skills related to using these technologies.

Interview participants elucidated strategies for analyzing the information they found, such as applying results immediately to see if they worked, comparing and contrasting new information with current practices. In contrast, several voiced how challenging it could be to decide if the information resource was credible, and a number presumed that sites run by professional or government organizations were trustworthy and legitimate, which might not be

accurate. Some participants dismissed social media completely as having any potential for credibility, which could be an error in the opposite direction.

Overall, a majority of study participants had literacy skills necessary to work within a PLE (Chatti, 2011) in that they made connections between existing information and new information they located, they were able to reflect on the value of what they found and use what they found, and stay focused on their learning goal. This positive finding that participants possessed literacy skills seemed congruent with the study sample, as participants were in managerial roles and almost 75% held higher education degrees.

Web 2.0 technologies (including social media).

The real potential of Web 2.0 technologies is their ability to allow users to not only consume information, but to also produce, disseminate, and reuse content (words, images, video, etc.). More participation in these technologies ideally creates an exponential growth in knowledge, which is promoted by openness: access people have to each other and access to content created by others. Learning can occur through collective networking (Brown and Adler, 2008). Approximately 36% of survey respondents reported regularly using social network sites, with almost 40% of survey participants reporting they did not use social network sites at all. Two of 10 reasons given for not using these sites were they felt access was denied or discouraged, and they perceived a need to be cautious regarding privacy. The reticence of employees to use Web 2.0 technologies interferes with the individual and social learning that Hsu, Ching, and Grabowski (2014) believed could be facilitated by these technologies. Self-reported use of social network sites did not correlate significantly with any of the independent variables that could have an influence (e.g., age and educational level), where it was proposed that employees who were younger and/or more educated would have higher satisfaction levels. The lack of significant

correlations could have resulted from the average age of survey participants being in the middle 40s, which in terms of technology is an older group. The participants in this study were highly educated in general, but the older average age of the group might have influenced the results.

Almost half of 111 survey respondents indicated that they communicated with *experts inside of their organization* using internet/Web 2.0 technologies. Of those, 28 survey responders wrote in which tools they used, with email being the most dominant. LinkedIn and Facebook were listed by 13 responders. Almost half of 111 survey responders indicated that they communicated with *experts outside of their organization*, but this time 31 responders listed the following Web 2.0 applications they used, ranked in order from highest to lowest frequency: LinkedIn and Facebook (which rated higher than email), Twitter, and listservs. These results indicated that participants in this study were adopting and utilizing Web 2.0 technologies slowly, and that there was room for growth.

Participants expressed both curiosity and interest in the newer technologies, wanting to understand what functions the new technologies served and how they could be implemented to help them do their jobs better. Several interview participants stated that their curiosity about these technologies motivated them to take part in the interview process. The expressed lack of understanding about how Web 2.0 technologies can be used at work supports Martindale and Dowdy's (2010) contention that it is challenging for learners to efficiently navigate changing online technologies. Another possible reason for lower use of Web 2.0 technologies by the interview participants was that some of the chosen learning goals were not conducive to using them. For example, one learning goal was straightforward in requiring information that could be gained only from inside the hospital health system. The nature of the learning goals influenced types of tools/applications the participants used.

Almost 40% of 110 survey responders were satisfied or very satisfied with the Web 2.0 technologies they used, however 31% were dissatisfied, very dissatisfied, or did not use them at all. When dissatisfied respondents were asked to identify what they thought would increase their satisfaction, 25 wrote the following: they would like the organization to accept and support use of Web 2.0 technologies, they would need to understand the value of these technologies and how to use them, they would need to be given time to use them, and they need to be supported by their peers. A significant relationship was found between the age of survey responders and their level of satisfaction, with younger supervisor/manager-level employees more likely to feel satisfied with internet/Web 2.0 technologies.

The interview participants (whose average age was also in the mid-forties), echoed survey responders when asked what would influence them to try internet/Web 2.0 technologies. They indicated that if their coworkers either used or recommended certain tools/applications, if they were aware of what the technology could provide, if they had access to the technologies, and received training on how to use them, they would be more likely to use these technologies. The positive social influence of coworkers was not supported in Genden's (2015) study that found coworker participation in social media was not an important factor for adoption of social media by the participants in her study, which examined factors in workers' perception and use of social media in informal learning in the workplace.

Tools and technologies used by study participants to construct their PLEs.

The field of research related to PLEs has been divided between viewing PLEs as a collection of tools used by learners to meet their learning needs and viewing PLEs as a distinct way to learn that encompasses learning strategies and activities (Atwell, 2007; Wilson, 2008). Martindale and Dowdy (2010) viewed PLEs as "... a combination of existing devices,

applications, and services as the practice of personal learning using technology” (p. 4). The following four sections focus on the collection of tools and technologies used by study participants.

Finding/storing/retrieving/classifying information. When survey participants were asked what tools/technologies they used to find information, search engines and information resources (e.g., electronic books, online news journals, online professional publications, audio books, podcasts, and digital video) were the most used (approximately 80%), followed by email (nearly 70%). Email was used most often (more than 50%) to store, retrieve, and classify information. Web 2.0 tools and technologies used to find information were ranked much lower than email (30 to 50%), and were in the following order: image and video host sites (e.g., YouTube, Flickr, and Pinterest), Twitter, virtual worlds, podcasts, Wikis, SlideShare, blogs, listserv, and online video. For storing, retrieving and classifying information, the participants were most likely to use SlideShare (almost 25%). The relatively high percentage (38.1%) indicated for use of virtual worlds for finding information was a surprise, and is difficult to explain, as virtual worlds ranked less than 15% of internet/Web 2.0 learning activities and in a separate question were ranked 12.5% for usefulness in meeting a work-related learning goal.

Interview participants reported using a variety of Internet/Web 2.0 applications to find information, but email and search engines (predominantly Google) were used most often. Additionally, interviewees reported using Microsoft’s SharePoint, and information resources such as journal articles. Web 2.0 technologies (e.g., YouTube, Wikipedia, Pinterest, Amazon, and LinkedIn) were used to a lesser extent. Some participants used resources internal to the hospital health system, such as their intranet data-base, electronic medical record system (EPIC), and their University system. Interview participants favored email for storing and retrieving

information and relied heavily on the use of folders (in email, in search engine “favorites” and in computer and shared drives).

Straka, Kleinann and Stokl (1994) found that employees in their study chose types of resources for learning according to individual preferences because their company did not have training available or it was of poor quality. For this study, survey respondents had 11 reasons of using internet/Web 2.0 technologies from which to choose. They gave almost equal weight to all of the options. The choice of “need to find information when company training was either unavailable or did not meet learning needs” ranked fourth, behind other reasons related to quick and easy access to information sources and liking the option to personalize their learning.

Building networks, collaborating, sharing knowledge. For survey participants, email was used more often than other tools and technologies to build networks and collaborate, to create knowledge, and especially to share knowledge (70%). Twitter, image and video host, and Wikis were tied for sharing information. Other Web 2.0 tools were also used, but at rates less than 24.0%.

Like survey participants, interviewees predominantly used email to network, collaborate, and share knowledge, followed by in-person phone calls or meetings. This use of email may indicate that interviewees did little networking with others outside of the hospital health system, in contrast to 48.6% of survey responders who indicated they communicated with experts outside of their organization (primarily through LinkedIn, Facebook, and email). This finding lends validation for Attwell’s (2007) view that PLEs offer much potential knowledge creation and sharing within organizations. When interviewees communicated with others outside of the system, it was typically with someone associated with a professional group, a vendor, or a government agency. Some communication occurred with former coworkers at other jobs. As

compared to participants in Genden's (2015) study, where results indicated that study participants "connect and communicate with people they know and those they do not know [via social media], building relationships globally" (p. 143), there was no indication that participants in this study were making global connections through any type of internet/Web 2.0 technology. This discrepancy could be a result of a difference in type of companies at which the participants worked. The participants in Genden's study worked for a Fortune 500 manufacturing company, while participants in this study worked for a hospital health system. Tools and technologies identified by interview participants for sharing information internally tended to be Microsoft applications used within the organization (Lync, Sharepoint, Excel, and PowerPoint). Interview participants, however, struggled with social media skills, feeling both uninformed about the tools/applications that were available and knowing how to use them even if they were aware of them.

Creating knowledge. A main argument supporting the need for personal learning environments in the workplace was that today's economy increasingly is based on the exchange of knowledge, and "knowledge workers" need access to the right tools and resources, so they can be agile and adaptive in fulfilling their job roles. Being a knowledge worker requires skills needed to access information along with the ability to analyze and detect patterns in information that then becomes knowledge. Defining knowledge and examining how knowledge is acquired has been a longstanding interest of researchers in psychology and education. A full treatment of this topic is too large an area of research to be addressed in this study. As constructivism and connectivism have been addressed as important educational theories for this study, the conceptualization of knowledge from those two perspectives is presented. For constructivists, knowledge is built (or constructed), situated within individuals, and results from additions to

prior learning, which occurs within certain social contexts and often is negotiated socially (Jonassen & Land, 2012). For connectivists, knowledge results from connections between networks of people and systems (Downes, 2012; Siemens, 2006b), and creation of content is emphasized (Downes, 2007a, 2007b). Due to the centrality of knowledge in the business world, PLEs need to include the necessary tools and technologies to enable employees to create and share knowledge effectively and efficiently. Because this study was concerned with a broad range of components of PLEs, the exploration of how the employees in this study approached creating and sharing knowledge was brief and incomplete, yet it was a beginning. The survey limited participants to choosing only from internet/Web 2.0 technologies that they used to create knowledge and “creating knowledge” was not defined for participants. The responses were interesting in that the tools/applications chosen did not seem to fit with the task of creating knowledge. The top six tools/applications listed were in the following order: email (41.6%), information resources (30.1%), search engines (25.7%), SlideShare (24.8%), online course (23%), and Twitter (20.4%). The concept of creating knowledge was too open to interpretation leading to a wide range of responses. The difference between information and knowledge was not defined in the survey, which also left room for interpretation. Interview participants were not limited in the same way as survey participants were, when they were asked the question if they thought they had created knowledge and if so, what methods they used. Not one participant asked what was meant by “knowledge,” yet several thought they did not create knowledge. Creating knowledge was interpreted by some interviewees as making tangible products, such as reports, a cost-benefit analysis, or the development of a new staff role. One participant felt the organization did not support software applications that would make content creation easier (e.g., video and image editing tools) and sharing of multimedia easier, especially educational videos.

Several participants thought that comparing and contrasting new information with old information or sharing information equated to creating knowledge.

Knowledge, as viewed by interview participants, seemed more aligned with the constructivist view, than with the connectivist view. A minimal amount of networking occurred overall, and it seemed to occur more often within the bounded system of the hospital. Interview participants indicated that they brought what they were discovering to others (in person via meetings and conferences) to discuss the relevance of their findings. This type of networking could support both the constructivist idea of social negotiation of knowledge and the connectivist view of knowledge residing within connections to others.

Reasons for choosing certain tools/technologies over others. This group of study participants appeared to rely more heavily on internet tools than Web 2.0 technologies to find and store/retrieve/classify information. When deciding which resource to use, survey participants gave equal weight to the following characteristics of internet/Web 2.0 technologies and resources: accessibility of the resource, time required to learn, amount of effort needed, and value of the resource, with the cost of the resource being slightly less of an influence. When interview participants were asked what influenced them to use certain tools/technologies over others, they talked about convenience, purpose, accessibility, and familiarity. For example if they needed to access a specific resource, such as a journal or a professional organization, then they would use the internet, or if they needed to find an inspirational idea, they could use social media. Participants were more likely to choose a tool or an application if they had successfully used it previously or if others had used it successfully. Interview participants were less likely to choose certain tools/technologies if they lacked familiarity with applications or if they thought it would take too long to learn to use them. These results supported the finding of Boileau (2011)

that the time and effort required to learn a new technology had to be balanced by benefits participants expected to gain. Unlike participants in Boileau's study, participants in the present study did not express a sense of responsibility to keep current with emerging technologies. However, participants in both studies demonstrated a propensity to turn to tools and technologies they already knew, especially as it related to use of social media.

Belief in the trustworthiness of information that can be found on various internet/Web 2.0 technologies also influenced which tools/applications were used. Survey responders rated the more traditional technologies of online courses and Webcasts/Podcasts/videocasts/Livecasts as the most credible. Among the Web 2.0 technologies, survey responders rated MOOCS as the most credible, followed by discussion forums/listservs, Wikis, and blogs. The higher rating for MOOCS was unexpected, because survey responders showed a very low rate of using MOOCS to find information (11.5%) and even lower rates for storing and retrieving information, networking, and creating and sharing knowledge (less than 5% for each). Virtual Worlds were given the lowest credibility. These findings indicated that study participants are not as trusting of information found through Web 2.0 technologies and they are less likely to use those tools/applications (in this study only 24.5% indicated using Wikis and 17.2 % indicated using blogs). Perceived credibility of internet/Web 2.0 technologies was not significantly correlated to any of the demographic variables of the responders.

Research Question 2: What Triggers an Employee to Construct a PLE?

Survey participants were given a list of 11 reasons from which to indicate what would prompt them to use internet/Web 2.0 technologies to meet job-related learning goals. Although all the reasons were chosen uniformly, reasons that had a slight edge over the others included: being able to quickly and conveniently access needed information, and the desire to have

personal control and direction in how they approached their learning. Interview participants viewed the internet as a good source of information and similar to the survey responders, liked the ability to search for a variety of information quickly.

Research on situated learning has noted that when learning is situated in real-life (as in the case of this study where participants were solving job-related problems), learners relied on strategies they had developed within particular contexts, which evolved over time (Choi & Hannafin, 1995). PLEs, as defined for this study, were concerned primarily with the use of internet/Web 2.0 technologies and did not focus on traditional resources. Interview participants tended to decide to use their PLEs based on the types of tasks they were doing. They turned to internet/Web 2.0 technologies when they needed to find materials quickly, when they needed new or technical information; when they were searching for images/videos; or when they needed to survey others. Some interview participants routinely used internet/Web 2.0 technologies and could not think of reasons not to use these resources. Conversely, interviewees were less inclined to turn to internet/Web 2.0 technologies when their problems involved people issues; when it was quicker and easier to ask someone; if the information they needed was already in-house; or when they needed to access information that was internal to the hospital system.

Research Question 3: How do Employees use their PLEs?

Choosing and evaluating achievement of learning goals.

Survey participants were asked to identify one or more job-related learning goals that they had experienced in the past six months or that they anticipated in the next six months. Thirty-four out of 71 responders listed individual goals (such as learning job specific skills, software skills, leadership skills). Eighteen responders listed goals related to participating in some type of formal education (e.g., courses, conferences). Seven responders had goals that were

concerned with development of programs/processes for the organization. These results lend support to Clardy's (2000) finding that employees tend to engage in self-directed learning when they need to address an imbalance between job requirements and skills.

For the interview process, interviewees were asked to think about and plan for a learning goal on which they could work within two weeks, so the specific learning goals chosen by the interviewees were constrained by time. Interview participants were also asked how they generally (not just for this study) diagnosed their learning needs and then how they turned those needs into learning goals. The participants' responses were aligned with Spear and Mocker's (1984) self-directed learning concept of "the organizing circumstance," which proposed that learners select projects (for this study learning goals) based on chance occurrences in the environment rather than preplanning their learning projects. In general, learning needs for this study's interviewees' were often stimulated when an interviewee came across something they did not know or when they needed more information. These needs typically happened when someone asked them a question to which they did not know the answer, or someone mentioned a topic of which they were not aware (i.e., when an outside vendor or consultant mentioned a new product or idea). This finding also supported the constructivist belief that "Meaning making is prompted by a problem, question, confusion, disagreement, or dissonance (a need or a desire to know) and so involves personal ownership of that problem" (Candy, 1991, p. 252). Most interview participants acted in accordance with this constructivist belief, because they had a practical conceptualization of learning goals, which typically was oriented to finding information they were searching for, unlike the concept of learning goals as used in formal educational contexts (where goals are established in advance, broken down into objectives, and then measured). Other interviewees planned and tried to align their learning needs with the needs of

the organization (i.e., if there was a need to learn what evidenced-based practices were being used for a certain departmental requirement). These findings support the results of a study (Kops, 1993) where “the job-related, self-planned learning efforts” of managers covered a wide range of topics and fit within the plans of their organization. This study’s findings also give some support to Clardy’s (2000) work in self-directed learning, which found that adults tended to “solve job-related or vocational issues such as changes in job duties, work processes, and licensing and certification requirements” (p. 106). Several interview participants chose to work on goals related to licensing and certification requirements for their services or their department.

Interview participants struggled with answering how they then turned their learning needs into learning goals. Most participants did not think in terms of “learning goals,” but thought practically in terms of solving a problem or getting answers.

The use of a desktop or laptop computers to accomplish job-related learning goals was ubiquitous. This survey sample also worked on the move, with 70.8% reporting they used smartphones and 59.3% reported using Tablets/EBooks. Although this group was mobile, they also were traditional in how they kept records. More than 90% of 103 survey respondents recorded accomplishment of their learning goals on electronic documents and more than 50% used written documentation. A third of the respondents used photos and almost a third relied on the organization’s learning management system.

Survey participants were asked how they judged the quality of their learning. The primary methods were internally oriented, based on having a sense of accomplishment and on their own evaluation of having achieved the end result. Secondary methods were externally oriented and based on opinions of others, such as co-workers, supervisors, outside experts or on a set of predetermined standards. These results were closely aligned with what interview

participants said when they were asked how they judged the quality (or degree of excellence) of their learning. They indicated that the quality of their learning was based on achieving successful outcomes and if others to whom the information was presented thought it was useful/helpful.

The survey participants were asked to indicate criteria they used to determine if they had met the learning goal. Forty-nine (57.0%) participants indicated they used criteria they developed to decide if they had achieved their learning goal. Twenty-one (24.4%) participants used criteria that were defined by peers or others to decide if they had achieved their learning goals.

Evaluating the quality and relevance of information found through websites, wikis, blogs, and discussion forums.

As discussed earlier, users navigate PLEs successfully when they were able to evaluate the information resources and knowledge they locate as they traverse the internet critically. Survey participants were asked how they evaluate the quality of a website. Participants were given 10 options from which to choose and were asked to rate each item on a 5-point Likert scale. All options were fairly uniformly weighted as to being true among responders, with “checking to see how up-to-date the information is,” “taking note of how in-depth the information is”, “ascertaining the objectivity of the information,” and “considering the presentation of the information” all having a slight lead, and with “examining both overt and covert affiliations,” “purposefully finding and using peer and editorially reviewed resources,” “verifying information,” and “checking to see if there any reviews of the site” having slightly lower responses. The uniformity among response options could have been related to respondents trying to present what they perceived were “acceptable” answers as all of the options represented good practice.

Survey participants were further asked if they used Wiki, blog, or discussion board sites to solve work-related problems or for professional development, and if yes, how did they

evaluate the quality of those sites. Of 94 responders, 24.5% indicated that they used Wikis. Eight options for evaluating the quality of Wikis were presented using the same 5-point Likert scale for the questions. The leading options weighted by responders as being true of them were “determining if the coverage is neutral” and “seeing whether various aspects of the topic are well balanced.” The two options least likely for being true were “checking to see how many revisions were made to the pages” and “checking out the expertise of the person(s) who reviewed the Wiki pages.” Blogs were used by 17.2% of the 93 responders. Four options were presented with the same 5-point Likert scale used to rate the items. Three of the four were given the same high weights of being true for the responders. Only the fourth option, “checking to see if the post is cited on other blogs” was rated lower. Twenty-four (25.8%) of the participants reported they used discussion boards. Using the 5-point Likert scale to determine the quality of information presented on the discussion boards, most of the participants who used them reported that they evaluated the quality of the interactions, content, and relevance of the posts. Considering the overall inflation of the survey participants’ responses on the survey questions related to evaluating quality of websites, Wikis, blogs, and discussion boards, it is possible that a social desirability bias exists, because respondents wanted to portray themselves as being cautious and thorough in how they evaluated these types of sites.

Interview participants were asked how they determined the relevancy (value plus accuracy) of information they found as they worked on their learning goals. In terms of value, participants strongly felt that the information had to relate directly to the goal of solving the problem on which they were working. Interestingly, several participants turned to team/project members for feedback before they felt comfortable determining the value of what they located.

Some relied on their own experience to evaluate the quality of what they found. For accuracy, the nature of the information found was important, along with the authority of the source.

The pedagogy of PLEs.

Learning through social negotiation is an important concept in both social constructivism and connectivism. Social negotiation was evident among interview participants who talked about taking the information they located and discussing it with peers, their own managers, upper administration, physicians, and teams before proceeding further with their learning goals. This type of negotiation was not evident between study participants and others outside of the hospital healthcare system. Downes (2007a, 2007b, 2009) viewed collaboration between learners and connectedness---where learners develop and maintain social networks and communication--- as key components of PLEs. Downes (2012) and Siemens (2006b) asserted that learning resides in connections formed with people and that knowledge is distributed among these people. Having “numerous and diverse” learners interacting in open systems is essential for connectivism to operate. As detailed above, half of the connections formed (with experts in the field) by survey participants were within the hospital health system and interview participants rarely ventured outside of their bounded system.

Learning activities.

Survey participants were asked to indicate what types of learning activities in which they engaged. They were given a list of 23 activities and instructed to choose all that applied. The top six activities that were over 50% each were, in descending order: accessing email, accessing the internet, reading information found on the internet or on social media sites, seeking consultation, participating in webinars, and in online courses offered by the company. The six learning activities least likely in which to be engaged (each was lower than 11%) were, in descending

order: creating and uploading media, writing blogs or internet articles, mentoring others outside of the company using the internet, providing or presenting webinars, actively contributing to discussion forums, and participating in a MOOC.

Researchers (Blaschke, 2012; Hase & Kenyon, 2007) viewed heutagogical practices and approaches as being linked to emerging Web 2.0 technologies, including social media. Interviewees demonstrated that they could engage in heutagogy, in that they acted as their own agents of learning and were self-directed in planning their learning, however, interviewees (like survey participants) did not lean toward Web 2.0 based activities leading to the deduction that overall, study participants were not capitalizing on the potential of Web 2.0 technologies for learning activities. Stipp's (1997) dissertation study on self-directed learning found that business leaders in the study most often read reference books, manuals, handouts, trade magazines, and talked to other people as learning resources. Twenty years later, this study sample is strikingly similar to Stipp's participants, only these participants tended to use electronic sources for the same activities of consuming information and electronic means for consulting with others. They were not, as a group, producers of information or socially engaged in creating knowledge.

Model of the Activation and Components of a PLE

Figure 8 is a visual representation of a model that describes the components of a PLE of the supervisor/manager-level employees in this study, and what activates the PLE. The model is based on the findings of this study.

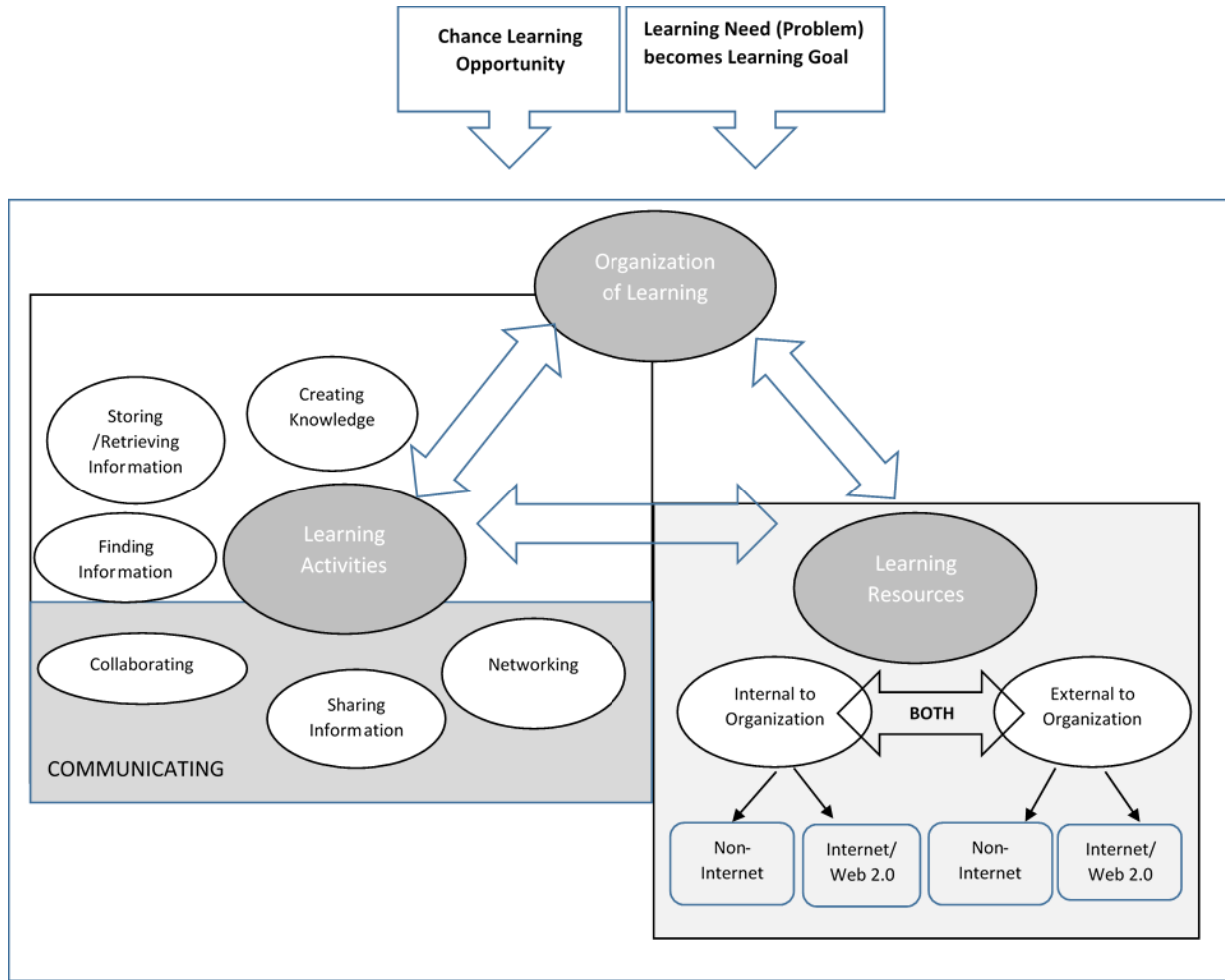


Figure 8: Model of the Activation and Components of a PLE

In the model for this study, the PLE system becomes activated when a hospital supervisor/manager-level employee happens upon a chance learning opportunity (e.g., an ad for a course in the hospital LMS system, a link in a newsletter to a webinar, or a vendor's invitation to their website) or when an employee has a learning need generally experienced as a problem (e.g., when the employee cannot answer a question, when the employee does not know something to do their job, or an organizational need develops). The learning need becomes a goal, which is generally to solve the problem. Once the system is activated, there is a circular cycle of moving between organizing a learning approach (i.e., learning strategy or project planning), engaging in learning activities, and finding learning resources.

Learning activities consist of finding and applying information, storing and retrieving information, creating knowledge, sharing knowledge, networking, and collaborating. The last three activities involve communication among people who are internal or external to the organization, and can occur in person, over the phone, or through the use of internet/Web 2.0 technologies, including social media. Learning resources can be internal to the organization and more traditional (e.g., the hospital system's: LMS, library system, printed journal articles, or data bases) or external to the organization (e.g., professional organizations/associations websites, government agency websites, vendor websites, websites located through internet searching, and information located through Web 2.0 applications, such as Wikis, Pinterest, Twitter, etc.).

The learning goal influenced the types of tools/technologies chosen and whether people internal or external to the organization were contacted. The organizational approach to learning adapts as learning activities are tried and learning resources are found. Learning activities are also influenced by the learning goal chosen and change based on results. The PLE system is in constant flux and the architecture can appear different with each use.

Implications for Practice

Organization of learning.

For researchers of instructional design. The questions for this study inquired about tools/technologies, and learning activities and strategies being used to build PLEs. The focus was not on how participants organized their learning. Hints about organization did surface during the interview participants' descriptions of their PLE Illustrations. Four participants illustrated and talked about project planning strategies or learning processes they used to organize their overall approach to working on their learning goal or problem. Although not a focal point for this study, it would be interesting to pursue (in future studies) how users of PLEs organize and approach

learning, which may turn out to be a significant aspect of PLE development and use that has not yet been discussed in research literature, to this researcher's awareness.

For HR Training Departments. When training employees on various project management approaches, consider incorporating methods and strategies for managing use of internet/Web 2.0 technologies as well. Specifically, attention on how to use these technologies to develop proficiency in locating, using, and managing learning resources (both human and objects) will be beneficial.

Social learning technologies.

For researchers of instructional design. The tools and technologies listed in the survey and listed for interview participants were based on tools/applications that were open and generally available to anyone using the internet. For this study, interview participants frequently mentioned tools/applications that were internal to, adopted by, or proprietary to the hospital health system. Some even felt that pressure existed within the system to use certain of those tools. Future studies could benefit from inquiring into applications and technologies used within organizations or subscribed by the organization, especially now that learning management system (LMS) companies are starting to incorporate social applications within their LMSs, such as discussion forums, chats, and listservs. Additionally, third party companies are creating web portals that contain Web 2.0 functionalities such as forums, instant chat, webinars, etc. Because these portals require organizational or individual membership to access them, they are higher in security. An example in healthcare is EPIC, a major provider of an electronic paperwork system for hospitals with a membership of almost 50% of hospitals in the U.S., that provides means for members to access each other through their website, where questions can be asked and answered, and information can be shared.

For organizational administrators. Encouraging hospital health system employees to increase communication with others (both internally and externally) by capitalizing on the potential of Web 2.0 technologies could benefit employees individually by enhancing their PLEs, and could benefit the organization by moving it closer to being a “learning organization.” Encouragement could come in the form of creating an environment that feels safe for their employees to explore Web 2.0 technologies by revising rules/policies that are simpler and allow for more openness, and then ensuring that employees are informed about the rules/policies. The organization should provide training on the types of Web 2.0 technologies that are available, the ways in which these technologies could be applied to employee’s work, and how employees could safely use the technologies.

When making decisions about workforce education at the organizational level in a hospital healthcare system, consider systems that include technologies for communicating, networking, knowledge creation, and sharing in informal ways, for example an LMS that includes social applications. In this way, the organization can maintain vigilance regarding privacy issues and monitor/regulate communications within organizational boundaries, while allowing employees opportunities to engage in some degree of connective learning.

Application.

For researchers of instructional design. Thirty-one survey participants (35.6%) reported that they used or applied the information they found 70-100% of the time, while using internet/Web 2.0 technologies to solve work-related problems or for professional development, while just over 40% reported that they used or applied the information found less than 40% of the time. Survey participants were asked a follow-up question of what factors they thought interfered with their ability to use or apply the information/knowledge they discovered. Twenty-

five participants responded, six respondents wrote in that the information they found was not relevant and seven participants thought that company policies and outdated or slow equipment and internet connections interfered. Interview participants were asked how they analyzed whether the internet/Web 2.0 tools they were using were effective and they struggled to answer the question. Some just “had a feeling” while others were not really sure. Most based their assessments on whether they achieved the end result of their goal. These findings showed an inefficient rate of use/application of information found and it would be of interest to delineate possible barriers to efficiency in future research. Once barriers are identified, then organizations could have direction on how to provide coaching to employees about how to utilize their PLEs with maximum efficiency and productivity.

For instructional designers. Using the end result as a criterion could contribute toward inefficiency, because a participant might not know they were off course until they were approaching the end. Having guidelines to use for continuous evaluation of effectiveness of the technologies chosen would allow users to make corrections in their learning strategies or choice of tools much earlier. In a coaching or supportive role, when assisting employees to develop and utilize PLEs, it would be helpful to use scaffolding to build necessary competencies for effective use of PLEs (e.g., critical thinking, reflection on learning progress, self-evaluation, error detection and correction, and development of measures of success).

For organizational administrators. To capture the valuable knowledge that can be created and shared through individual and collective employee PLEs, it would benefit the organization to institute a knowledge management system. Such a system could be part of, or separate from, a learning management system.

Limitations of the Study

One limitation of this study is the use of managers and supervisors working for one company that was a hospital health system with unique qualities and attributes, making it challenging to generalize beyond that context. Employees who work in different contexts (e.g., information technology, marketing, advertising, and business and industry) most likely would use internet/Web 2.0 technologies differently.

The study also restricted the sample to supervisor/manager-level employees. The population for the study was approximately 1,000 managers/supervisors who met the criteria for inclusion in the study. A greater number of participants (from a less restricted sample) could have improved reliability. The participants' average age was 45 years. Having a younger group could have provided different results because younger participants who have grown up with the internet as ubiquitous might be more active in using Web 2.0 technologies.

In terms of the survey construction, the length of the survey could have been problematic. A shorter survey may have resulted in additional completions (only 113 completed surveys out of 1,005 mailed invitations to participate in the survey).

Another limitation of the study was allowing interview participants to select their own learning goals. Because participants chose their learning goal based on their interests and work responsibilities, the variation of goals added complexity and made it challenging to make comparisons and draw conclusions.

Recommendations for Further Study

As mentioned in the previous section on limitations of the study, studying different types of organizations and sectors, such as technology, manufacturing, education, and business or

industry, would be useful. The use of a heterogeneous sample of organizations could compare and contrast the use of internet/Web 2.0 technologies in diverse organizations.

A larger sample size could also correct for the age limitation mentioned above. Being able to compare employees by age could provide information on training needs specific to age groups. For example, younger employees could be expected to be more active users of technology, thereby requiring less training on the technologies, whereas older employees may have an advantage in developing PLEs to meet organizational needs because of their experience, thereby requiring less training on the planning and organization of learning.

The study sample was homogenous by race and gender as well (predominantly Caucasian women). The type of organization (large health care system) has more female managers/supervisors among nurses. Replicating the study with a more diverse sample could provide additional information on whether there are significant demographic differences in how employees use internet/Web 2.0 technologies.

Additional research is needed to study the process employees would use to achieve the same work-related learning goal. Each participant could be assigned the same learning goal (rather than allowing them to choose their own) and their processes could be examined to identify similar or different ways participants approached meeting the goal.

Finally, a longitudinal study is needed to determine if the technologies and learning strategies identified for employees' PLEs remain in use, how they changed over time, and what circumstances or development of new technologies precipitate change.

Closing Thoughts

PLEs are a means through which today's employees can stay flexible, current, independently manage their learning needs, and make valuable contributions to a learning

organization. Researchers have identified potential benefits to adoption of PLEs, including increased opportunities for cross-organization learning (Wilson et al., 2007); increased interaction and connection between employees and others (outside the boundaries of formal courses) through adaptable and customizable tools (Mott, 2010); and having a context for creative knowledge sharing between employees (Nonaka, 1994).

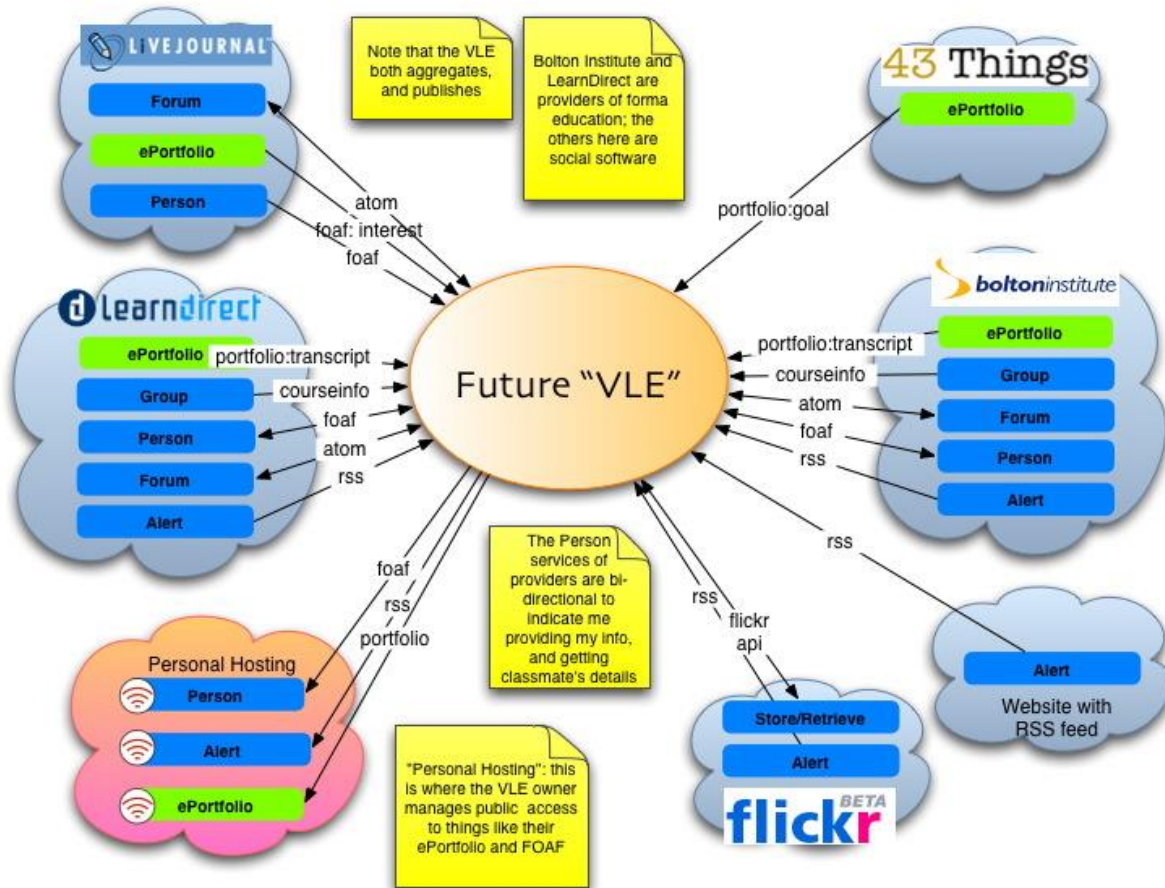
Finding that supervisor/manager-level employees in this study are creating and using personal learning environments was encouraging, even if they did not label them as such for lack of familiarity with the term. Although the focus of this study was on the internet/Web 2.0 PLE component of supervisor/manager-level employees, it was impossible to ignore that a significant component of their PLEs were resources internal to the hospital health system such as other employees, teams, administration, hospital libraries and librarians, and hospital information systems and databases. The nature of these employees' PLEs, as defined for this study, were in early stages of development both in the variety and complexity of the tools/technologies being employed, as well as the learning strategies used. The true potential of using internet/Web 2.0 technologies to expand knowledge through connection with others outside of the organization has not been met yet in the organization studied. The results of this research endeavor created a "snapshot" of the architecture of the PLEs in use by the study sample at the point in time during which the study was conducted (See Figures 7 and 8). What became evident during the analysis of results was that PLEs are not static. The natures of PLEs constantly change, depending on the particular problem or learning goal, as well as when particular technologies drop out of favor or new ones emerge or when learners are exposed to newer learning approaches. Study participants expressed interest in learning about the many technology tools/applications that were available and to find ways they could be employed effectively to meet the demands of their jobs. Hospital

health systems could benefit by creating easy access to learning modules that update employees on newly developing internet/Web 2.0 tools/applications and providing information on how they can be applied in the work environment.

I still don't get what hashtag and Twitter are, and why people use it and what the value in that is... And yet I know that there are large groups of people who do it every day... unless somebody actually sat down and showed me it was worth my time... But I don't know that I would necessarily feel comfortable exploring them on my own. I would go to a class about it (Interviewee 7).

APPENDIX A

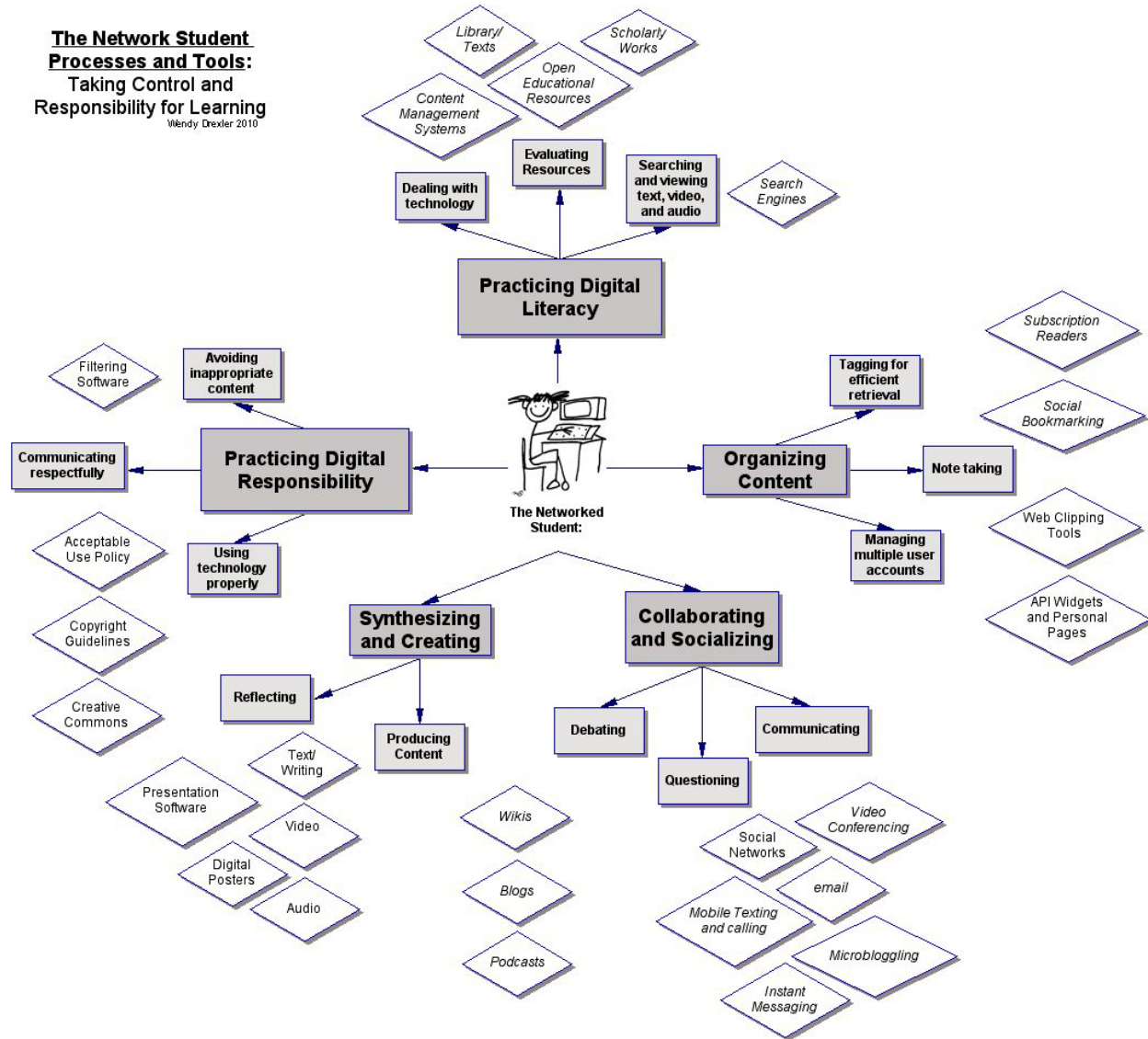
CONCEPTUAL MODEL OF A FUTURE VIRTUAL LEARNING ENVIRONMENT



Wilson's 2005 conceptual model of a future (VLE), now commonly referred to as a PLE. This design "...shifts emphasis away from the isolated experience of the modular VLE (Wilson, et. al., 2006, p. 176)." <http://ftp.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-213/paper28.pdf>

APPENDIX B

NETWORK STUDENT PROCESSES AND TOOLS



The Networked Student Model that can readily be adapted to show what a model PLE for an employee could look like (Drexler, 2010, p.100)

APPENDIX C

CONCEPT MAPS OF PLES

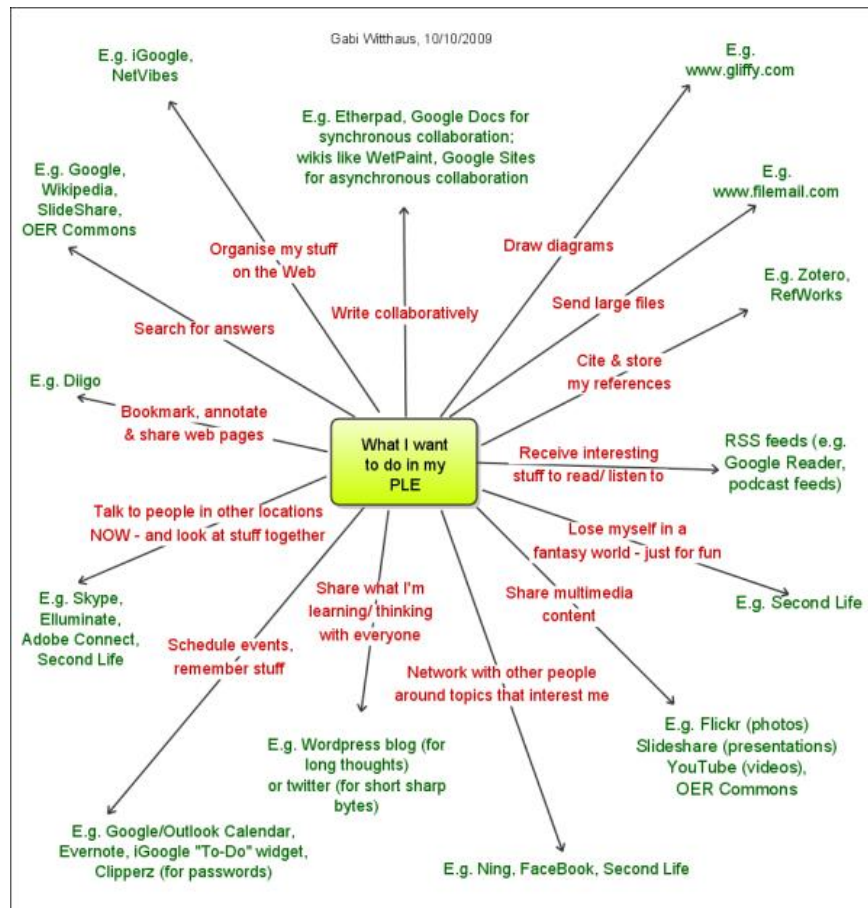


Figure C1 Gabbi Witthaus (2009). A collection of images visualizing Personal Learning Environments/Networks started by Scott Leslie and continued by the community at large since 2008. Accessed on 3/17/2013. http://www.edtechpost.ca/ple_diagrams/index.php/

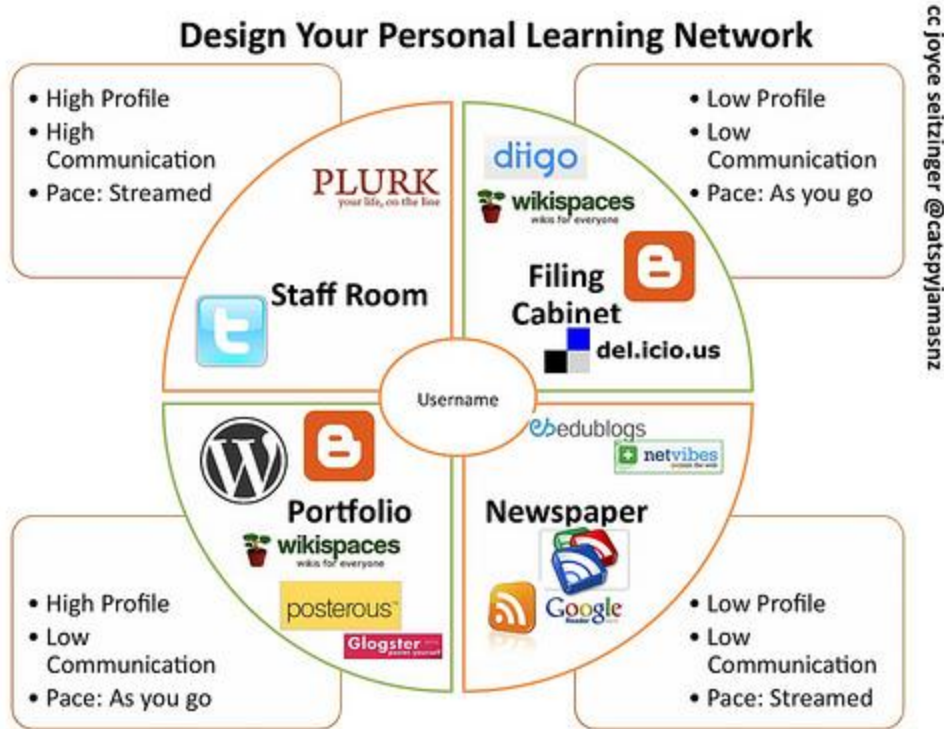


Figure C2 Joyce Seitzinger, “Design Your Personal Learning Network (n.d.). A collection of images visualizing Personal Learning Environments/Networks started by Scott Leslie and continued by the community at large since 2008. Accessed on 3/17/2013. http://www.edtechpost.ca/ple_diagrams/index.php/

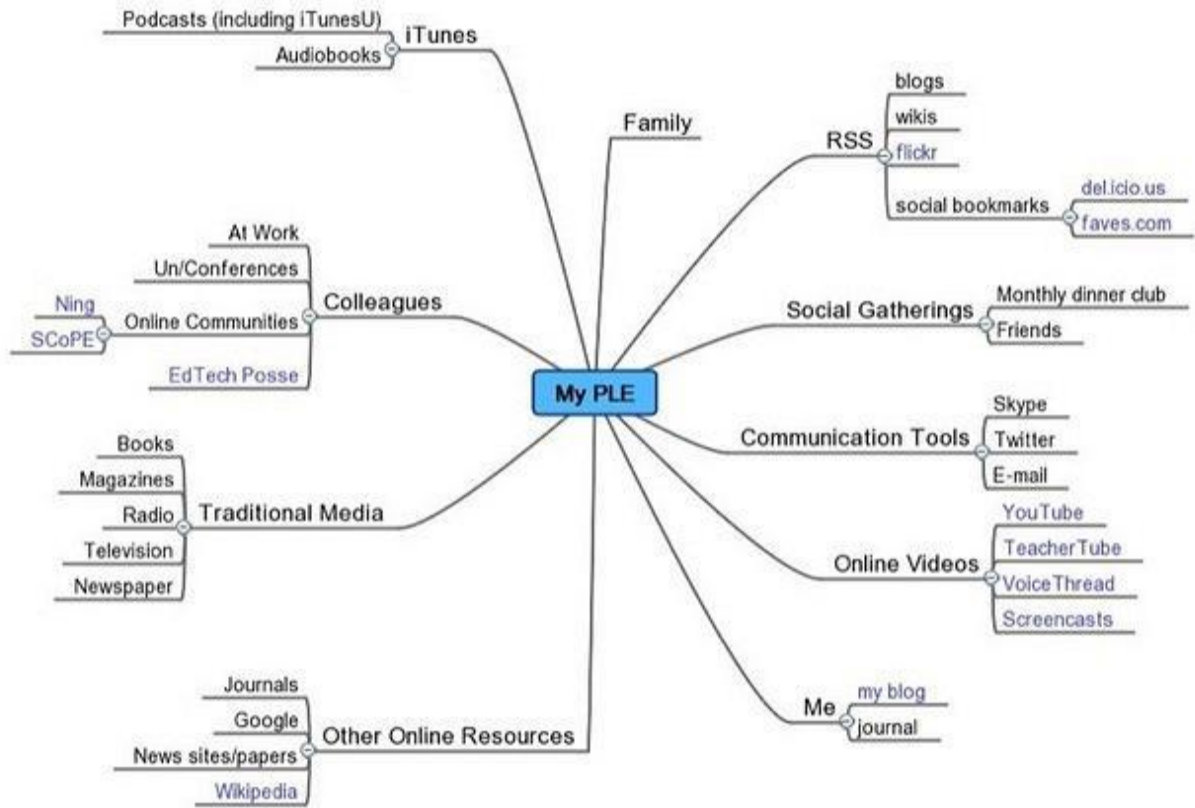


Figure C3 McToonish, "My PLE" (n.d.). A collection of images visualizing Personal Learning Environments/Networks started by Scott Leslie and continued by the community at large since 2008. Accessed on 3/17/2013. http://www.edtechpost.ca/ple_diagrams/index.php/

APPENDIX D
SURVEY MATERIALS

D1 E-Mail Invitation

From: Director, Organizational and Human Resources Development

XX Health System

To: [e-mail address]

Subject: Personal Learning Environment Survey

Dear XX Leader Academy participants and alumni:

You are invited to participate in a research study being conducted by Wayne State University, in partnership with XX, about how employees use internet/Web 2.0 technologies to solve work-related problems and for professional development. This study is being conducted by Principal Investigator (PI) Denise Wunderlich, a doctoral candidate in the Instructional Technology Program at Wayne State University.

Click on the link below, which will direct you to the completely confidential survey. The survey will be open for two weeks, and possibly an additional week. Those who complete the survey can enter a drawing for a \$25 gift card. Four gift cards will be awarded. It should take you 20 - 25 minutes to complete the survey. Your responses are confidential; XX will not know who took the survey.

[Survey link here]

At the end of the survey, you will be invited to further volunteer to participate in an interview process, which will involve attendance at a group informational meeting (30 minutes or less) and one interview (approximately 45 minutes) to take place at XX at convenient times and places.

This interview is optional and your interview responses will also be completely confidential.

The results of this study will be used to understand how to facilitate and support employees' use of internet/Web 2.0 technologies for continuous workplace learning.

If you have any questions about this study now or in the future, you may contact Denise Wunderlich at 313-577-3398 or by email at denise.wunderlich@wayne.edu.

We are hoping for a 100 % response! Your input is valued and greatly appreciated.

Sincerely,

XXX

D2 Follow-up E-Mail Reminder for Survey Completion:

From: Director, Organizational and Human Resources Development

XX Health System

To: [e-mail address]

Subject: Personal Learning Environment Survey

Dear XX Leader Academy participants and alumni:

About one week ago, I sent you an invitation to participate in a brief survey on how employees use internet/Web 2.0 technologies to solve work-related problems and for professional development.

If you have responded, thank you! If not, please consider doing so today. Click on the link below, which will direct you to the completely confidential survey. Those who participate in the survey will be entered into a raffle for a \$25 gift card. Four gift cards will be awarded.

[Survey link here]

With your input, survey results can be used to understand how to facilitate and support employees' use of internet/Web 2.0 technologies for continuous workplace learning. Your participation is anonymous and voluntary. You are free to not answer questions or withdraw at any time. Your decision will not change any present or future relationships with XX or its affiliates.

If you have any questions about this study now or in the future, you may contact Denise Wunderlich at 313-577-3398 or by email at denise.wunderlich@wayne.edu.

Thank you in advance for taking your time to provide needed information. Your input is greatly valued and much appreciated.

Sincerely,

XXX

D3 Personal Learning Environment (PLE) Survey

Q1 Research Consent

Title of Study: Personal Learning Environments for Business Organizations Principal Investigator (PI): Denise Wunderlich, Doctoral Candidate in the Instructional Technology Program at Wayne State University W: 313-577-4597 C: 248-217-2353

Purpose

You are being asked to be in a research study of how working adults use Internet and Web 2.0 technologies to solve work-related problems and for professional development, because you are a working adult with Internet access. This study is being conducted at Wayne State University in partnership with Henry Ford Health System. The estimated number of study participants to be enrolled at Henry Ford Health System is about 150 -200.

Please read the following information and ask any questions you may have (by contacting Denise Wunderlich) before agreeing to be in the study.

Study Procedures

In this research study, we will examine what practices supervisor/manager employees are engaging in when they need to find information to help them with a problem at work or to enhance their knowledge about their profession or job role. If you agree to take part in this research study, you will be asked to complete a survey delivered electronically and to be interviewed. Questions on the survey will be focused on learning how participants use internet and Web 2.0 tools to:

- find resources
- evaluate, store, and organize information
- create and share knowledge
- form connections with others doing the same work
- evaluate completion of work-related learning goals

The question formats will be check lists, multiple choice, and fill-in-the blanks. There will also be questions asking for demographic information. It should take you 20 - 25 minutes to answer the survey questions. At the end of the survey, you will be invited to further participate in an interview process, which will involve attendance at a group informational meeting (30 minutes or less) and two weeks later one interview (approximately 45 minutes) to take place at your organization at convenient times and places. The interview questions will expand on the survey questions. You will be asked to provide your contact information should you be willing to participate. That information will only be used to contact you to schedule a meeting and for your review of the transcripts of the interview. Your name will not be associated with the interview and reported results of each interview will not contain any identifying information.

Those who complete the survey can enter a raffle for a \$25 gift card by completing a second, prize-drawing survey that can be accessed through the original survey. Four gift cards will be awarded. Winners will be notified within two weeks of the drawing.

Benefits

The possible benefits to you for taking part in this research study are becoming more aware of and/or proficient in the use of Internet-based and Web 2.0 tools/applications that can be used to meet on-the-job learning goals to solve work-related problems. You will also be introduced to the idea of creating a personal learning environment, which can help you become a knowledge worker with the necessary skills for today's 21st Century work demands. Additionally, information from this study may benefit other people now or in the future if it helps lay the groundwork for companies (including your own organization) to consider supplying additional support to employees in their desire to create professional, personal learning networks.

Risks

There are no known risks at this time to participation in this study.

Study Costs

Participation in this study will be of no cost to you.

Compensation

You could possibly win one of the four \$25 gift certificates for completing the survey. If you volunteer to participate in the interview process, at the conclusion you will be offered a personalized work environment plan/process to help improve your performance utilizing Internet and Web 2.0 technologies should you feel you would benefit from such.

Confidentiality

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research interview records by a code name or number. Information that identifies you personally will not be released without your written permission. However, the Human Investigation Committee (HIC) at Wayne State University, or federal agencies with appropriate regulatory oversight [e.g., Office for Human Research Protections (OHRP), Office of Civil Rights (OCR), etc.] may review the research records. When the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

For those that participate in the prize-drawing survey, your contact information will not be associated with your survey responses. The contact information will be permanently deleted after the prizes have been awarded.

You will be asked to read this information sheet and accept it before beginning the survey. To maintain your confidentiality, you will be asked to refrain from putting your name or other identifying information on the survey. The survey software program will scrub your response of any identifying information, such as your IP address.

Voluntary Participation/Withdrawal

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you decide to take part in the study you can later change your mind and withdraw from the study. You are free to only answer questions that you want to answer. You are free to withdraw from participation in this study at any time. Your decisions will not change any present or future relationship with Henry Ford Health System or Wayne State University, or other services you are entitled to receive.

The principal investigator (PI) may stop your participation in this study without your consent. The PI will make the decision and let you know if it is not possible for you to continue. The decision that is made is to protect your health and safety, or because you did not follow the instructions to take part in the study.

Questions

If you have any questions about this study now or in the future, you may contact Denise Wunderlich at the following phone number 313-577-4597. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Consent to Participate in a Research Study

To take part in this study, you must click on the button indicating that you have read the information sheet and are voluntarily agreeing to take the survey. If you choose to take part in this study you may withdraw at any time. You are not giving up any of your legal rights by starting the survey.

Q2 Please click the button that represents your willingness to take the survey.

- By clicking this button, I am indicating that I have read the above Research Consent information and I am willing to take this survey.
- By clicking this button, I am indicating that I do not want to take this survey.

Q3 Social network sites = web-based services that allow you to (1) construct a public or semi-public profile, (2) develop a list of other users with whom you share a connection, and (3) view and navigate your list of connections and those made by others within the system. Examples: LinkedIn, Facebook, Twitter, and Ning.

Which statement most closely describes you in relation to using social network sites for solving work-related problems or for professional development?

- I do not use them
- I am curious about social network sites, but have not used them yet
- I am using social network sites and consider myself a beginner
- I use social network sites regularly
- I consider myself an expert at using social network sites to effectively achieve results

Q4 If you are not using social networking sites for solving work-related problems, please provide a brief description as to why:

Q5 Web 2.0 technologies = technologies that provide the means for interacting, networking, and collaborating with others to exchange ideas, build knowledge, and get feedback. Common applications are: blogs, wikis, multimedia sharing (e.g., YouTube), and social network sites (e.g., FaceBook, Twitter).

Please select the item that most correctly describes your employer's policies regarding use of Web 2.0 technologies at work:

- My employer prohibits access to Web 2.0 technologies
- My employer allows limited access to Web 2.0 technologies
- My employer encourages the use of Web 2.0 technologies
- My position requires the use of Web 2.0 technologies
- I don't know what my employer's policies are about Web 2.0 technologies

Q6 Professional development = acquiring information/knowledge to enhance professional skills that contribute to career building, including: communication, leadership, personal, and professional skills. Please describe one or more job-related or professional development learning goal(s) that you have had in the past six months, or that you anticipate will come up in the next six months. (Please be specific in describing goals):

Q7 Please reflect on the past three months when you have used Internet technologies/applications to solve work-related problems and/or for professional development.

Click in the square(s) indicating which technologies you have used for a particular purpose. You can click in more than one square in the same row.

	Click if you have used to find information (read, view, or listen)	Click if you have used to store, retrieve, classify information	Click if you have used to build networks to collaborate with others	Click if you have used to create knowledge/information	Click if you have used to share knowledge/information with others
Information resources (e.g., web pages, electronic books, online news journals, online professional publications, audio books, podcasts, digital video)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Search engines or search engine aggregators (e.g., Google, Yahoo, Bing, Ask, Dogpile, Metacrawler, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet phone calls (VOIP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skype	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instant messaging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online Courses (where content is predetermined and delivered electronically)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: Please describe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q8 Please reflect on the past three months when you have used Web 2.0 technologies/applications to solve work-related problems and/or for professional development.

Click in the square(s) indicating which technologies you have used for a particular purpose. You can click in more than one square in the same row.

	Click if you have used to find information (read, view, or listen)	Click if you have used to store, retrieve, classify information	Click if you have used to build networks to collaborate with others	Click if you have used to create knowledge/information	Click if you have used to share knowledge/information with others
Social bookmarking sites (e.g., Delicious, Diigo, Evernote)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brainstorming tools (e.g., Mindmaps or graphic organizers such as CMaps, Mindomo)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Listserv (communicate with a group of people, who have a shared interest, via email that can be broadcast to all the group members e.g., Google groups, professional associations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chat rooms (users with similar interests meet to have communication at the same time, where messages are responded to in real time or where webcams are used for video conversations)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blogs (websites where a person or group of people write brief paragraphs of opinion, usually on a central theme or topic and where users can make	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Click if you have used to find information (read, view, or listen)	Click if you have used to store, retrieve, classify information	Click if you have used to build networks to collaborate with others	Click if you have used to create knowledge/information	Click if you have used to share knowledge/information with others
<p>comments (e.g., Wordpress, Tumblr, Blogger, Google +)</p> <p>Google + (the social networking application offered through Google)</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Discussion board or group forums (online bulletin boards or discussion groups where one can read what is written by others or write a message and post it to the board e.g., Yahoo, LinkedIn discussion forums)</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Podcast (audio content on a website that can be listened to on a computer or MP3 player, audiobooks)</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Online video: (video content that can be viewed on a computer or on a mobile device, e.g., YouTube)</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>SlideShare (slide shows over the Web---similar to PowerPoint)</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Online office applications (e.g., Google Docs, Microsoft Office 365, desktop sharing)</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>Image and video hosting websites (allow users to share images and videos,</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Click if you have used to find information (read, view, or listen)	Click if you have used to store, retrieve, classify information	Click if you have used to build networks to collaborate with others	Click if you have used to create knowledge/information	Click if you have used to share knowledge/information with others
e.g., Flickr, Pinterest)					
Wikis (websites that allow creation and editing of interlinked web pages by a group of people to collaboratively create knowledge, e.g., Wikipedia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facebook (where users create personal profiles, add other users as friends, and exchange messages. Users may join common-interest groups, such as the workplace)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Twitter (a microblogging service where one can submit a post of 140 characters or less [tweet], and where others can follow you and where you can follow others)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LinkedIn (a business-related site mainly used for professional networking. Users build a network of contacts to follow different companies and to find jobs, people, and business opportunities)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Massive Open Online Courses (MOOCs): use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Click if you have used to find information (read, view, or listen)	Click if you have used to store, retrieve, classify information	Click if you have used to build networks to collaborate with others	Click if you have used to create knowledge/information	Click if you have used to share knowledge/information with others
platforms to make the course content and interactions available to as many people as possible and where resources are open to all who are interested					
Educational online games: (video games or role-playing games played online by oneself or with others for the purpose of learning)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Virtual Worlds: an animated three-dimensional online world where individuals design and share a community environment so that they can interact in a simulated world through avatars (e.g., Second Life, WOW, the SIMS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: Please describe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q9 Click in the square next to the technology devices you have used over the past three months to accomplish job-related learning goals or for professional development (click all that apply).

- Desktop computer or laptop
- Tablet/Ebook (e.g., iPad, Kindle, Nook)
- Smartphone

Q10 Do you use Internet/Web 2.0 technologies to find and communicate with experts in your profession who are inside of the company or organization for which you work?

- Yes
- No
- If yes, please list the technologies that you use _____

Q11 Do you use Internet/Web 2.0 technologies to find and communicate with experts in your profession who are outside of the company or organization for which you work?

- Yes
- No
- If yes, please list the technologies that you use _____

Q12 Click on the circle in the column below that most closely matches how much the following characteristics influence your use of a specific Internet/Web 2.0 technology or application resource.

	No influence	Some influence	Strong influence
Accessibility (the resource can flexibly meet user's needs, preferences)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time required to learn the technology/application	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of effort needed to locate, access, and use the resource	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost of the resource	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Value (potential benefit or usefulness of the resource)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 Click on the circle in the column below that most closely matches the usefulness of each category of tools/applications to meet your job related learning goals or for professional development.

	Do not use	Not at all useful	Somewhat useful	Very useful
Presentation tools such as podcasts, online videos and SlideShare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaboration tools such as Microsoft Office, Google Docs, Wikis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organization tools such as content tagging and social bookmarking sites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brainstorming Tools such as Mindmaps or graphic organizers such as CMaps, Mindomo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication tools such as discussion boards/group forums, Listservs, chat rooms, blogs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social networking applications such as Ning, Jive, Bloomfire, FaceBook, Twitter, LinkedIn, Pinterest, Flickr, Google+	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Massive Open Online Courses (MOOCS)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Educational Online Games	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virtual Worlds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 Select which of the following you use to document or demonstrate your accomplishment of learning goals, solutions to work-related problems, or professional development. Click as many as apply.

- Electronic Documents (e.g., Word/Excel files)
- Photos
- E-portfolio
- Learning management system (LMS)
- Written documents on paper
- Publish to a website
- Other: Please describe _____

Q15 How satisfied are you with the Web 2.0 technologies you use to accomplish job-related learning goals or for professional development? Web 2.0 technologies = technologies that provide the means for interacting, networking, and collaborating with others to exchange ideas, build knowledge, and get feedback. Common applications are: blogs, wikis, multimedia sharing (e.g., YouTube), and social network sites (e.g., FaceBook, Twitter).

- I don't use these types of technologies/applications
- Very Dissatisfied
- Dissatisfied
- Neither dissatisfied or satisfied
- Satisfied
- Very Satisfied

Q16 If you are dissatisfied, very dissatisfied, or neither, briefly describe what you would need to increase your satisfaction in using Web 2.0 technologies/applications:

Q17 Please choose from the drop-down menu the extent to which you agree with the following statements. The reason I use Internet/Web 2.0 technologies to meet job-related learning goals or for professional development is because:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I can conveniently access information when I need it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am able to get information quickly---on demand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to direct my own learning---have personal control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can repurpose information for other uses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can combine formal learning with informal learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I can approach learning in ways that are best suited for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable with using Internet and Web 2.0 technologies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to develop specialty knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to connect with individuals who have the same professional interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to respond flexibly to work projects that develop by chance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to find information when company training was either unavailable or did not meet my learning needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 Please choose from the drop-down menu the statement that most closely reflects how you judge the quality of your learning as you use Internet/Web 2.0 technologies and applications to solve work-related problems or for professional development.

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
I judge the quality based only on the end result (i.e. products I produce, skills I developed, or an outcome such as being able to find answers to my questions)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consider the process (i.e. amount of time, effort, struggle, deliberation) I go through to judge the quality of my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I consider myself to be the primary source of judging the quality of my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
I use other sources (i.e. supervisor, customers, coworkers, outside experts) to judge the quality of my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I judge the quality of my learning against a set of predetermined standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I judge the quality of my learning based on the sense of accomplishment I felt at the conclusion of my learning project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q19 Please click on the circle that indicates how much credibility (i.e. belief in trustworthiness) you would give to professional information or advice you locate on:

	No credibility	Somewhat skeptical	Some credibility	A lot of credibility
A discussion board/group forum/Listserv	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media sources (e.g., YouTube, SlideShare, Flickr, Pinterest)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Webcasts/podcasts/videocasts/Livecasts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Online courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social network sites (e.g., Facebook, LinkedIn, Instagram, Google+)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blogs or microblogs (e.g., Twitter)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wikis (e.g., Wikipedia)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Online educational games	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Massive Open Online Courses (MOOCs)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virtual worlds (e.g., Second Life)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20 Please choose from the drop down menu the statement that most closely reflects how you evaluate the quality of a website. I evaluate the quality of a website by:

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
Verifying the author and/or institutional identity of a website	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Examining both overt and covert affiliations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Considering the presentation and format of information on the website	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ascertaining the objectivity of the information (i.e., check to see if the information presented is fact or opinion and/or whether there is a conflict of interest)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking to see how current or up-to-date the information is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taking note of how comprehensive or in-depth the information is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking to see if there are any reviews of the site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Purposefully finding and using peer and editorially reviewed resources that are available through universities, schools, libraries, subscriptions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verifying information (i.e., compare information found on a website to other websites or to offline sources such as newspapers, magazines, books)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q60 Do you use Wikis to solve work-related problems or for professional development?

- No
- Yes

Q21 Please choose from the drop-down menu the statement that most closely reflects how you evaluate the quality of a wiki. I evaluate the quality of a wiki by:

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
I do not use wikis so cannot answer this question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking out the expertise of the person(s) who have authored the wiki page(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking out the expertise of the person(s) who have helped review the wiki page(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Looking to see how much collaboration went into creating the wiki page(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking to see how many revisions were made to the wiki page(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeing how many citations were made in the wiki page(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Looking into the source(s) of the citations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeing whether various aspects of the topic are balanced well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determining if the coverage is neutral (without bias, recognizes different viewpoints, the language is neutral, and there is an emphasis on facts)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q61 Do you use Blogs to solve work-related problems or for professional development?

- No
- Yes

Q22 Please choose from the drop-down menu the statement that most closely reflects how you evaluate the quality of a blog. I evaluate the quality of a blog by:

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
I do not use blogs so cannot answer this question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
First impression	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking on the expertise of the author of the blog who is writing about the topic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeing if there is a substantive discussion of the topic(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checking to see if the posts are also cited on other blogs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q62 Do you use discussion boards to solve work-related problems or for professional development?

- No
- Yes

Q23 Please choose from the drop-down menu the statement that most closely reflects how you evaluate the quality of a discussion board. I evaluate the quality of discussion boards by:

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
I do not use discussion boards so cannot answer this question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The quality of interactions (i.e. how constructive and productive exchanges between the members are)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The quality of content in posts made by others (i.e. do the participants seem knowledgeable)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The relevance of posts (i.e. information and knowledge offered is in response to the questions that are posed)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The novelty of posts (i.e. ideas that are new to you are offered)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q24 What criteria do you use to decide if you have achieved your learning goal?

- I use criteria that I have developed myself
- I use criteria that are defined by peers or others in my profession
- If you use criteria that are defined by others, which industry or professional standards do you use? _____

Q25 Please click in the circle under the column that indicates how confident you are in your ability and skills to:

	Not at all confident	Somewhat confident	Confident	Very confident	Extremely confident
Use Internet/Web 2.0 tools to locate information to problem-solve your work-related learning goal or for professional development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critically analyze the information or knowledge you find in your search	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the information you find by applying it to your learning goal or for professional development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q26 Please choose from the drop-down menu the extent of how true each of the following statements are about you. When learning new materials through use of Internet/Web 2.0 technologies (to solve work-related problems or for professional development) I will:

	Not true of me most of the time	Occasionally not true of me	Undecided	Occasionally true of me	True most of the time
Discuss the material with my supervisors/ managers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consult with colleagues inside my company to verify the usefulness of the information I found	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Make contact with others in my profession – outside of my company – to verify the usefulness of the information I found	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Put to use what I discovered independently, without checking with anyone else	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Share what I have learned with others (outside of my company) who might benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Share what I have learned with others (inside of my company) who might benefit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other: Please describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q27 Click on the squares that indicate which learning activities you engage in when solving a work-related problem or for professional development. (Select all that apply)

- Accessing email
- Accessing the Internet
- Seeking consultation
- Providing consultation
- Teaching/presenting
- Writing (e.g., blogs, Internet articles)
- Mentoring others within your company via the Internet
- Mentoring others outside of your company via the Internet
- Reading information found on the Internet or on social media sites
- Participating in discussion (e.g., social media, discussion forms, Listservs, chat, Skype)
- Personal note-taking using an internet or Web 2.0 tool or application
- Observation using media found on the Internet (e.g., video, podcasts, photo sites)
- Creating and uploading media (e.g., video, podcasts, photos)
- Participate in webinars
- Provide/present webinars
- Accessing social media (e.g., Facebook, LinkedIn, Twitter)
- Passive reading or observing in discussion forums
- Actively contribute to discussion forums
- Participation in a MOOC (Massive Open Online Course)
- Participation in an online course offered by your company
- Participation in an online course offered by another company or institution (e.g., university)
- Other: Please describe _____

Q28 How often have you decided to use or apply the information/knowledge you discovered (while using Internet/Web 2.0 technologies) to meet any job-related learning goals you have had?

- Less than 10% of the time
- 10 to 39% of the time
- 40 to 69% of the time
- 70 to 100% of the time

Q29 If less than 70 - 100%, please provide a brief description of what factor(s) interfere with your ability to use or apply the information/knowledge you discovered:

Q30 What is your gender?

- Male
- Female
- Other

Q31 How old are you? Please write in numerical value.

Q32 What is your race?

- African American/Black
- American Indian/Alaskan Native
- Asian/Pacific Islander
- Caucasian/White
- Hispanic/Spanish/Latino
- Middle Eastern
- Multi-ethnic
- Other: Please describe _____

Q33 What is the highest degree you have received?

- High school diploma or equivalent
- Associate's degree
- Bachelor's degree
- Master's degree
- Professional degree (MD, DDS, JD, DD, DVM)
- Doctorate degree (PhD, EdD)
- Other: Please describe _____

Q34 What year did you receive your highest degree?

Q35 How many years have you worked at your company? Please enter a numerical value.

Q36 What is your job title?

Q37 Is your job classified as...

- Medical
- Technical
- Administrative
- Other: Please describe _____

Q38 How many years have you worked in your present position? Please enter a numerical value.

Q39 Within the past year, have you participated in formal, structured, facilitator-led training in your field (i.e. attended a training, workshop, conference).

- Yes
- No

Q40 If yes, how many times? Please enter a numerical value.

Q41 You have completed the survey and are now being invited to volunteer to take part in a workplace interview process that involves one brief informational meeting, a job-related task, and a 45-minute interview.

There is value in participating! You will have the experience of engaging in your own personal learning environment and enhance your development as a 21st century knowledge worker. Additionally, your participation can help lay the groundwork for companies such as yours to support employees in their desire to create personal learning environments.

If you give your consent to be interviewed, you will be taken to a form that will gather your contact information, which will only be used to contact you to schedule meetings. Your name will not be associated with the interview and reported results will not contain any identifying information. XX will not know how you respond in the interview.

Please click on the response that matches your wishes.

- Yes, I give my consent to be contacted to start the interview process
- No thank you, I am satisfied with having completed the survey and do not consent to being interviewed

Q42 Thank you for taking the time to complete this survey! Your response is highly valued. Would you like to enter the drawing to win one of four \$25 gift certificates for having completed the survey?

- Yes, please enter me in the drawing
- No thank you, I am not interested in entering the prize drawing

APPENDIX E

INTERVIEW MATERIALS

Group Information Meeting and Interview Protocols

E1 Group Information Meeting Protocol

Date:

Introduction and Opening

- Introduce self
- Hand out consent forms and go over the form by reading it aloud.
- **SAY: If you would like to change your mind about volunteering to go through with this interview process you do not need to sign the consent and you can leave the meeting. If you are undecided, please stay and listen to the instructions, after which you can decide. If you want to participate I will need you to sign the consent form before you leave the meeting.**
- Ask those that are willing to participate to sign the consent. Collect consent forms
- **SAY: The purpose of this study is to find out how you develop and use a personal learning environment to solve work-related problems**
- **SAY: Of particular interest is**
 - **How you construct your PLE**
 - **How you determine whether or not the Internet tools and/or Web 2.0 technologies that you use are helping you accomplish your learning goals**
- Provide the employees with a handout (Employee PLE Worksheet) that has on it a definition of a PLE. Go over the definition.

Instructions

- **SAY: I would like you to think of a work-related learning goal to work on over the next two weeks. It should be a goal that can help you solve a problem related to your job. As you work on solving your goal over the next two weeks, please note:**
 - a. **Which Internet and Web 2.0 technologies/applications you use in the process (these should be included in your illustration) and for what purpose you use them**

- b. **Keep track of how many work hours you devote to working on your learning goal each week**
 - c. **Which devices you use**
 - d. **How you evaluate your progress as you work on your goal**
 - e. **You have been given the employee worksheet to assist you.**
 - f. **Let's go over the worksheet again, only this time paying attention to the table of Internet/Web 2.0 technologies**
 - g. **Do you have any questions about how to use the worksheet?**
- Have employees look at several examples of PLE illustrations (distribute 1)
 - **SAY: As you review these examples of PLEs, keep in mind how they are illustrated because I would like you to create an illustration of your own PLE between now and the next time we meet in two weeks. You may illustrate your PLE manually (by hand) or electronically (by computer). The important thing is that you include all of the Internet and Web 2.0 technologies that you use to solve work-related problems and that you organize them visually in a way that makes sense to you.**

Wrap Up

- **SAY: Do you have any questions about these instructions?**
- **SAY: Are there any comments or suggestions would you like to make?**
- **SAY: Your willingness to volunteer your valuable time is truly appreciated**
- Schedule dates with each participant at the informational meeting for the interview in two weeks.
- Remind them to bring their worksheet and PLE illustration to the interview!

NOTES ABOUT THE MEETING:

E2 Group Information Meeting Participant Questions Handout

- Question: What are Web 2.0 applications?

Answer:

Applications that allow you to comment on something, create something and share it, and/or social media. Where you can interact, network, and collaborate with others. The worksheet lists applications like these. Common applications are blogs, wikis, multimedia sharing (YouTube) and social network sites (Facebook).

- Question: If we are not able to develop a work related learning goal that we work on and track for the next couple of weeks, then would now be the time to say I am not able to participate?

Answer:

Yes, it is fine if you want to stop at any point in the project.

- Question: I don't know if I should wait and hear more what this is like in terms of real world applications, like examples, because right now it seems very theoretical and that I am going to have to create something and track that, but if what you are saying is that if it can help with something that I am already working on and I have to track it, that is something different?

Answer:

That was my intention, not that you had to do something extra, something that is not part of your regular job duties. When you think about a work related learning goal, think about it as a goal that would help you solve a problem related to your job, and also make sure you evaluate your progress as you go: for example, if you think "I really needed this piece of information" or "I wanted to share something with somebody" and you are running into obstacles, note that too.

An example of a learning goal for me---in the mental health profession

Say I have a number of clients who are dealing with stress issues and I want to help them reduce stress by providing them with stress reducing activities. My learning goal would be to locate those activities and be able to teach them to my clients. That would be part of my job responsibility anyway --- I might search the internet or use Web 2.0 technologies--- I might go on LinkedIn and ask other professionals in the counseling profession if they have any exercises, or I might go to a website that has information about stress management. I would track which applications I am using, are they successful, are they helping me actually finish and complete what I set out to do.

- Question: Do we have to decide today what our goal is that we are going to work on?

Answer:

Maybe not today, but as soon as you can---within a couple of days.

- Question: Can you give us better examples of types of problems?

Participant:

I actually have two. One seems too big and one seems too small. But one of them that I am thinking of is how am I going to get my CEUS. The broader one is learning new software to do our dash boarding and that is going to take much more than two weeks, that is going to be the bigger one.

Answer:

That is a good point. I was imagining that your learning goal would be completed within the two weeks. It is not *that* important, as long as we can talk about your sense of

whether you are making progress toward your goal---then your goal does not have to be completed.

Participant:

A problem I have is email management—making sure those important emails don't get buried. It could be that simple, right?

Answer:

Yes. What I am trying to create is a snapshot of what you are doing in the here and now. Often times researchers ask you what you did three months ago, six months ago, and it is hard to remember. So I want you to pay attention to what you are doing as you do it. Hopefully, you can roll this task right into something you currently need.

- Question: And when you say tracking something that is just tracking it?

Answer:

That is what the worksheet is for, to help you. If you want, you can use the worksheet to check off applications you use, or you can use it to remember things you have done. You can make notes on the worksheet about the applications you are using. Then I am going to come and interview you, and ask you more detailed questions.

Ad Lib:

A personal learning environment definition has two major components: one is the tools and applications that are being used and also the hardware devices like if you are using your tabletop, or laptop, or smart phone and then also what types of processes or learning activities or strategies you are engaged in as you go about trying to solve this problem.

- Question: You want us to diagram something like this [PLE illustration] out?

Answer: Yes.

- Question: And in the middle, that would be your goal?

Answer: You could do it that way. Or you could just write your goal somewhere on your illustration, it does not make any difference. You could still think of yourself as being at the center of your own learning environment; however you want to conceptualize it, there is no right or wrong. These are just some examples of illustrations to give you a kick start.

- Question: Most of these items [applications listed on the PLE illustration] I don't use. I have never used them, so I Google, I use Outlook, I use FaceBook for private stuff, but Clippy, Filemail, or any of these items, I am not familiar with.

Answer: This is just an example. I don't want you to think that you need to follow the example in terms of the tools/applications that you use.

- Question: So it could be very simplistic in that I might use three tools?

Answer: That is perfectly fine. I don't want you to feel that you have to do anything new. I just want you to take a snapshot of what you are actually doing. The reason I gave you the task to do over the next two weeks, is because typically researchers ask you to recall what did you do three months ago or six months ago, and I think it is really hard to do that, so I wanted to make it more immediate. This task brings what you are doing up in your awareness. A personal learning environment could also include going to the library, reading books, magazines, talking to coworkers. We could broaden the definition, but I am not interested in that. I am just looking at the piece where people utilize technology to solve these problems. I am asking you to be more conscious and

aware of what you are doing, and to log and track it. Then when I come to interview you, it will be fresher in your mind.

- Question: So does that include our computer system here and the applications that feed into that?

Answer: It could.

- Last year when EPIC came in we were all assigned certain classes, certain learning. We had to assign staff members certain classes. We had to register ourselves for learning and it was a whole process for all of us in the XX. I guess in looking back I am thinking, “What have I done to go outside for my personal learning goal?” That was huge thing last year—it was put in our goals, handed down by the leadership.

Answer: In my mind that is an example of a more formalized, structured learning system. This is the opposite of that. This is where you are figuring out what you want to learn yourself. Instead of having someone say to you, you need to learn this process and take this course—this is where you say to yourself: In the course of my day to day job, when I come across a problem, and I have not been to training on it, and I need to figure it out, what do I do?

- Question: I can't say that I have hear of a lot of these [applications listed on the PLE illustration]

Answer: I do not want you to get hung up on the actual names of the applications listed on this illustration. What is in the blue ink will change for each of you. But, in the red ink, these represent the processes. For example: “When I need to do X, like find information or talk to someone (red ink), do I go to YouTube and watch a video or do I look up a website to get the information, or do I do something else, or some combination of these (blue ink)?”

- Question: We are pretty restricted at where we go off into the internet, especially while we are at work and we have to portray that image to all our employees, to all the staff. I mean if they see you wandering off on to the internet, even for an assignment such as this, I feel that they would be looking for an explanation, or they would report it to somebody that I would have to explain to. So this is something I would definitely feel I had to do on my own time, outside of work. And to be honest, I don't even know if you can get YouTube on the Henry Ford system.

Answer: So you are worried about getting in trouble for doing this task while at work? Before I could do this study in cooperation with XX, I had presented the research project to the XX University and they had to OK it. They know we are doing this project and what the project entails. They gave it their OK. Also, that is why you are being asked to work on a job-related learning goal.

- Question: So if we are doing some research for a job-related thing, but working on it from home, is it OK to include that in there?

Answer: Yes, if you could just make note of the fact that you did that from home.

- Question: In terms of our goal, can it be basic, daily work? How we navigate the internet and other technologies to accomplish our day at work, is that what you are looking for or are you looking for a more specific goal?

Answer: A specific goal. Something you need to learn in order to fix a problem that you are dealing with. I know you are doing it all the time during your work, just stop, reflect and ask yourself, “If I just operationalize this and call it a goal, what would that goal be?”

E3 Interview Behavioral Research Informed Consent

Title of Study: *Personal Learning Environments for Business Organizations*

Principal Investigator (PI): Denise Wunderlich, Doctoral Candidate

Instructional Technology, College of Education, Wayne State University

W: 313-577-4597

C: 248-217-2353

Purpose

You are being asked to be in a research study of how working adults use internet and Web 2.0 technologies to solve work-related problems and for professional development, because you are a working adult with internet access. This study is being conducted at Wayne State University in conjunction with Henry Ford Health System. The estimated number of interview study participants is about 10 - 20. **Please read this form and ask any questions you may have before agreeing to be in the study.**

Study Procedures

In this research study, we will examine what practices supervisor/manager employees are engaging in when they need to find information to help them with a problem at work or to enhance their knowledge about their profession or job role.

If you agree to continue to take part in this research study, after having first completed the electronic survey, you will be asked to participate in an interview process, which will involve attendance at today's group informational meeting (30 minutes or less) and two weeks later one interview (approximately 45 minutes) to take place at your organization at convenient times and places. The contact information that you have provided in order to attend today's information meeting, will only be used to contact you to schedule an individual meeting and for your review of the transcripts of the interview. There will be no identifying information such as your name, associated with the interview and reported results of interviews will not have any identifying information.

At today's informational meeting you will be asked to identify a work-related learning goal and over the next two weeks, track what internet and Web 2.0 tools/applications you use and what processes you engage in to solve the problem. To assist you with this task, you will be given an Employee PLE Worksheet and shown an illustration of a personal learning environment (PLE). At the interview you will be asked questions about what you did. Specifically, questions will focus on

- what type of internet and Web 2.0 tools you used to find resources,
- how you evaluated, stored and organized that information,
- how you created and shared knowledge,
- how you formed connections with others doing the same work,
- how you evaluated completion of your learning goal

The interview will be digitally taped and transcribed. You will be sent the transcription and asked to review the transcript and make any changes to correct inaccuracies or add additional information needed to clarify responses. You will be asked to return the corrected interview

transcripts within five working days. Any interview transcript not received within this period will be considered accurate and used as is.

Benefits

The possible benefits to you for taking part in this research study are becoming more aware of and/or proficient in the use of internet-based and Web 2.0 tools/applications that can be used to meet on-the-job learning goals to solve work-related problems. You will also be introduced to the idea of creating a personal learning environment, which can help you become a knowledge worker with the necessary skills for today's 21st Century work demands. Additionally, information from this study may benefit other people now or in the future if it helps lay the groundwork for companies (including your own organization) to consider supplying additional support to employees in their desire to create professional, personal learning networks.

Risks

The only known risk at this time to participation in this study is the possibility of a breach of confidentiality, since a master list of participants names will be temporarily kept until the transcripts have been reviewed (after which the list will be destroyed). This risk will be addressed by the principal investigator keeping all lists in a locked drawer that only the principal investigator can see. Supervisors will not know who participates and who does not.

Study Costs

Participation in this study will be of no cost to you.

Compensation

If you volunteer to participate in the interview process, at the conclusion you will be offered a personalized work environment plan/process to help improve your performance utilizing internet and Web 2.0 technologies, should you feel you would benefit from such.

Confidentiality

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research records by a code name or number. Information that identifies you personally will not be released without your written permission. However, the Human Investigation Committee (HIC) at Wayne State University, or federal agencies with appropriate regulatory oversight [e.g., Office for Human Research Protections (OHRP), Office of Civil Rights (OCR), etc.] may review the research records. When the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

You will be asked to read the informed consent form and accept it before beginning the interview process. The audio files of your interview will be used for research or educational purposes only, and your identity will be protected or disguised. Once the audio file from the interview has been transcribed and reviewed by you and the researcher, the audio file will be permanently deleted. You have the right to review the audio file and/or transcript of the audio file prior to deletion. Your personal identifying information (i.e. name) will not be attached to the transcript and once the transcript is complete, any record of your name and all contact information will be destroyed.

Voluntary Participation/Withdrawal

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you decide to take part in the study you can later change your mind and withdraw from the study. You are free to only answer questions that you want to answer. You are free to withdraw from participation in this study at any time. Your decisions will not change any present or future relationship with Henry Ford Health System or Wayne State University, or other services you are entitled to receive.

The principal investigator (PI) may stop your participation in this study without your consent. The PI will make the decision and let you know if it is not possible for you to continue. The decision that is made is to protect your health and safety, or because you did not follow the instructions to take part in the study.

Questions

If you have any questions about this study now or in the future, you may contact Denise Wunderlich at the following phone number 313-577-4597. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Consent to Participate in a Research Study

To voluntarily agree to take part in this study, you must sign on the line below. If you choose to take part in this study you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered. You will be given a copy of this consent form.

_____	_____
Signature of participant	Date
_____	_____
Printed name of participant	Time
_____	_____
Signature of person obtaining consent	Date
_____	_____
Printed name of person obtaining consent	Time

E4 Interview Protocol

Reference Code: (date/site initial/number order of interview)

Date:

Pseudonym name for confidentiality:

I. Introduction and Opening

- Hi and curiously ask: what made you decide to volunteer to be interviewed?
- **SAY: The purpose of today's meeting is to find out how you developed and used your personal learning environment to solve the work-related problem that you identified during or after the group information meeting, and to more generally understand how you approach the use of Internet/Web 2.0 technologies for work.**
- **SAY: I will be recording our interview. Do you have any questions about that?**

II. General Information

- **SAY: I will now ask you several questions about demographics and your job.**
- 1. **Please complete the information sheet**

TURN ON RECORDER

CHECK TO SEE IF IT IS RECORDING

RECORD: pseudonym name, date, time of day, location

- 2. **What policies, if any, do you think XX has about the use of Internet/Web 2.0 technologies in the workplace?**

Provide following definition of Web 2.0 if needed:

Web 2.0 technologies = technologies that provide the means for interacting, networking, and collaborating with others to exchange ideas, build knowledge, and get feedback.

Common applications are: blogs, wikis, multimedia sharing (e.g., YouTube), and social network sites (e.g., FaceBook, Twitter).

III. RESEARCH QUESTIONS

SAY: I will now ask you questions about the work you did over the past two weeks on your task to solve a work-related learning goal. You may refer to your worksheet and illustration to assist you in answering these questions.

(Research Question 1—How do Employees Construct Their PLEs?)

- 3. **Tell me how you identified your learning goal and how you worked on solving it?**
- 4. **What did you learn while engaging in this process?**

5. **How did you go about: (elaboration: what applications and strategies did you use)**
 - a. **locating and accessing information?**
 - b. **storing and retrieving information?**
 - c. **analyzing the information you found?**
elaboration: figuring out if it was helpful/accurate
 - d. **making decisions about how to use the information?**
 - e. **creating knowledge?**
elaboration: methods used to make something?
 - f. **communicating, collaborating, and building networks?**
 - g. **sharing and disseminating information and knowledge with others?**

Elaboration:

Information = data and facts that have been given some meaning by way of relational connection. Ex. Hair color, skin tone = data; photograph of face = information

Knowledge = the collection of information in a way that makes it useful. Knowledge refers to a process where patterns within a given set of information are ascertained. Ex. theories, constructs, concepts)

6. **How did you figure out which tools to use for particular purposes, as you worked on your learning goal?**

Elaboration: Why did you pick the tools that you did---and not others?

7. **Looking back on the strategies you used and the tools you picked to accomplish your goal---what, if anything, would you have done differently?**

(Research Question 3---How do Employees Use Their PLEs?)

8. **How did you evaluate the relevance of the information or knowledge you found as you worked on your goal (i.e. valuable and accurate information as compared to unhelpful or misinformation)?**
9. **How did you analyze whether or not the Internet/Web 2.0 applications you used were effective (produced the desired effect) in helping you to accomplish your goal?**
 - a. **What criteria did you use?**
10. **How did you judge the quality (degree of excellence) of your learning as you used your PLE?**

If possible, summarize answers so far.

SAY: Before I move on to the next set of questions, is there anything you would like to add?

SAY: I will now ask you more general questions (not related specifically to the task you worked on over the past two weeks).

(Research Question 2---What Triggers an Employee to Construct a PLE?)

- 11. In general, what positively influences you to try Internet/Web 2.0 technologies and applications at work to solve work-related problems or for professional development?**
 - 12. In general, what has moved you to initiate use of Internet/Web 2.0 technologies and applications to solve some work-related problems, but not others?**
-

(General Information)

- 13. In general, how do you diagnose your learning need(s) at work or for professional development?**
- 14. In general, how do you formulate a professionally relevant learning goal for yourself?**

If possible, summarize answers so far.

SAY: Before we move on, is there anything you would like to add?

IV. Concluding the Interview

- **SAY: Now I would like to take a few minutes to review your PLE illustration and your Employee PLE Worksheet. Let's start with the illustration.**

15. Tell me how you went about creating your PLE illustration.

(If the employee has not completed the illustration, have them do so now).

Review the worksheet. Inquire if there were any problems in using it.

- In reviewing the worksheet, make sure the employee put in the number of hours worked each week, and if they did not, have them do so now. If they are estimating, make note of that. **SAY: I will quickly review the main points we learned during today's interview:**
- **SAY: Is there anything further you would like to say? Are there any comments or suggestions you would like to make.**

SAY: The next step is that I will have this recording transcribed and then will forward the transcription to you for your review. I welcome any comments or feedback you have concerning the accuracy with which you think the transcription represents your views. You will be asked to return the corrected interview transcripts within five working days. Any interview transcript not received within this period will be considered accurate and used as is. Would you prefer I email the transcript or send it via post? Which email (mail) address would you like me to use?

- **SAY: Thank you for your participation in this study. Your time and assistance are greatly valued.**

E5 Interviewee Demographic Worksheet***DEMOGRAPHICS FOR INTERVIEW PARTICIPANTS***

Reference Code: (date/site initial/number order of interview)

Date:

Pseudonym name for confidentiality:

Q1 What is your gender?

- Male
- Female
- Other

Q2 How old are you? _____

Q3 What is your race?

- African American/Black
- American Indian/Alaskan Native
- Asian/Pacific Islander
- Caucasian/White
- Hispanic/Spanish/Latino
- Middle Eastern
- Multi-ethnic
- Other: Please describe _____

Q4 How many years have you worked at XX? _____

Q5 What is your job role?

Q6 How many years have you worked in your present position? _____

Q7 What is the highest degree you have received?

- High school diploma or equivalent
- Associate's degree
- Bachelor's degree
- Master's degree
- Professional degree (MD, DDS, JD, DD, DVM)
- Doctorate degree (PhD, EdD)
- Other: Please describe _____

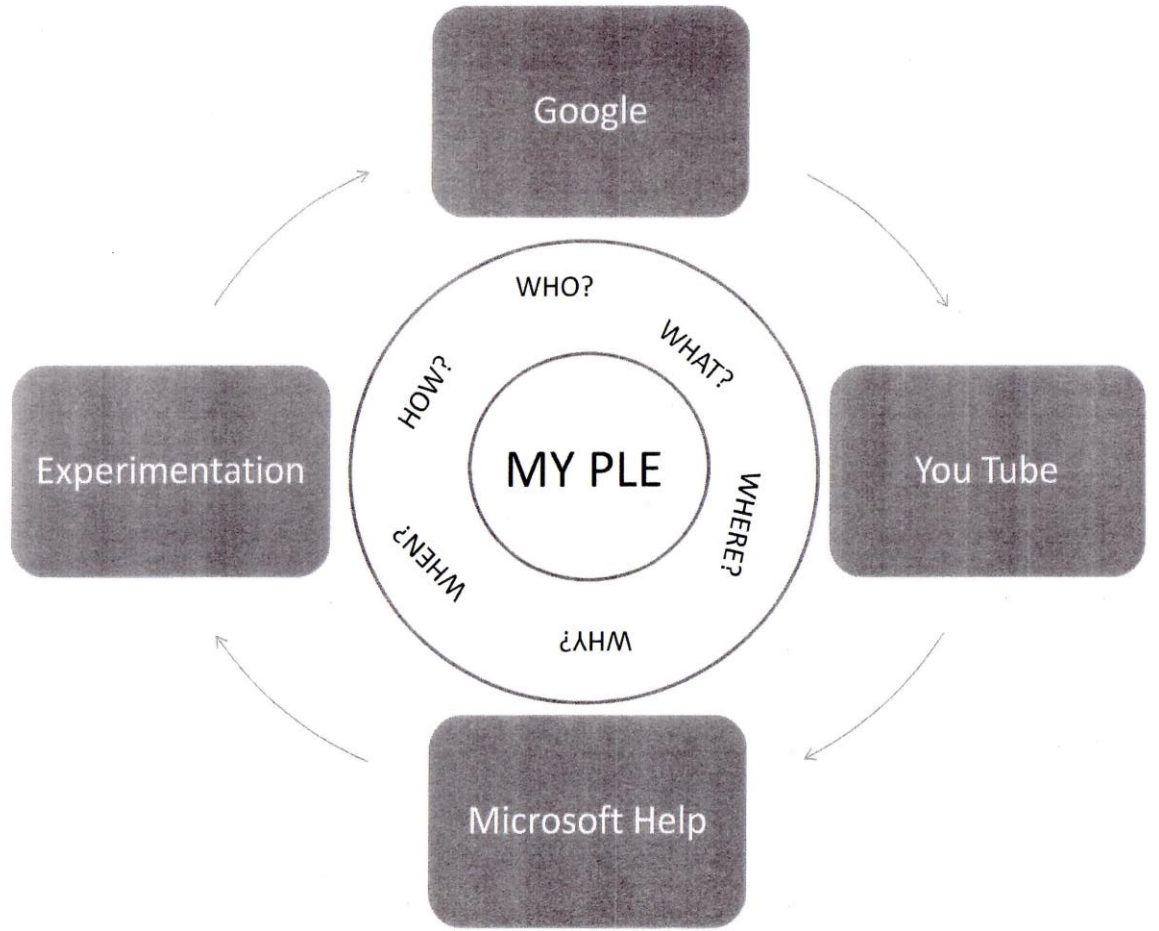
Q8 What year did you receive your highest degree? _____

Q9 Are you now attending or enrolled in college? YES_____ NO_____

E6 Participant PLE Illustrations

APPENDIX F
EMPLOYEES' PLE ILLUSTRATIONS

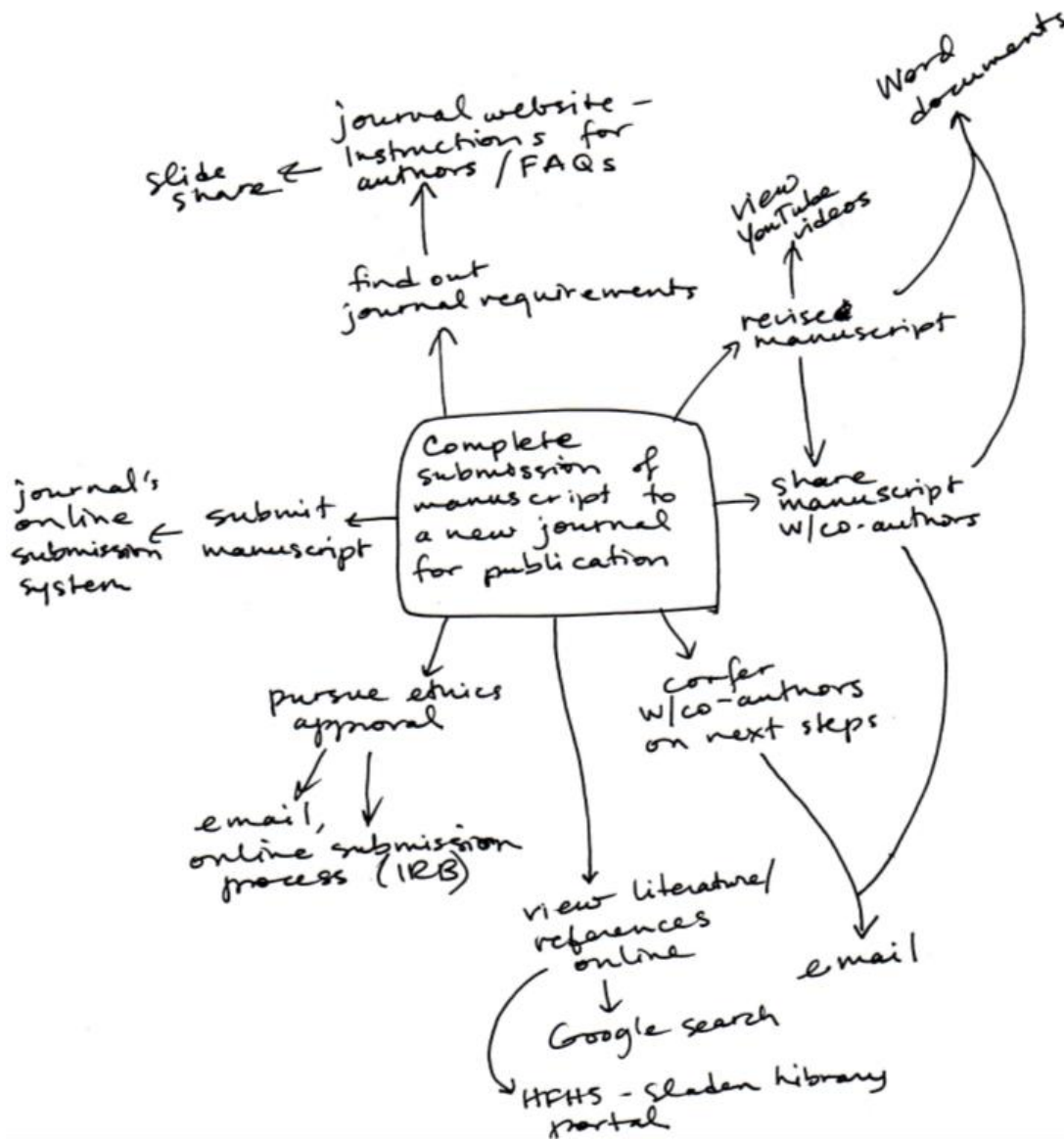
Interviewee 1



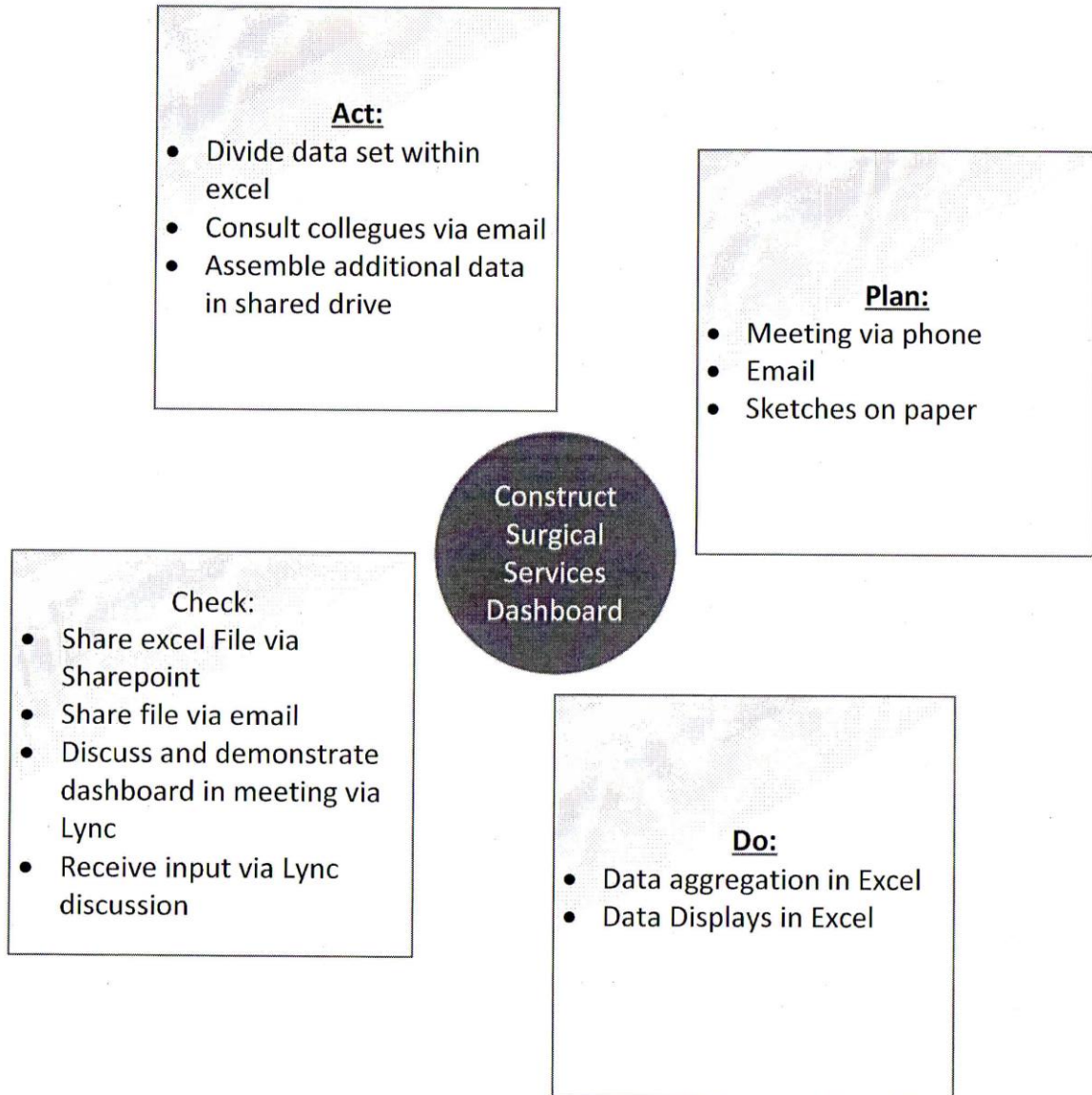
3-16-2015-5fd-01

Interviewee 2

3-17-2015
IFP-02



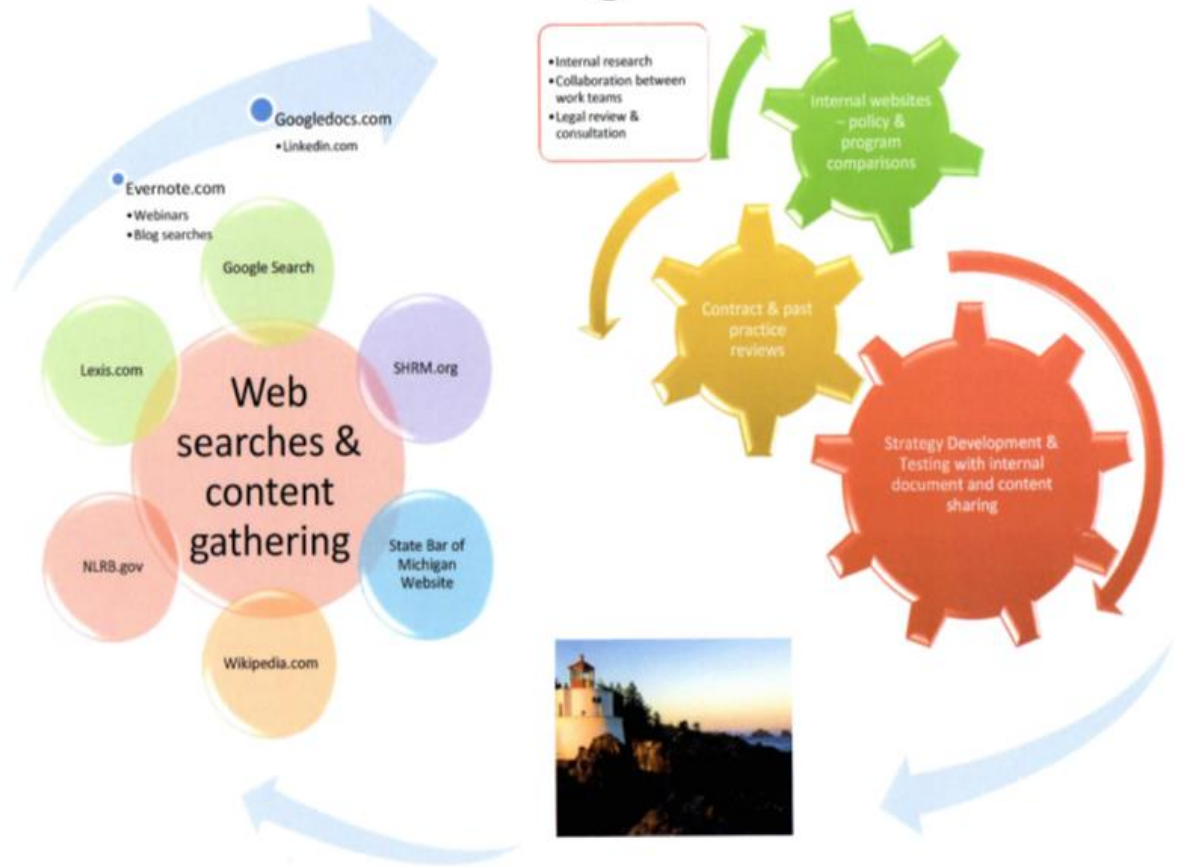
Interviewee 3



3_20_2015-IFP_03

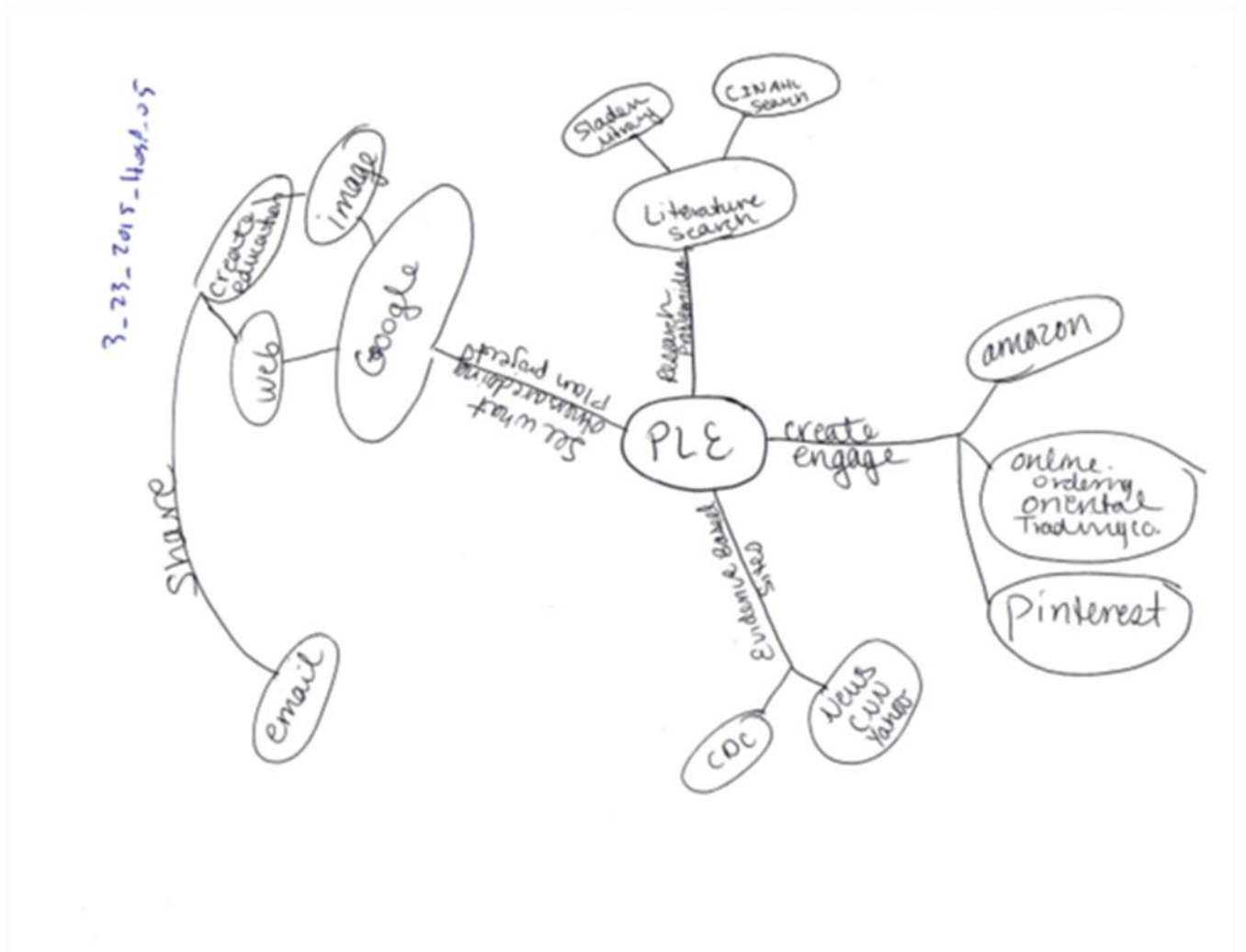
Interviewee 4

Virtual Learning Environment

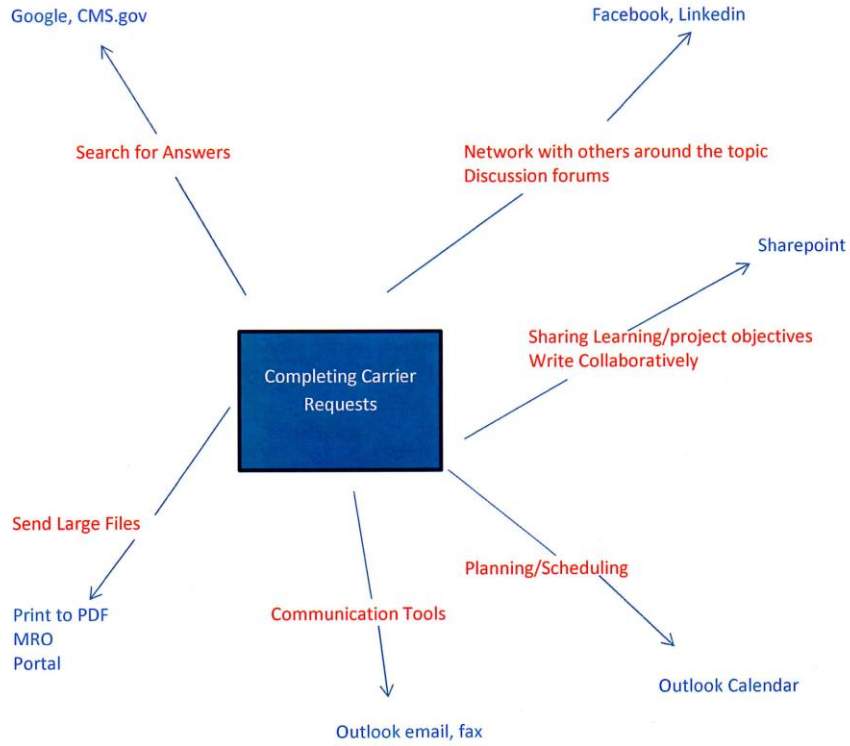


3-23-2015-1FP-04

Interviewee 5

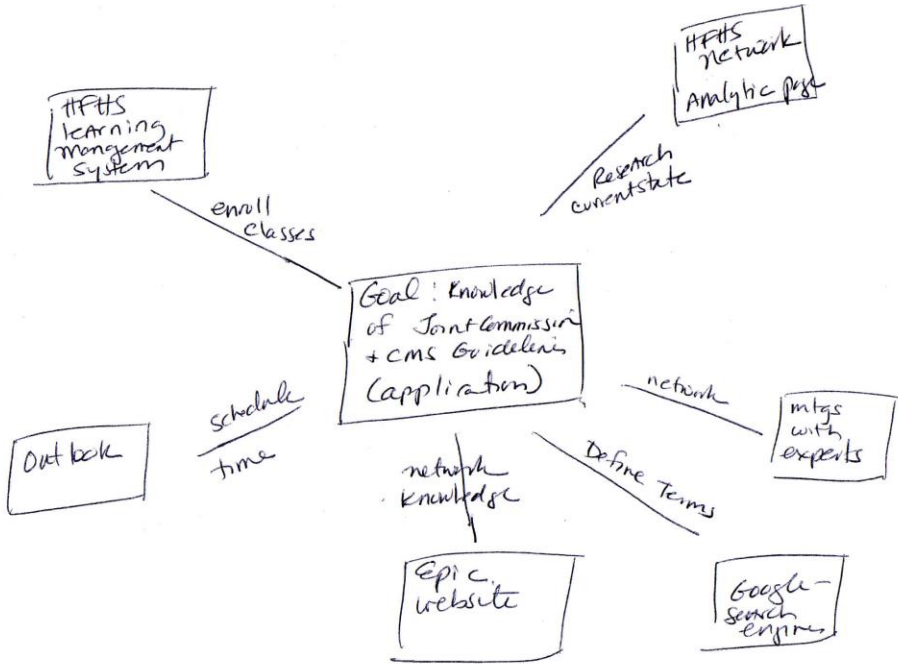


Interviewee 6



3-23-2015 - IFP-06

Interviewee 7

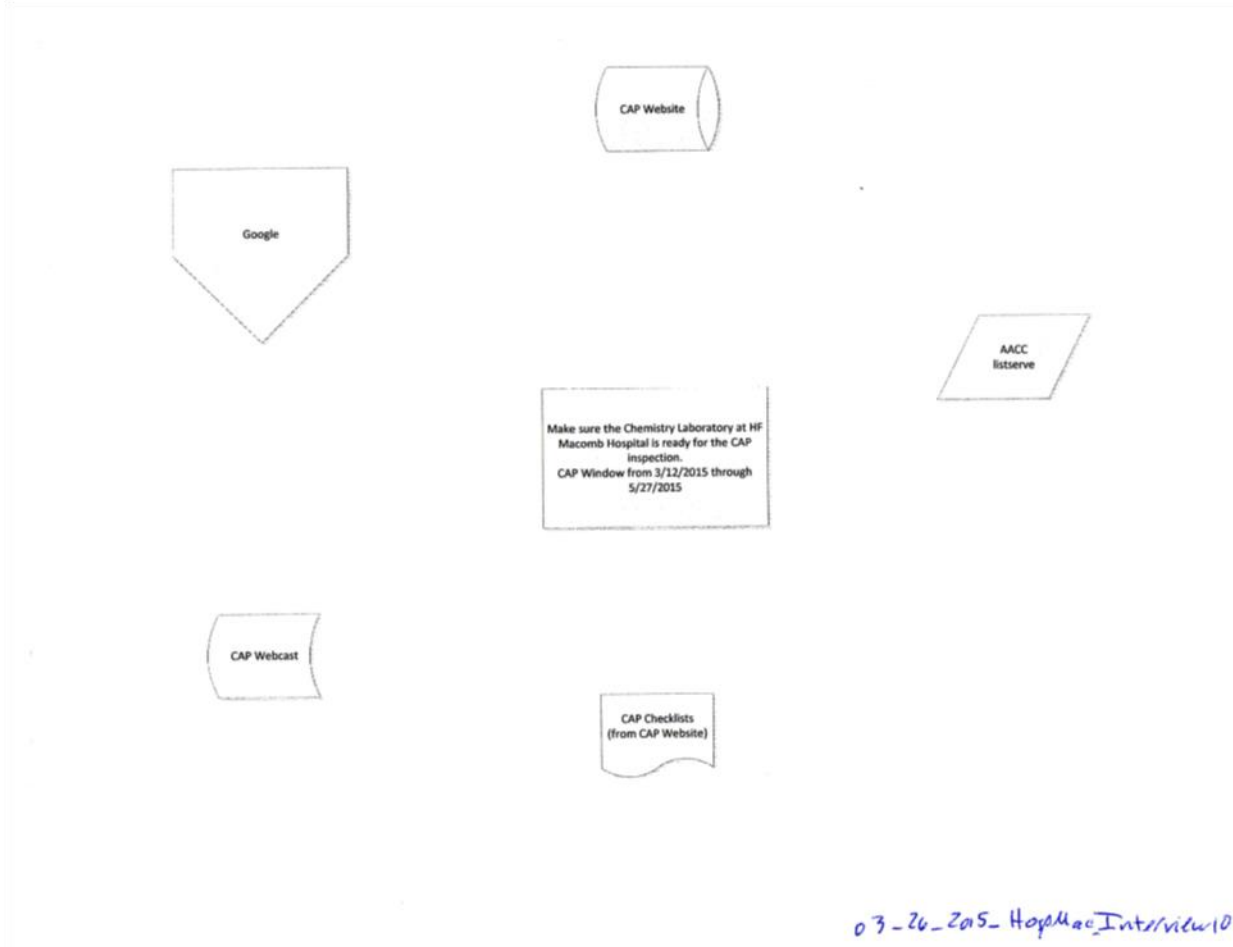


3-25-2015-IFP-07

Interviewee 9

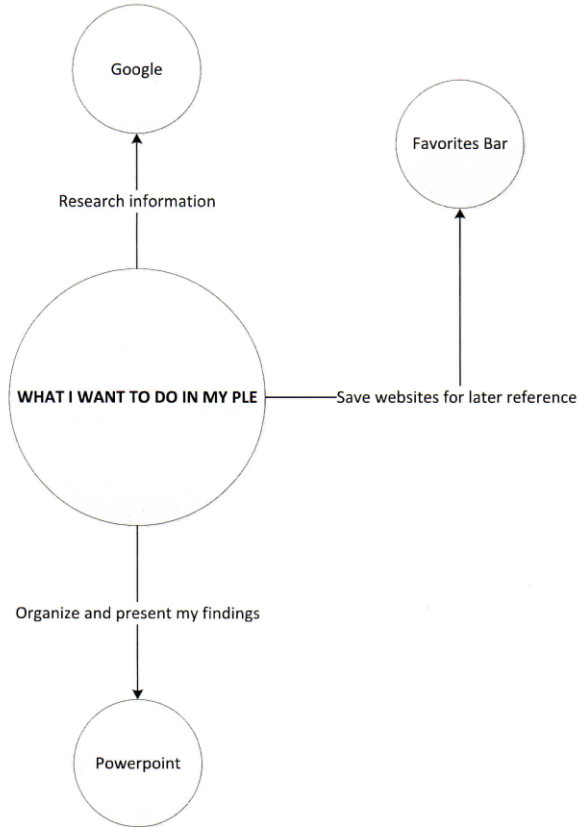


Interviewee 10

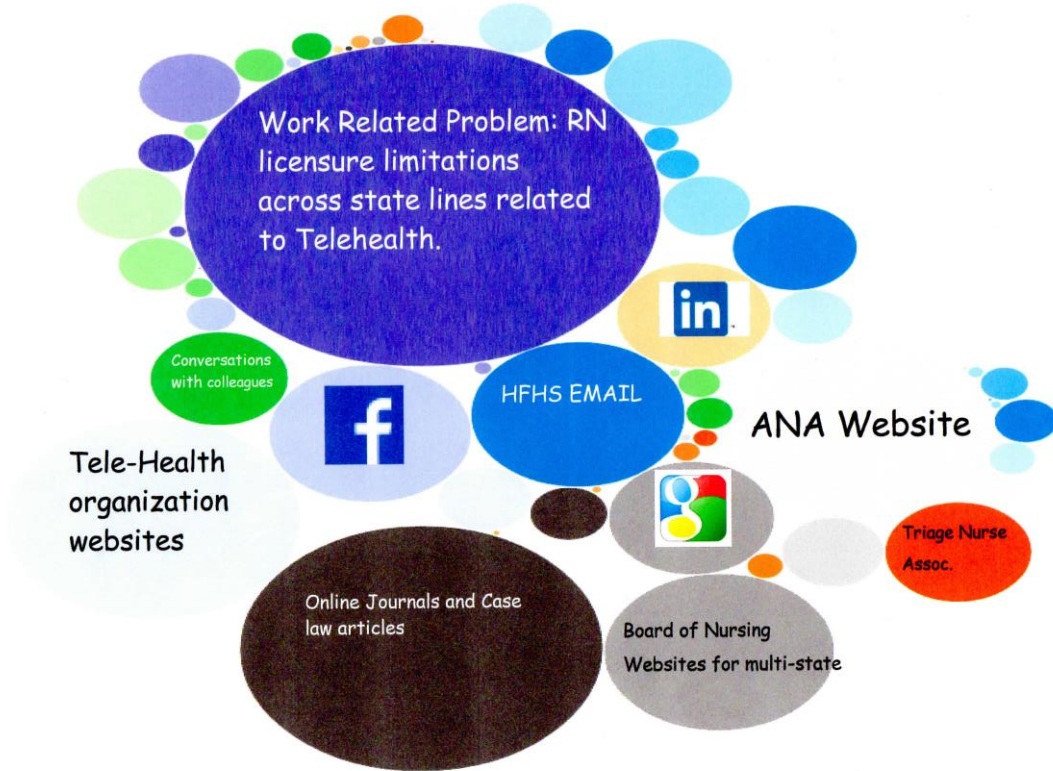


Interviewee 11

3-31-2015-HF+asp-11



Interviewee12



4-9-2015-W3-12

APPENDIX G

EMPLOYEE PLE WORKSHEET

EMPLOYEE NAME:

Definition of a Personal Learning Environment (PLE):

- A new approach to the use of new technologies for learning
- Learners use a combination of technology devices, Internet/Web 2.0 applications, and services
- An approach that lets people connect and collaborate through use of computers to access professional and/or social networks through the Internet
- Flexible use of networks of people, content, and services allow learners to be more adaptable and responsive to changing learning needs and goals
- Learners take responsibility for their own learning by developing learning goals and managing the learning process
- Learners become agents of knowledge: consuming, creating, and sharing knowledge

As you work on solving your work-related learning goal over the next two weeks, please note:

- a. Which Internet and Web 2.0 technologies/applications you use in the process (these should be included in your illustration) and for what purpose you use them
- b. Keep track of how many work hours you devote to working on your learning goal each week
- c. Which devices you use
- d. How you evaluate your progress as you work on your goal

Please check which of the following technology devices you used during the past two weeks while working on your work-related learning goal (you can choose more than one)

- Desktop computer at work
- Desktop computer at home
- Laptop computer
- Smartphone
- Tablet (iPad or similar) Netbook
- MP3 Player
- iPod Player
- eBook reader (e.g., Kindle, Nook)
- Other (please describe)

Please check all of the following methods you used to document and/or demonstrate your accomplishments on your learning goal or to record what you learned while solving your work-related problem over these past two weeks. (You can choose more than one)

- electronic documents (word or Google documents, diary, logs, journals)
- written documents on paper (diaries, logs, journals)
- audio tape
- video tape
- photos
- publish to a website
- e-portfolio
- workplace learning management system (LMS)
- other

ONLINE/WEB2 TECHNOLOGIES AND/OR APPLICATIONS – Check the applicable box if you have used to view and/or create over the two weeks while working on your work-related learning goal	√
Electronic print sources (e.g., electronic book, online news journal, online professional publication)	
Digital audio book	
Digital video (e.g., YouTube)	
• Viewing	
• Creating and sharing	
Search engines or search engine aggregators (e.g., Internet Explorer, Google, Firefox, Metacrawler, Dogpile)	
Content tagging (i.e. assigning a keyword or term to a piece of information such as an Internet bookmark, digital image, or computer file, thereby allowing the information to be found again by browsing or searching).	
Communication tools (e.g., email, instant messaging)	
Livcasting (eg., SKYPE)	
Collaborative office applications (e.g., Google Docs, Zoho Documents, Show Document) to share and manage documents	
Mindmaps or graphic organizers (e.g., CMaps, Mindomo)	
Podcast (audio content on a website that can be listened to on a computer or an audio player, such as an iPod or other MP3 player).	
• Viewing	
• Creating and sharing	
Webcast or Videocast (video content on a website that can be viewed on a computer or on a mobile device such as a Smartphone or iPad)	
• Viewing	
• Creating and sharing	
Open online course (usually offered by a university for free)	
Social bookmarking site (e.g., Delicious, Diigo, Evernote)	
Discussion boards/group forums (i.e., online "bulletin board" where one can read what is written by others or write a message and expect to see responses to those messages so that users can share and discuss information and opinions)	
Chat room (i.e., a particular address on the web where users with similar interests meet to have communication at the same time, where messages are typed and responded to in real time or where webcams are used for video conversations)	
Blogs (i.e. websites in which a person or a group of persons make regular written entries consisting of brief paragraphs of opinion, information, personal diary entries, or links, usually on a central theme or topic, and generally recorded in chronological order for example WordPress, TypePad, Blogger))	
• Reading/commenting	
• Writing	
Micro blogs (i.e. a type of blog that has abbreviated or shortened written entries or updates, an example being Twitter posts otherwise known as tweets)	
• Reading/commenting	
• Writing	
Wikis (i.e. websites that allow easy creation and editing of any number of interlinked web pages by a group of people to collaboratively create knowledge such as Wikipedia)	

ONLINE/WEB2 TECHNOLOGIES AND/OR APPLICATIONS – Check the applicable box if you have used to view and/or create over the two weeks while working on your work-related learning goal	√
<ul style="list-style-type: none"> • Reading/commenting 	
<ul style="list-style-type: none"> • Writing 	
SlideShare (i.e. for creating and sharing slide shows over the web, similar to Power Point) <ul style="list-style-type: none"> • Viewing 	
<ul style="list-style-type: none"> • Creating and sharing 	
Ning, Jive, Bloomfire (i.e. an online platform for people or businesses to create their own social networks)	
Facebook (i.e. a social networking service where users create personal profiles, add other users as friends and exchange messages. Users may join common-interest user groups such as the workplace) <ul style="list-style-type: none"> • Reading 	
<ul style="list-style-type: none"> • Contributing/posting 	
LinkedIn (i.e. a business-related social networking site mainly used for professional networking. Users build connections with other users. This list of connections can then be used to build a network of contacts in order to follow different companies, and to find jobs, people, and business opportunities. <ul style="list-style-type: none"> • Reading 	
<ul style="list-style-type: none"> • Contributing/posting 	
Flickr (i.e. an image and video hosting website that allows users to share images and videos) <ul style="list-style-type: none"> • Viewing 	
<ul style="list-style-type: none"> • Contributing/sharing 	
Pinterest (i.e. a virtual pin board that allows users to “pin” something they find of interest on another website or one of their own photos to a virtual board of their creation) <ul style="list-style-type: none"> • Viewing 	
<ul style="list-style-type: none"> • Contributing/sharing 	
Virtual Worlds (e.g., Second Life, WOW, the SIMS Online)	
Educational online games (video games or role-playing games played online by oneself or with others for the purpose of learning)	
Other (please describe)	

HOW MANY HOURS DID YOU USE YOUR PLE TO WORK ON YOUR WORK-RELATED LEARNING GOAL?

WEEK 1: _____

WEEK 2: _____

PLEASE ATTACH YOUR ILLUSTRATION OF YOUR PLE

You may illustrate your PLE manually (by hand) or electronically (by computer). The important thing is that you include all of the Internet and Web 2.0 technologies that you used to solve work-related problems and that you organize them visually (graphically) in a way that makes sense to you.

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ABSTRACT**PERSONAL LEARNING ENVIRONMENTS FOR BUSINESS ORGANIZATIONS**

by

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This exploratory, mixed-methods case study investigated supervisor/manager-level employees in a hospital health care organization to examine how they created and used PLEs, what internet/Web 2.0 technologies were used to solve work-related problems (or for professional development), and what strategies were engaged to meet learning goals. Research questions addressed: what internet/Web 2.0 technologies were used to find and retrieve information, build networks, collaborate, and create and share knowledge; what triggered employees to use internet/Web 2.0 technologies to solve work-related problems; how they evaluated information found; how they determined completion of learning goals; how much confidence they had in their abilities to locate, analyze, and use information; what actions they took; and what types of learning activities they engaged in.

Results indicated that the work environment influences decisions employees made regarding use of internet/Web 2.0 technologies. Almost 40% of survey participants reported that they did not use social network sites. Two factors played an inhibitory role: (1) perceptions of lack of organizational support for use of these technologies and (2) concern over accidental violation of confidentiality rules specific to the healthcare industry. The majority of study

participants were confident in their abilities to find, critically analyze, and apply information they found (an important requisite for success in a PLE). Participants rated “traditional” technologies of online courses and Webcasts as having the most credible information. In general, learning needs for interviewees were stimulated when they needed more information to answer questions. Participants judged the quality of their learning based on a sense of accomplishment and on the end result, as well on opinions of others (e.g., co-workers and supervisors) or on a set of industry standards. The top six learning activities listed were: accessing email, accessing the internet, reading information on the internet or social media sites, seeking consultation, participating in webinars, and online courses offered by the company. The nature of participants’ PLEs, as defined in this study, were in early stages of development, both in the variety and complexity of the tools/technologies being employed, and in the learning strategies used.

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Education

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