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Knowledge Transfer Preferences of Expert Employees Nearing Retirement

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2016

Abstract

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MBA, University of Maryland University College, 2004

BS, University of Phoenix, 2002

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

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Abstract

Managers of organizations face increasing rates of retiring Baby Boomers as that generation begins to leave the workforce. Some managers of organizations have no formalized knowledge transfer strategies in place to reduce the lost productivity and negative financial effects of these retiring employees. The purpose of this single-site case study was to explore the knowledge transfer preferences of expert scientific support employees nearing retirement at a United States national laboratory in northern California. Understanding the preferences of employees nearing retirement may allow managers to affect the business practice of promoting organizational learning by implementing strategies that catalyze knowledge transfer from expert employees. Systems theory, expectancy theory, knowledge management theory, and organizational learning theory concepts provided the framework. Semistructured interviews with 24 expert scientific support employees provided data, which were subsequently coded and analyzed using the pawing technique. The analysis of themes revealed mentoring to be the preferred method of knowledge transfer, the barriers to knowledge transfer and multiple types of knowledge transfer, and the impact of lack of knowledge transfer on productivity. Public research organization managers implementing effective knowledge transfer programs may increase the potential for scientific discoveries affecting social change through increased prosperity of citizens who could benefit from the derivative advances in energy research.

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Dedication

I dedicate this work to those who thought they would never achieve high goals in their lives. Never did I think I would have achieved a doctorate. I have proven hard work, perseverance, and support from one's family may help achieve anything. To those who read this and strive to reach high goals, this is for you.

Acknowledgments

I thank my wife, Orinda, for her unyielding support of me during this phase of our lives together. My sons, Garren and Jonathan, deserve thanks for being so patient during the times when I was not able to spend time with them as much as I hoped to spend. Garren and Jonathan may have their father back fully in their lives. However, for my family, the goal was always in mind and we finished the journey together. To my friends and other family who have missed me for the past several years as I have been conducting this study, I promise I will be back to share the joy of life. I hope I have made them proud.

I thank my mentor, Dr. Carol-Anne Faint for her continuous guidance, coaching, and support through the process of completing this study. Dr. Michael Ewald, Dr. Judith Blando, and Dr. Gene Fusch also have my appreciation for the parts each played in helping me to learn continuously through this process. Dr. Freda Turner has my gratitude for providing me guidance early in my study by advising me that if the achievement of a doctorate were easy, everyone would have a doctorate. Dr. Turner's advice was a constant source of encouragement throughout this study. Finally, and most importantly, I thank my Creator for giving me the gifts through which I achieved this accomplishment and am able to move forward and help others in a new way.

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Section 1: Foundation of the Study

Managers of organizations will soon experience a labor shortage attributable to an aging workforce and decreasing numbers of the next generation of workers (Fredericksen, 2010; Neumark, Johnson, & Mejia, 2013; Szinovacz, 2011). Managers may experience reduced organizational productivity resulting in a decline of organizational competitive advantage. Ignoring the need for the transfer of expert knowledge from retiring employees compounds the loss of organizational knowledge leading to additional reductions in competitive advantage (Calo, 2008). Authors have studied methods of knowledge transfer in organizations (Levy, 2011; Mayfield, 2010; Pollack, 2012), motivations among employees in transferring knowledge (Hu & Randel, 2014; Markova & Ford, 2011), and the effect of knowledge type transferred on knowledge transfer intention by employees (Hau, 2013). However, employee preferences regarding knowledge transfer efforts are unknown. Managers of organizations may use the knowledge of employee preferences to develop knowledge transfer programs, thereby increasing competitive advantage and the productivity of their employees.

Background of the Problem

An increasing number of employees are eligible for retirement in the United States resulting from of the high number of Baby Boomers becoming eligible for retirement (Bal, De Jong, Jansen, & Bakker, 2012; Neumark et al., 2013). Failure to transfer knowledge from retiring employees may cause a reduction of organizational knowledge accrued by the employee base (Calo, 2008; Stone & Tetrick, 2013). The effect of productivity loss resulting from a lack of knowledge may result in lost customers and

reduced organizational success (Forcada, Fuertes, Gangolells, Casals, & Macarulla, 2013; Levy, 2011). Although the potential problem of knowledge loss is apparent, managers may not have strategies to retain older workers to maintain organizational effectiveness (Bal et al., 2012).

The increased rate of retirements may affect organizations in ways that vary by industry. In the public sector, managers employing financial professionals have difficulty in recruiting analysts because of reductions of available employees possessing specialized financial analysis skills (Robert Half International, 2011). In the construction industry, loss of knowledge may be a factor in decreased productivity and decreased client satisfaction (Forcada et al., 2013). Ignoring knowledge transfer efforts from experienced employees may result in decreased organizational productivity and output, as well as loss of competitive advantage (Cochran, Crowne, & Carpenter, 2012; Joe, Yoong, & Patel, 2013; Kim, Lee, Paek, & Lee, 2013; Sirmon, Hitt, Ireland, & Gilbert, 2011).

Several studies are available regarding knowledge transfer methods including succession planning, mentoring, WIKIs, and using technology solutions to capture and transfer both explicit and tacit information (Appelbaum, Benyo et al., 2012; Levy, 2011; Mayfield, 2010). Models of knowledge transfer studied include knowledge brokering and tacit knowledge conversion (Nonaka & Krogh, 2009; Ward, House, & Hamer, 2009). Other authors studied the success of knowledge transfer methods by investigating barriers preventing knowledge transfer such as organizational culture, motivation, and trust (Al-Adaileh & Al-Atawi, 2011; Hu & Randel, 2014; Huang, Davison, & Gu, 2011).

No previous researchers designed studies addressing the topic of knowledge transfer preferences at national laboratories with missions to conduct highly specialized research. A search of Walden University and University of California libraries identified no other studies regarding the same topic. Organizational leaders promoting knowledge transfer among employees may experience reduced loss of productivity and competitiveness resulting from experienced worker retirement (Levy, 2011). In the public sector, a primary factor in institutional governance is preserving organizational intellectual capital promoting productivity and efficient use of public resources (Pee & Kankanhalli, 2015). Findings from the current study may assist organizational leaders determine techniques to promote knowledge transfer efforts.

Problem Statement

The number of employees retiring is attributable to an increase in the average age of the United States population (Lewis & Cho, 2011). As employees retire, organizational knowledge loss may occur (Fredericksen, 2010). Thirty eight percent of the United States public workforce will likely retire by 2030 (Neumark et al., 2013). Loss of organizational knowledge results in reduced skills and less productivity in the next generation of employees aged 35 to 44 years (Calo, 2008). The general business problem is the need for strategies to capture and retain organizational knowledge. The specific business problem is, when developing knowledge transfer strategies, some managers lack knowledge of near-retirement employees' preferences for knowledge transfer practices.

Purpose Statement

The purpose of this qualitative, single-site case study was to explore the knowledge transfer preferences of expert scientific support employees nearing retirement to enable mangers to develop knowledge transfer strategies. The study took place at a United States national laboratory in northern California. The laboratory has more than 4,200 employees; 1,500 employees are scientific support employees. Participants were employees expecting to retire within 5 years who have at least 10 years of current job experience. I interviewed 24 scientific support employees to achieve data saturation (Guest, Bunce, & Johnson, 2006).

The results from this study may help managers develop strategies to maintain or increase productivity prior to and after the retirement of employees. Understanding the preferences of employees nearing retirement may allow managers of organizations to affect the business practice of promoting organizational learning through knowledge transfer from expert employees. Results of organizational learning through enhanced business practices might include increased competitive advantage, higher employee retention, and job satisfaction (Sabir & Kalyar, 2013). Public research organization managers implementing effective knowledge transfer programs may increase the potential for scientific discoveries affecting social change through increased prosperity of citizens who benefit from advances in energy research.

Nature of the Study

I used a qualitative methodology as the noted business problem is one for which no expected answer was available to prove or disprove a fact. Researchers use qualitative

approaches for exploration in which no predetermined answer exists (Yin, 2014). Quantitative approaches exist for researchers to prove or disprove a predetermined state or compare states of being or action to each other (Bettany-Saltikov & Whittaker, 2014; Malina, Norreklit, & Selto, 2011). The results of a literature review contained no studies to provide a basis for comparison among industries or national laboratories. No comparisons to a state of being or action are appropriate, so a quantitative approach was not appropriate. Similarly, a mixed methods approach was not appropriate, as mixed methods approaches require quantitative and qualitative elements (Tashakkori & Teddlie, 1998). The study is an exploration of knowledge transfer preferences among expert employees nearing retirement. For these reasons, a qualitative approach was the best fit for exploring the problem of how expert scientific support employees nearing retirement transfer knowledge.

Several choices were available for qualitative research design. I considered a phenomenological design for the study. Phenomenological design is appropriate to investigate the lived experiences of individuals (Moustakas, 1994; Reiter, Stewart, & Bruce, 2011). However, as the employees have not yet performed knowledge transfer activities prior to retirement, a phenomenological approach was not appropriate.

I contemplated and dismissed an ethnographic design. A long-term study of a cultural group was not necessary to explore preferences of individuals experiencing the single event of knowledge transfer preferences prior to retirement (Scarduzio, Giannini, Geist-Martin, 2011; Shover, 2012). A grounded theory design was not appropriate as the outcome of the research included neither theoretical models regarding knowledge transfer

preferences nor formal theories from the data analyzed (Corbin & Strauss, 2015). Life stories were not directly applicable to the isolated event of retirement and work preferences, so a narrative design was inappropriate (Clandinin & Connelly, 2000; Jorgensen, Dahl, Pedersen, & Lomborg, 2013).

A case study approach was the best fit for this qualitative study. The intent was to obtain a detailed description and understanding of the knowledge transfer preferences of expert employees nearing retirement. Although a multisite case study approach may have been appropriate, I rejected the approach. The presence of knowledge transfer strategies at other national laboratories was not available. For the stated reasons, the focus of the study was the lack of knowledge transfer strategy found at one national laboratory. Yin (2014) described five possible criteria for conducting single-case studies. The possible criteria include (a) testing a critical case of a known formulated theory, (b) unique cases, (c) representative cases, (d) revelatory cases, and (e) longitudinal cases. Meeting any number of criteria is sufficient for conducting a case study. This case study included two of the five criteria. The intent was to explore the knowledge transfer preferences of expert, representative employees of a national laboratory who are nearing retirement, a population not observed in social scientific research. For these reasons, a single-site case study method was appropriate to answer the research questions offered in the next section.

Research Question

The purpose of this study was to explore knowledge transfer preferences of expert employees nearing retirement at a United States national laboratory, specifically employees in scientific support roles. The central research question was:

How do expert scientific support employees nearing retirement prefer to transfer knowledge?

The following research subquestions were fundamental to supporting the central research question and were the basis for development of interview questions.

1. What knowledge transfer techniques are available to employees?
2. What do employees recommend as preferred knowledge transfer techniques?
3. What barriers may prevent knowledge transfer from employees?
4. What suggestions do employees offer to overcome knowledge transfer barriers?

Interview Questions

I used the following questions during personal interviews with participants to gain knowledge for further analysis in the study:

1. What is your current position in your organization?
2. How many years have you worked for the Laboratory?
3. How many years of experience do you have in your field?
4. What is your desired timeframe for retirement?
5. When you retire, what plan is in place to backfill your position?
6. Please describe the 2–3 most important parts of your job.

7. What kinds of knowledge do you think are important to transfer to others?
8. What techniques do you have available to transfer your expert knowledge to other employees before you retire?
9. What techniques may you employ personally to transfer your expert knowledge to other employees?
10. From the list of techniques you will use personally, which is your most preferred method to transfer knowledge to other employees?
11. What barriers may prevent you from transferring your expert knowledge to other employees?
12. What suggestions do you have for overcoming any barriers preventing you from transferring your expert knowledge to other employees?
13. What concerns do you have about transferring your expert knowledge to other employees?
14. What concerns do you have about knowledge loss in organizations when employees leave?

Conceptual Framework

Four theories comprised the conceptual framework. The theories were (a) systems theory, (b) organizational learning theory, (c) knowledge management theory, and (d) expectancy theory of motivation. The authors of the four theories provided a foundation for understanding extrinsic and intrinsic factors relating to knowledge transfer among employees. Presented in this section is (a) a description of the theories comprising the conceptual framework in this study, (b) a discussion of relationships between each theory

described in the conceptual framework, and (c) how the theories relate to the problem of organizational knowledge loss from lack of knowledge transfer.

von Bertalanffy (1950) discussed systems theory as the *whole* comprising more than the sum of its parts. Many parts comprise a system, each part with interrelationships with the other parts of the system. The interrelationships are noteworthy as the application of an external influence upon one part of a system may affect other parts. The implication for the systems theory in this study is employee behavior and the processes of knowledge transfer are part of an organizational system including other factors such as a competitive advantage, productivity, and employee performance. Attitudes and influences upon one part of the organization may affect other parts in positive or negative ways. A manager resolving the problem of organizational knowledge loss and productivity should consider systems theory (von Bertalanffy, 1950) before implementing potential partial solutions.

Argyris and Schön (1978) defined organizational learning theory as a method to identify and correct errors. Later, Dodgson (1993) described organizational learning as how employees in organizations use knowledge and routines to develop organizational efficiency. Dodgson (1993) also stated organizational learning is also more than the sum of its parts, a corollary to the systems theory developed by von Bertalanffy (1950). Employees are the parts of the organization who hold organizational knowledge used in working together to achieve shared goals. The problem of organizational knowledge loss relates to organizational learning theory through reduced knowledge creation caused by

lack of knowledge transfer in organizations. Employees of organizations create, manage, and use two types of knowledge: *explicit* and *tacit* knowledge.

Polanyi (1966), and later, Nonaka (1994), described explicit knowledge as knowledge codified and transmitted through methods such as writing, diagramming, and speaking. Tacit knowledge is more difficult to transfer because of the personal and contextual qualities of the knowledge (Nonaka, 1994). Polanyi (1966) described tacit knowledge stating, “We can know more than we can tell” (p. 4). Managers who want to increase organizational efficiency must realize organizational learning is part of a complex system of employees sharing explicit and tacit knowledge.

Vroom (1964) defined expectancy theory as the motivation of employees to accomplish tasks by making choices. Employees must *do* something for knowledge transfer to occur in organizations. Vroom (1964) proposed behavior results from choices in which alternatives range from maximizing pleasure to minimizing pain. Employee motivation may affect the preferences in transferring knowledge. Vroom stated individual motivation comprises an employee’s belief that increased effort leads to increased performance, favorable performance results in desirable rewards, the reward gained will satisfy an important need, and the desire to satisfy the important need is worth the effort expended. The implication of the expectancy theory is the employee’s beliefs regarding the outcome of the effort expended in knowledge transfer activities affect individual employee motivation to transfer knowledge. If an employee does not believe the effort of knowledge transfer is personally rewarding, the motivation to expend the effort is likely to be low. Employees, as part of an organizational system, may act based on influences in

a different part of the system. Managers who want to influence the intrinsic motivation of employees might choose to provide direct or indirect incentives (Martín-Pérez, Martín-Cruz, & Estrada-Vaquero, 2012).

Definition of Terms

This study includes several terms that, to clarify understanding, I have chosen to define. To provide clarity, listed below are definitions of selected terms:

Baby Boomers: Baby Boomers are adults born between 1946 and 1964 (Neumark et al., 2013).

Competitive advantage: A competitive advantage is a state in which employees in an organization achieve an advantage over rivals in an industry through the management of resources not easily imitable or substitutable by other firms. Firm-based knowledge resources are essential to achievement of competitive advantage (Sirmon et al., 2011).

Expert employees: Expert employees are individuals employed in the same role or organization for 10 years or more or considered experts by others based on their high achievement in their domain through years of experience (Martin et al., 2012).

Explicit knowledge: Individuals may express explicit knowledge using sentences or drawings. Individuals may acquire explicit knowledge through activities and practice (Nonaka & Krogh, 2009).

Generation X: Generation X members include adults born between 1965 and 1980 (Tang et al., 2012).

Knowledge transfer: Knowledge transfer is the action of moving knowledge, tacit or explicit, from one individual to another. Formal or informal networks are necessary for

the social interactions needed to transfer tacit knowledge; transfer of explicit knowledge occurs through activities such as documented practices, e-learning, or reports (Oye, Salleh, & Iahad, 2011).

Nearing retirement: Employees nearing retirement are eligible for retirement within 5 years based on an employee-stated date or the date on which an employee might receive monthly retirement income from the employer, or age 62 years based on Social Security Administration rules (Social Security Administration, n.d.).

Scientific support staff: Scientific support staff includes employees who provide support services to scientists and do not engage directly in scientific discovery. Examples of job titles include project managers, carpenters, administrators, human resources specialists, and accountants (Diamandis, 2015).

Tacit knowledge: Tacit knowledge includes knowledge encompassing personal qualities, commitment, and context from an individual. Nonaka and Krogh (2009) stated how tacit knowledge is difficult to formalize and communicate, as tacit knowledge is intuitive and conceptual. Individuals with tacit knowledge understand *how* to accomplish tasks or activities (Oye et al., 2011).

WIKI: WIKIs are editable web pages individuals collaboratively create native electronic documents and upload documents for future retrieval (Levy, 2011).

Assumptions, Limitations, and Delimitations

Assumptions

Researchers use assumptions to identify beliefs not yet verified as true (Kirkwood & Price, 2013). The first assumption was managers of organizations want to retain the

knowledge of expert employees nearing retirement. Managers may not consider knowledge transfer among employees necessary to productivity, though other researchers have provided warnings (Calo, 2008; Levy, 2011). Managers may not be aware of the impending problem and may not acknowledge potentially lost productivity caused by the future reduction of available workers (Calo, 2008). Managers may overcome lost productivity by recognizing an urgent need to transfer organizational knowledge to the next generation of employees prior to expert employee retirement. Additionally, manager support is necessary to allow interviews of employees for the study.

The second assumption was a willingness of employees to self-identify as an expert nearing retirement. Employees may not self-identify as experts because of a lack of self-awareness (Joe et al., 2013). To identify employees as experts, I provided employees with an operational definition of an *expert*. Experts are individuals considered an expert by other employees. Alternatively, experts are individuals employed in the same organization for at least 10 years (Martin et al., 2012).

When known as older workers, employees may not want to make retirement intentions known for fear of reprisal or treatment as less valuable (Stone & Tetrick, 2013). Participants may fear reprisal. To alleviate the fear of reprisal, I notified participants that data collected are confidential and no names of participants would appear in the study.

Limitation of researcher bias was the third assumption. Research activities, including interviewing, coding, and discussion of results, may unintentionally introduce researcher bias (Chenail, 2011). In addition, because of my employment at the

organization studied, participants may have been reluctant to share honest responses for fear of reprisal.

I employed three methods to reduce bias. The first was an assessment of self-resistance to data contrary to the initial assumptions of results. Resistance to the results by a researcher may indicate bias. Case study researchers are prone to bias, as the design method requires researchers to have an intimate understanding of the problem beforehand to define the case boundaries accurately (Yin, 2014). Second, a small group of trusted colleagues reviewed preliminary findings without knowing the source of information. The trusted group of colleagues challenged presented results and provided feedback on any perceived bias in the findings. Finally, I informed participants of my employment within the organization, discussed confidentiality of participant responses, addressed any reluctance to be honest, verified no manager-to-employee relationship existed, and offered each participant the option to conclude the interview at any time.

Limitations

Limitations are potential weaknesses of a study (Brutus, Aguinis, & Wassmer, 2013). The results of this study may not be applicable to other national laboratories or government agencies as I interviewed employees from only one United States national laboratory. Without further investigation in other organizations, generalization of results may not be appropriate. In addition, national laboratories have many employees with advanced degrees and have participated in educational activities as students for many years. The population of participants is not comparable to every industry's population; consequently, conclusions made from the study may not be generalizable to industries

with different educational bases. Researchers using case study methods may provide valuable research by identifying other cases that may be generalizable when replicated (Yin, 2014). Future researchers may use results from this study as the basis for additional studies in various national laboratories or industries.

Delimitations

Delimitations are the boundaries of a study imposed by a researcher (Bernard, 2013). Perceptions of individuals at a single site, a national laboratory in the United States, were the focus of the study. The national laboratory has more than 4,200 employees on one main site and five satellite locations in the same geographical area. I limited interviews to employees meeting the criteria of an expert and who are eligible for retirement within 5 years based on the guidelines of the laboratory or the federal minimum retirement age of 62 years (Social Security Administration, n.d.). Other employees not meeting these criteria may not have considered transferring job responsibilities to another employee after retirement.

Significance of the Study

Loss of knowledge resulting from employee retirement may affect both the employee's immediate workgroup and other parts of an organization (López-Nicolás & Meroño-Cerdán, 2011; Mills & Smith, 2011). Organizational productivity loss, decreased throughput, and lessened competitive advantage are three potential effects of knowledge loss (Calo, 2008; Sirmon et al., 2011). Some managers are not aware of the problem of organizational knowledge loss; some are aware but do not act in any significant manner. Other managers may choose to assess the risks to their organizations before considering a

knowledge transfer strategy (Levy, 2011). After managers are ready to reduce the effects of knowledge loss attributable to retirement, the managers may use the results of this study to develop plans to transfer knowledge from employees prior to retirement. Manager-developed plans may reduce potential effects of service reductions to United States citizens caused by an increasing retirement rate of the federal workforce. In addition, managers providing additional learning opportunities may enhance employee job satisfaction for remaining and replacement employees.

Contribution to Business Practice

Reduced organizational productivity, output, and governmental services are results of lack of knowledge transfer from experienced, retiring employees (Calo, 2008; Fredericksen, 2010). Managers may not be able to achieve their scientific missions because of an absence of knowledge transfer practices in national laboratories. I explored knowledge transfer preference of expert employees nearing retirement. The findings and conclusion from this study may help managers of national laboratories in planning efforts to reduce organizational knowledge loss and maintain organizational productivity. In addition, opportunities for learning during knowledge transfer may benefit retiring, replacement, and remaining employees as Sabir and Kalyar (2013) found organizational learning linked to job satisfaction. Although a substantial base of research on knowledge transfer practices and issues resulting from an increase in federal worker retirements exists (Fredericksen, 2010; Lewis & Cho, 2011; Neumark et al., 2013; Szinovacz, 2011), research on the transfer preferences of expert scientific support employees who hold knowledge is lacking.

Implications for Social Change

Citizens may experience reduced government services resulting from increasing retirement rates of the federal workforce and a declining available workforce. Retiring employees leave with explicit and tacit knowledge gained through years of experience. Managers of federal organizations may need years to replace or regain knowledge lost from retiring employees. The remaining workers will be less productive than other workers are without knowledge transfer from experienced employees (López-Nicolás & Meroño-Cerdán, 2011; Mills & Smith, 2011). The United States Department of Energy maintains a network of national laboratories to "ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions" (United States Department of Energy, n.d., para. 1). Managers may use the results of this study to engage retiring workers and capture expert knowledge, thereby reducing the effects of organizational productivity loss and increasing job satisfaction for retiring, replacement, and remaining employees. Reducing the effects of knowledge loss resulting from employee retirements may help promote the prosperity of citizens who benefit from advances in energy research and technology.

A Review of the Professional and Academic Literature

To determine how authors of previous research have described the problems of organizational loss of productivity because of increasing numbers of employees retiring and how managers may mitigate the problem using knowledge transfer methods, I used multiple databases accessed through the Walden University Library and the University of California Digital Library. The databases used include ABI/INFORM Complete,

Academic Search Complete, Business Source Complete, EBSCO, Emerald Management Journals, LexisNexis Academic, ProQuest Central, PsycINFO, SAGE Premier, and ScienceDirect. The University of California Library staff provided assistance to obtain loans of books not available electronically. Search terms used include *knowledge transfer*, *retirement*, *knowledge management*, *tacit knowledge*, *explicit knowledge*, *expert*, *knowledge transfer barriers*, *motivation*, *organizational culture*, and *trust*. The searches yielded multiple references. The literature review includes 84 peer-reviewed references with 86% of the references published in or after 2011. A total of 81/84 (96%) references used in the literature review are peer-reviewed references. The entire study includes 127 references with 112 (88%) peer reviewed references and 108 (85%) references published in or after 2011.

Previous researchers agreed employees within organizations might experience decreased productivity and competitive advantage resulting from knowledge loss when employees retire (Joe et al., 2013; López-Nicolás & Meroño-Cerdán, 2011; Mills & Smith, 2011). Several authors agreed an increasing number of employees are retiring including individual contributors and managers (Durst & Wilhelm; 2011; Lewis & Cho, 2011; Neumark et al., 2013). Increasing employee retirement will increase tacit and explicit knowledge loss leading to organizational productivity loss and reduction of competitive advantage (Joe et al., 2013; López-Nicolás & Meroño-Cerdán, 2011; Mills & Smith, 2011).

Knowledge management and transfer are highly complex processes as the processes are dependent upon individuals who, by nature, exhibit highly variable work

practices because of differences in knowledge transmission and interpretation (Joia & Lemos, 2010). When managers realize the complexity of the problem, compounded with systems theory as described by von Bertalanffy (1950), a need to address the problem of knowledge loss in organizations is apparent. Whole organizations comprising more than a sum of its parts means the general problem is more than the summation of individual problems.

Although many researchers (Appelbaum, Gunkel et al., 2012; Gururajan & Fink, 2010; Mayfield, 2010) described methods and barriers to knowledge transfer, a common successful strategy to use in every organization does not exist. The literature includes many recommendations for managers of organizations to promote various knowledge management and knowledge transfer practices (Gururajan & Fink, 2010; Levy, 2011; Markova & Ford, 2011), thereby preventing knowledge loss when expert employees retire. Several authors (Gagnon, 2011; Gururajan & Fink, 2010; Levy, 2011; Lewis & Cho, 2011; Mayfield, 2010) recommended methods to support tacit and explicit knowledge in future transfer efforts including (a) documentation, (b) mentoring, (c) electronic databases, (d) meetings, (e) rehiring retirees, and (f) knowledge brokering. Researchers (Al-Adaileh & Al-Atawi, 2011; Gururajan & Fink, 2010; Joia & Lemos, 2010; Swift & Hwang, 2013) found multiple factors affecting knowledge transfer including individual motivation, formalization of knowledge transfer practices, trust, organizational culture, and physical workspace design. The research aligned with Vroom's (1964) expectancy theory of individual motivation to accomplish tasks. If

individuals do not have appropriate motivation, intrinsic or extrinsic, knowledge transfer activities do not occur compounding the reduction in organizational performance.

The literature review section includes several sections. Each section includes a review of literature related to organizational productivity and competitive advantage loss resulting from retiring employees and knowledge transfer practices. The review begins with an overview of the current problem faced by managers and the potential risks of inaction. Next is an account of the history of knowledge management from 1962 to present reviewing the complexity of the topic described by researchers. Next is a summary of definitions of knowledge transfer including specific definitions of tacit knowledge, explicit knowledge, knowledge conversion, knowledge creation, and expertise found in the literature. Concluding the literature review section is a description of knowledge transfer methods and factors affecting knowledge transfer.

Overview of United States Population Retirement

Retirement is a planned, complete, and most often, permanent withdrawal of the workforce by an older worker (Kopecky, 2011). As the population of the Baby Boomer generation begins to retire, knowledge not transferred will not be available for the next generation of workers (Cochran et al., 2012; Fredericksen, 2010; Lewis & Cho, 2011). To understand the need for knowledge transfer programs, managers should be aware of workforce projections, specifically how the available number of experienced workers will decrease over the next decade because of the increasing retirements of Baby Boomers (Fredericksen, 2010; Neumark et al., 2013; Stone & Tetrick, 2013; Szinovacz, 2011).

Although the shift in age has increased across multiple industries, the mean age of workers increased most rapidly in state and federal governments resulting from slowed hiring after the majority of Baby Boomers entered the workforce (Lewis & Cho, 2011). For example, in 1980, state governments employed as many workers under age 30 as over age 50. In 2006, state government employees over age 50 outnumbered state government employees younger than 30 years by four times (Lewis & Cho, 2011). In 2007, 24.4% of state government employees were age 55 years or older (Lewis & Cho, 2011). Fredericksen (2010) noted approximately 25% of the estimated 166.9 million United States workers will be at least age 55 years by 2018. The statistics cited are relevant for this study as the population for this study is a national laboratory managed by a state government entity.

Postretirement reemployment also affects the available workforce. More individuals returning to work after retirement increases the skilled workforce available. However, once individuals retire, most stay retired (Pleau & Shauman, 2013). Pleau and Shauman (2013) found the average percentage of individuals returning to the American workforce after retirement to be 3.7% in a sample of workers studied from 1977 to 2009. The trend in postretirement reemployment has not changed significantly between 1977 and 2009 (Pleau & Shauman, 2013). Although the historic trend in postretirement reemployment is unchanged even during times of recession, Pleau and Shauman found effects from robust health and pension programs on postretirement behavior. Declining availability of private health insurance has a negative influence on postretirement employment rates (Pleau and Shauman, 2013). However, individuals may perceive a need

to work longer to retain employer-sponsored health benefits until Medicare coverage begins at age 65 years (Szinovacz, 2011). Szinovacz (2011), and Hurd and Rohwedder (2011) suggested the diminishment of defined pension plans might also indicate a tendency to delay retirement or reenter the workforce. Individuals eligible for defined pension plans have higher retirement rates than individuals with defined-contribution plans (Hurd & Rohwedder, 2011).

Although financial incentives are one consideration for workforce reentry, other incentives are also important to retirees. In addition to financial incentives, individuals consider social, personal, and generative issues when deciding to return to work after retiring (Armstrong-Stassen & Schlosser, 2011; Armstrong-Stassen & Staats, 2012, Bal et al., 2012). The percentage of individuals returning to work is essential to the success of one potential method of knowledge transfer: retiree rehiring (Lewis & Cho, 2011).

Potential Effect of Management Inaction

A concern for managers is 38% of the current United States workforce will likely retire by 2030 (Neumark et al., 2013). This high percentage of the workforce may cause a similar percentage of knowledge loss from the workforce unless transferred to other workers (Lewis & Cho, 2011; Stone & Tetrick, 2013). Coupled with a likely increase in turnover in younger workers who no longer expect to retire from the same organization at which employment started (Fredericksen, 2010), managers will need to hire individuals frequently. The individuals hired will need training thus knowledge transfer practices and succession planning is essential to maintaining institutional memory (Lewis & Cho, 2011), organizational effectiveness (Lewis & Cho, 2011; Mills & Smith, 2011) and

competitive advantage (Joe et al., 2013, Sirmon et al., 2011). In addition to knowledge transfer needed during hiring, Wang and Wang (2012), found tacit and explicit knowledge sharing had an effect on organizational innovation leading to increased operational and financial performance of an organization. A lack of knowledge transfer activity may have a detrimental effect on organizational performance.

In state and federal government agencies, inaction regarding knowledge transfer is a larger problem compared to private industries as the public workforce has a larger percentage of older workers than private industry (Lewis & Cho, 2011). Increasing numbers of retirements without adequate knowledge transfer may reduce the capacity of state and federal agencies to provide services to citizens (Lewis & Cho, 2011; Pee & Kankanhalli, 2015). As the population of the United States grows, the demand for services will also increase (Fredericksen, 2010). If managers ignore the need for knowledge transfer from retiring employees, the combination of capacity loss and increased demand for service will likely cause a crisis in governmental services to its citizens. Managers who develop knowledge transfer processes may contribute to public sector sustainability (Greiling & Halachmi, 2013).

History of Knowledge Management

The science of knowledge management is a complex field of study described regularly throughout the 20th century (Lambe, 2011; Wallace, Fleet, & Downs, 2011; Wilkesmann & Wilkesmann, 2011). Lambe (2011) suggested a lack of historic awareness of the field of knowledge management contributes to the complexity. Lambe found knowledge management concepts and practices published as early as 1962. The term

knowledge management appears in multiple publications regularly in the 1960s and 1970s (Lambe, 2011). Researchers published articles describing the relationship between data management and knowledge management (Lambe, 2011) in the 1970s. The term knowledge management became more prevalent in the 1980s than in earlier years (Lambe, 2011). Lambe suggested multiple uses of terms and approaches modeled from other disciplines in research published since the 1960s contributes to uncertainty and confusion in the field of knowledge management. Another reason for complexity in the field is researchers have not found one knowledge transfer method effective in every instance, nor have researchers found a common, systematic approach to evaluating knowledge transfer methods (Wallace, et al., 2011; Ward et al., 2009). Uncertainty in available research underscores the need for additional studies of the effectiveness of knowledge transfer methods.

Researchers, as noted by Lambe (2011), started exploring a subset of knowledge management by studying practical and theoretical challenges of knowledge transfer, utilization, and diffusion in the 1970s and 1980s. Arrow (1969) identified the societal need for study in the area of knowledge transfer in 1969. Arrow stated the importance of understanding knowledge transfer as a method to solve two socioeconomic problems. Arrow asserted knowledge transfer might resolve international inequality of productivity and failure of educational systems to reduce income inequality. Arrow differentiated the production of goods from the production of knowledge observing no benefit from developing knowledge twice. Arrow declared nations with higher productivity had successful communication systems to transfer knowledge so researchers should study

communication systems and costs of communication to transmit knowledge to reduce productivity and income inequality between nations.

Knowledge in healthcare settings was an area of research in the 1970s (Lambe, 2011). Lambe (2011) described the study of knowledge utilization in healthcare settings as a precursor to research in social and economic effects of knowledge creation and application in large-scale economies and organizations. Researchers at the Human Interaction Research Institute advanced studies of knowledge utilization to include organizational transformation and introduced the concept of capacity building in nonprofit organizations (Lambe, 2011).

The term knowledge management became a formal and mainstream concept in the 1980s, originating in practice from the consulting community (Lambe, 2011). The practice of knowledge management became increasingly common in organizations for two reasons. The first reason was managers recognized information and knowledge as assets, and the second reason was the realization individuals might use the Internet to disseminate information on a global scale at a relatively low cost (Lambe, 2011).

Nonaka (1994) called for a shift in thinking how organizations create and use knowledge. Nonaka discussed differences between tacit and explicit knowledge to meet an increasing need to solve problems through knowledge creation and innovation sharing from one part of an organization to another. Nonaka proposed a spiral model illustrating how tacit and explicit knowledge contribute to knowledge creation. Nonaka described the importance of knowledge conversion essential to transferring knowledge between tacitness and explicitness and transferring knowledge among individuals. In addition,

Nonaka compared three distinct management models managers may use, each of which relies on middle managers, described as knowledge engineers, who synthesize information from frontline employees and top level management to put innovative ideas into action.

Nonaka and Krogh (2009), further refined Nonaka's (1994) earlier model to clarify the concepts presented in Nonaka's 1994 work. Nonaka and Krogh clarified Nonaka's definitions of knowledge creation, knowledge conversion, and the distinction between tacit and explicit knowledge. Nonaka and Krogh restated the conceptual model by describing how tacit and explicit knowledge are not competing concepts but rather part of a continuum. Additionally, Nonaka and Krogh stated tacit knowledge is necessary to explain explicit knowledge; thus, employees use both types of knowledge in knowledge transfer activities.

Several researchers (Andreeva & Kianto, 2012; López-Nicolás & Meroño-Cerdán, 2011; Mills & Smith, 2011) studied business practices and found correlations between knowledge management practices and organizational performance. Andreeva and Kianto (2012) suggested focusing upon knowledge management might have an effect on an organization's financial status. However, Mills and Smith (2011) found knowledge management practices are not consistently direct contributors to organizational performance. Together, knowledge management technology and developing organizational structures supporting knowledge management support organizational performance. Mills and Smith warned managers must find the right combination of practices that will be effective in their respective organizations. Resulting from the three

studies, managers may articulate the business effect, and necessity of, knowledge management practices in improving organizational performance.

Knowledge Transfer Defined

Several researchers (Joia & Lemos, 2010; Wilkesmann & Wilkesmann, 2011) have defined knowledge transfer in the literature. Knowledge transfer is complex and transferred on several levels of human interaction. Knowledge transfer is variable attributable to individual differences in transmission and interpretation of knowledge (Joia & Lemos, 2010). Tacit and explicit knowledge are two primary types of knowledge described by Nonaka (1994) and Polanyi (1966). This section includes a discussion of different knowledge types, how individuals convert one type of knowledge to another type, the distinction between knowledge creation and knowledge transfer, and the difference between experience and expertise in knowledge transfer. Finally, the section concludes with a description of a framework proposed by Ward et al. (2009) for knowledge transfer.

Founding definitions. Knowledge transfer is a complex process individuals conduct at multiple levels of an organization. Transfer may be on any of three levels: individual, intra-organizational, or inter-organizational (Wilkesmann & Wilkesmann, 2011). Although transfer of written knowledge is an exercise in data transference, transferring non-verbal, know-how, tacit knowledge as defined by Polanyi (1966) involves human intervention thereby increasing variability in the process (Wilkesmann & Wilkesmann, 2011). Oye et al. (2011) also supported the need for human interaction in tacit knowledge transfer through formal and informal social networks. Oye et al.

described knowledge transfer as the action of moving knowledge, tacit or explicit, from one individual to another.

Knowledge transfer is contextual. The organization's culture (Chow, 2012) and motivation factors (Chen, Chang, Tseng, Chen, & Chang, 2013; Hau, Kim, Lee, & Kim, 2013; Swift & Hwang, 2013) affect knowledge transfer among individuals. Knowledge is difficult to manage as knowledge is highly contextual and situational (Nonaka, 1994). Additionally, each human being interprets knowledge differently (Joia & Lemos, 2010), adding complexity to knowledge transfer activities. A discussion of knowledge types found by researchers shall help define the concept of knowledge transfer, as knowledge exists in different forms.

Explicit knowledge. Individuals use two primary types of knowledge in knowledge transfer. Individuals express explicit knowledge through writing or drawings. Polanyi (1966) described explicit knowledge as transmittable through formal and systematic methods. Individuals acquire explicit knowledge through activities and practice (Nonaka & Krogh, 2009). Individuals may also capture explicit knowledge through digital means including databases and archives from which other individuals may access the information when needed (Nonaka, 1994). Organizational documents and systems contain explicit knowledge (Jyoti, Gupta, & Kotwal, 2011). In addition, individuals may tell and show another individual explicit knowledge (Nonaka, 1994). An example of explicit knowledge is the procedure to change the engine oil in a vehicle. One individual may create the knowledge how to accomplish this task and write the instructions on a piece of paper with drawings to add clarity. Later, another individual

may pick up the document and follow the instructions to change the oil in the same type of vehicle.

Tacit knowledge. Conversely, an individual's tacit knowledge has personal and experiential qualities (Joia & Lemos, 2010; Nonaka, 1994). The personal qualities of tacit knowledge create a different challenge as tacit knowledge indwells within a person (Polanyi, 1966). Individuals cannot easily transmit tacit knowledge through digital, written, or verbal means. Individuals gain tacit knowledge through experience (Nonaka, 1994). Polanyi (1966) described tacit knowledge as knowing more than one can tell whereas Nonaka and Krogh (2009) tied tacit knowledge to the senses, intuition, or implicit rules of an individual or organization. This definition is problematic for managers who want to capture knowledge quickly about how a person should achieve results as individuals gain knowledge through experience. Individuals retain transferred knowledge better when multiple social interaction opportunities take place over time, ideally three to six months (Levy, 2011). One example of tacit knowledge is the understanding of the culture of the organization gained by experience interacting with different individuals throughout the organization. Interactions among individuals to learn from their experience is a time-consuming and nonprescriptive process using social exchange mechanisms including meetings and conversations (Nonaka, 1994; Wilkesmann & Wilkesmann, 2011).

Knowledge conversion. Nonaka (1994) and Nonaka and Krogh (2009) extended Polanyi's description to a practical level for managers by proposing a continuum-based model describing knowledge creation through tacit and explicit knowledge conversion.

Nonaka described four modes of conversion: from tacit to explicit knowledge through externalization, from tacit to tacit knowledge through socialization of shared experiences, from explicit to tacit knowledge through internalization, and from explicit to explicit knowledge through a combination process. Nonaka and Krogh stated tacit and explicit knowledge are not mutually exclusive but are complementary through interactions by individuals and groups. Nonaka and Krogh provided the example of an individual speaking a sentence containing explicit knowledge to require tacit knowledge needed to shape sounds and use rhythm to provide meaning. True knowledge is the capacity of an individual to act based upon both tacit and explicit elements (Nonaka & Krogh, 2009).

Knowledge creation and transfer in individuals. Wilkesmann and Wilkesmann (2011) extended the concepts of Polanyi (1966), Nonaka (1994), and Nonaka and Krogh (2009) to the transfer of knowledge among individuals. Wilkesmann and Wilkesmann described obtaining knowledge and providing knowledge as two distinct but interrelated aspects of the knowledge transfer process. Individuals integrate new knowledge with their existing knowledge thereby creating distinctly new and personalized knowledge. New knowledge integration is necessary for tacit knowledge transfer because of the personal nature of knowledge within individuals (Nonaka, 1994) although employees learning truly explicit knowledge captured in written forms may not need to integrate new knowledge. As knowledge is a continuum between tacit and explicit (Nonaka & Krogh, 2009), knowledge transferred brings new knowledge based upon the receiver. The result is knowledge creation resulting from knowledge transfer among individuals; a linkage exists between knowledge transfer and knowledge creation theories. However,

individuals should note a process is important and necessary to determine useful and useless knowledge as some knowledge may not be useful (Chatti, Schroeder, and Jarke, 2012; Levy 2011). Knowledge is constantly changing and may become useless if changed over time or if removed from an original context.

Knowledge transfer approaches. Customization of approaches to knowledge transfer is necessary for knowledge has different degrees of tacitness and explicitness (Chen & McQueen, 2010). Embedded, tacit knowledge is most difficult and time-consuming to transfer. Multiple individuals own tacit knowledge embedded in teams and social interactions (Chen & McQueen, 2010). In contrast, explicit knowledge is easier to transfer than explicit knowledge (Chen & McQueen, 2010). Employees may store words and numbers in electronic repositories for future retrieval.

Chen and McQueen (2010) described two types of knowledge transfer processes: structured and unstructured. Structured knowledge transfer is formal and systematically planned. For example, if a manager wants one employee to transfer knowledge needed to create a report to another employee, the manager may establish a scheduled time for one employee to write down each step needed. Later, the manager may have the two employees sit together to discuss the steps. Finally, the manager may ask the employee who just learned the steps to create the report to prove the employee may retain and act upon the knowledge transferred. Conversely, unstructured knowledge transfer is an informal and sometimes spontaneous process (Chen & McQueen, 2010). Chen and McQueen found three types of unstructured processes called unstructured copy, unstructured adaptation, and unstructured fusion. Unstructured knowledge transfer often

occurs in daily work in a just-in-time approach among individuals who work in the same field and who share a common language. To address variability in the tacitness of knowledge, managers should customize knowledge transfer approaches based upon the knowledge type transferred.

Experience and expertise differences relating to knowledge transfer. Knowledge transfers between two types of individuals: experts and novices. Experts are vital to organizations because experts possess specialized individual knowledge, know how to locate codified knowledge of methods and procedures, and solve problems efficiently (Joe, et al., 2013). Experts also have extensive skills acquisition, years of experience, and exhibit high performance in a domain of expertise (Martin et al., 2012; Wilkesmann & Wilkesmann, 2011). Martin et al. (2012) and Wilkesmann and Wilkesmann (2011) found individuals consider others experts by coworkers if the individuals have more than 10 years of domain experience and authoritative knowledge in an area of practice. The differences in knowledge among novices and experts are the gaps individuals work to fill when transferring knowledge (Wilkesmann & Wilkesmann, 2011). Identification of novice and expert employees is essential for determining an appropriate knowledge transfer process. Novice employees often require more structured knowledge transfer processes compared to expert employees who may use unstructured methods including adaptation and fusion to transfer knowledge effectively (Chen & McQueen, 2010).

Knowledge transfer models. A challenge for managers is to develop a strategy to transfer tacit and explicit knowledge from expert employees to others in an

organization. Ward et al. (2009) conducted a narrative review of knowledge transfer literature and identified 28 different knowledge transfer models proposed by other researchers. The 28 models did not contain every common component identified, adding to the potential confusion of managers trying to develop a strategy.

Ward et al. (2009) identified three main types of transfer processes from the 28 models reviewed. The three types of knowledge transfer processes identified were linear, cyclical, and a dynamic multidirectional process. Ward et al. found cyclical processes most frequently. The cyclical processes were similar to the linear models with the exception of a loop back to the beginning of the model depicting an interactive and ongoing process.

Synthesizing information from the 28 knowledge transfer models and three types of knowledge transfer processes studied, Ward et al. (2009) proposed a dynamic multidirectional process as a foundation for future research. The dynamic multidirectional process proposed has five components each linked to the others. The components are problem identification and communication, knowledge/research development and selection, contextual analysis of barriers, knowledge transfer activities or interventions, and knowledge utilization (Ward et al., 2009). Ward et al. suggested multidirectional linkages between each component in which any component may occur without regard to preceding another. Although untested, Ward et al. suggested the multidirectional framework model provides necessary contextual flexibility. The framework also accurately reflected the need for simultaneous actions of individual components by managers creating knowledge transfer strategies in organizations.

Knowledge transfer is critical to managers who want to reduce productivity and competitive advantage loss when expert employees obtain new roles within an organization, leave the organization for another company, or retire (Joia & Lemos, 2010; Kim et. al., 2013; Mills & Smith, 2011; Sirmon et al., 2011). Although understanding the concept of knowledge transfer is beneficial, managers may find detailed instruction on knowledge transfer methods helpful. Presented in the next section is a discussion of potential knowledge transfer methods.

Knowledge Transfer Methods

Researchers (Levy, 2011; Lewis & Cho, 2011; McNichols, 2010) described many methods to transfer knowledge among employees in organizations. A search of electronic databases including ProQuest, Business Source Complete, ScienceDirect, and ABI/Inform Complete returned hundreds of articles written about different methods of knowledge transfer used to capture tacit and explicit knowledge. None of the articles found included a preference for one method over others, supporting the need to study the knowledge transfer preferences of expert employees nearing retirement. However, different methods might be appropriate in different circumstances based upon the individuals of the organization (Gagnon, 2011; Lewis & Cho, 2011; Mayfield, 2010). The following section includes descriptions of knowledge transfer methods found in the literature reviewed.

Documentation. Individual creation of documents detailing knowledge for others to read is one method of knowledge transfer. Documentation may be in print or electronic format using word processing, spreadsheet software, or web pages. Individuals may store

documents in an electronic repository such as a database for convenient retrieval by themselves or others when needed (Levy, 2011). Individuals may store and transfer explicit knowledge using documents. By definition, explicit knowledge is knowledge written or captured in drawings (Nonaka, 1994). Examples include operating procedures, equipment diagrams, and pictures (Levy, 2011). Levy (2011) suggested managers require summaries included in documents for ease of determining usefulness when searching for information.

Meetings. A meeting among employees is another method of knowledge transfer, specifically in the area of tacit knowledge transfer. Providing individual opportunities to discuss and ask questions is essential to retention because of the tacit, complex nature of knowledge (Levy, 2011). Meetings may be one-on-one or conducted in teams. One-on-one meetings include mentoring sessions, described in the next section. McNichols (2010) found unanimous agreement for team meetings as an effective knowledge transfer method from a group of Generation X engineers studied. The engineers described team environments as trusting, a factor in effective knowledge transfer (McNichols, 2010). Mayfield (2010) proposed town hall meetings as another effective method to transfer knowledge so individuals may share knowledge democratically and obtain immediate feedback. Individuals who share knowledge in teams create collective knowledge superior to one individual's knowledge. Transferring the collective knowledge back to each team member creates competitive advantage for the organization (McNichols, 2010).

Mentoring. Several researchers described mentoring an essential method to transfer knowledge (Appelbaum et al., 2012; Brondyk & Searby, 2013; Gururajan & Fink, 2010; McNichols, 2010). Mentoring is a relational exchange of information between two people for purposes of individual growth. Mentoring involves exchanges of knowledge, skills, and social networks on a regular basis over time (Brondyk & Searby, 2013). Although many mentoring programs are informal, formal programs sponsored by managers of organizations are more successful than informal programs (Levy, 2011; Mayfield, 2010; McNichols, 2010).

Support for formalized mentoring programs exists based upon several research articles (Huskins, et al., 2011; Mayfield, 2010; McNichols, 2010). Craig, Allen, Reid, Riemenschneider, and Armstrong (2012) stated mentorship provides benefits to the mentor and the employee. Baby Boomers have a desire to continue performing meaningful work and mentoring is one method favored by the group to contribute to the mission of the organization (Gursoy, Chi, & Karadag, 2013). Mayfield (2010) stated a need for formalization of mentoring programs to provide equitable opportunities for employees and managerial guidance in the content of knowledge exchanged. Huskins et al. (2011) discovered formalized mentoring programs increased the alignment of expectations between the mentor and mentee. McNichols (2010) found management support essential to overcome the barriers of time resources and budget constraints. Management support is crucial because of the time needed for mentoring programs, often requiring three to six months to facilitate retention of knowledge transferred based upon the tacitness and complexity of the knowledge (Appelbaum, Benyo et al., 2012; Joe et al.,

2013; Levy, 2011). McNichols' study of engineers found individuals are willing to exchange information with other individuals. However, if managers focus on short-term financial results rather than long-term success, mentoring programs for knowledge transfer purposes become a lower priority and eventually abandoned (McNichols, 2010). Finally, formalized mentorship programs include rewards and coaching support needed to continue an effective mentorship program. Successful mentorship programs require a reward system for the participants to continue participation (Appelbaum et al., 2012; Gururajan & Fink, 2010; Mayfield, 2010; McNichols, 2010). Support in the form of communities of practices or coaching training is also effective (Pollack, 2012). Formalized mentoring programs may be effective in facilitating knowledge transfer among employees prior to an employee leaving the organization for retirement.

Rehiring retirees. Only some knowledge transfer methods involve time and resources spent prior to an employee's retirement. State and local governments use retiree rehiring as a method for knowledge transfer (Lewis & Cho, 2011). This practice, commonly known as *double dipping,* involves employees retiring from a state or local government agency, receiving a pension, and returning to full employment with a public agency with the same retirement system (Thom, 2015). This practice allows employees to earn two income streams from the same public agency, an advantage for employees who want additional income after many years of public service. Employers benefit by hiring experienced employees into difficult to fill and sometimes lower paid positions. Alternatively, employers may hire the retiree back in the same department but in a slightly different role to transfer knowledge to employees hired to take the retirees place.

As time and resources are two barriers to knowledge transfer (McNichols, 2010), and additional money may be an incentive to promote knowledge transfer (Markova & Ford, 2011), managers may consider the practice of rehiring retirees to concentrate solely on knowledge transfer effective. However, Lewis and Cho (2011) warned the practice of rehiring retirees decreases career opportunities for younger workers potentially increasing turnover. Additionally, if an employee retires without any knowledge transfer and a different agency hires the employee, the agency loses the knowledge completely. Most importantly, as reemployment rates after retirement average only 3.7% from 1997 to 2009 (Pleau & Shauman, 2013), the practice of rehiring retirees will be marginally effective as a method to transfer knowledge. Other factors including gender and preretirement career type are significant in an individual's tendency to return to work postretirement (Armstrong-Stassen & Staats, 2012; Pleau & Shauman, 2013).

Knowledge brokers. Ward, Smith, House, and Hamer (2012) and Conklin, Lusk, Harris, and Stolee (2013) described using knowledge brokers in organizations as a method to formalize knowledge transfer. Knowledge brokers serve as intermediaries between creators and users of knowledge, creating links between the groups to facilitate formal knowledge transfer. Knowledge brokers are leaders who use influence rather than power to transfer knowledge between groups with similar interests (Conklin et al, 2013). Ward et al. illustrated how knowledge brokers become the intermediaries for translating research into practice as one method for exchanging knowledge among researchers and decision makers. Ward et al. found knowledge brokers were effective in transferring knowledge by actions including locating knowledge and tailoring knowledge for teams

by writing short reports easily read by decision makers. Knowledge brokers are helpful to decision makers who must synthesize knowledge from different sources and use knowledge gained to create actionable steps. Gagnon (2011) agreed knowledge brokering was one promising method of knowledge transfer among individuals. However, Ward et al. and Gagnon (2011) admitted knowledge brokering may not be effective from an efficacy or cost-effectiveness perspective because of a lack of research available.

Electronic storage and retrieval. Individuals may transfer knowledge using multiple electronic-based methods. Electronic databases store knowledge objects individuals may retrieve later. Knowledge providers create and store knowledge objects including digitized video recordings, documents, e-learning, and multimedia presentations to externalize tacit knowledge (Levy, 2011, Oye et al., 2011; Wei-Tsong & Zu-Hao, 2011). Electronic databases may be useful when individuals upload knowledge objects and retrieve them using software tools and system applications in an intuitive method (Levy, 2011).

Individuals may use WIKIs as another electronic repository to store and retrieve knowledge. WIKIs are editable web pages individuals collaboratively create native electronic documents and upload documents for future retrieval (Levy, 2011). WIKIs have history and version control functions allowing individuals to view contributions provided by other individuals and collaborate virtually in a collective authorship manner (Kiniti & Standing, 2013). Individuals may conduct full text searches of WIKIs resulting in a list of documents or electronic text based upon the search terms entered. Wei-Tsong and Zu-Hao (2011) found a positive influence of the use of WIKIs on knowledge sharing

intention though member sharing, virtual community participation, and benefit promotion.

Even though individuals in groups may view WIKIs as viable knowledge transfer tools regardless of the age of the individuals (Appelbaum, Benyo, et al., 2012), the evidence of sustained use of WIKIs as an effective knowledge transfer method is not consistent. Although Levy (2011), Gururajan and Fink (2010), Mayfield (2010), and Wei-Tsong and Zu-Hao (2011) described successful knowledge transfer using WIKIs, Kiniti and Standing (2013) found several challenges for managers to overcome in the successful implementation of a WIKI. To implement WIKIs successfully, managers should focus upon finding a corporate champion, ease of use, integrating WIKIs into standard work practices, and overcoming employees feeling of ownership of their knowledge. Without management support to implement a formal strategy, successful implementation of WIKIs are inconsistent (Kiniti & Standing, 2013). Managers of organizations should evaluate the organization culture and individual motivational barriers prior to implementing electronic storage and retrieval methods, including the use of WIKIs.

Factors Affecting Knowledge Transfer

Lambe (2011) credited Arrow (1969) with the first discussion on how organizational constraints affect knowledge transfer. Employees transferring knowledge are essential to prevent wasted effort in knowledge production. Arrow stated communication systems, information withholding to maintain monopoly positions, costs, and inability of the receiver to understand are factors affecting organizational knowledge

transfer. Multiple researchers found transfer of knowledge affected by other factors including formalized transfer practices, learning styles, cognitive ability, motivation, trust, organizational culture, language, and workspace design. Listed in the following section are descriptions of factors affecting knowledge transfer.

Formalized practices. Managers who formalize knowledge management practices may deter knowledge transfer in organizations although some researchers found formalization essential to successful knowledge transfer. Donate and Guadamillas (2011) and Pollack (2012) stated management support is essential to formalized knowledge transfer programs. Mayfield (2010) suggested formalized knowledge transfer practices including town hall meetings, mentoring, and reward programs increase tacit knowledge sharing among individuals. Lindner and Wald (2011) found organization of knowledge through defined standards, quality requirements, and institutionalization of knowledge transfer responsibilities contributed positively to effective knowledge transfer in project-based organizations. Similarly, Donate and Guadamillas recommended managers should push employees to use knowledge transfer tools and participation in knowledge transfer initiatives. In a study of intergenerational knowledge transfer, Harvey (2012) stated formalized mentorship programs are effective in transferring explicit and tacit knowledge.

Conversely, other researchers found formalization practices ineffective. Gururajan and Fink (2010) found informal mentoring programs ineffective as employees had little motivation to perform knowledge transfer activities. Lambe (2011) described the practice of formalization of knowledge transfer in best practices programs did not always achieve

positive responses when managers use top-down management approaches. Joia and Lemos (2010) found hierarchical structures did not have a significant effect upon knowledge transfer practice supporting the inconsistent results found by Lambe.

Cognitive ability. The cognitive ability of the receiver of knowledge has an effect upon knowledge transfer. The cognitive ability of the receiver to interpret knowledge affects the efficacy of transfer. A reduced absorptive and retentive capacity of an individual is indicative of increased difficulty in knowledge transfer (Chen & McQueen, 2010; Gururajan & Fink, 2010). Education gaps, cultural differences, and communication styles are factors in an individual's absorptive and retentive capacity (Chen & McQueen, 2010). Using structured knowledge transfer methods may increase the quality and quantity of knowledge absorption with the exception of structured methods requiring a technological component the receiver is unable to use (Gururajan & Fink, 2010). As the absorptive and retentive capacity of the receiver increases, managers may promote knowledge transfer using less structured transfer methods including peer-to-peer interactions and social exchanges (Chen & McQueen, 2010).

Motivation. Conflicting evidence on the effect of individual motivation on knowledge transfer is available (Goh & Nee, 2015; Hu & Randel, 2014). Individual motivation may be intrinsic or extrinsic. Examples of extrinsic motivation factors include individual recognition, monetary rewards, management direction, and job security (Appelbaum, Benyo, et al., 2012; Goh & Nee, 2015; Gururajan & Fink, 2010; Hu & Randel, 2014; Martín-Pérez et al., 2012). Intrinsic motivation factors include a strong personal commitment to an organization, personal satisfaction with performing job

duties, autonomy, task achievement, goal orientation, and willingness (Lu, Lin, & Leung, 2012; Martín-Pérez et al., 2012).

Hu and Randel (2014) and Chen, Chang, Tseng, Chen, and Chang (2013) found positive relations between extrinsic motivation and knowledge sharing. Motivation factors including promotions, pay raises, group-based rewards, and public recognition positively influenced motivation to share explicit and tacit knowledge. Similarly, Gururajan and Fink (2010) found compensation for time and effort spent transferring knowledge was a prerequisite for knowledge transfer to occur in academic settings. Conversely, Markova and Ford (2011) suggested providing monetary rewards may have the opposite effect upon highly intrinsically motivated individuals resulting in knowledge hoarding. Amayah (2013) found a negative correlation between knowledge sharing and personal benefits. Hau et al. (2013) found organizational reward systems and management by objectives counterproductive to knowledge transfer efforts. Hau et al. found organizational rewards have negative effects on tacit knowledge transfer but a positive effect on explicit knowledge transfer. In addition, Goh and Nee (2015) found incentive systems might increase the potential for individuals to share useless knowledge.

Martín-Pérez et al. (2012) and Yeon, Wong, Chang, and Park (2015) found intrinsic and extrinsic motivation exhibited by employees promotes knowledge transfer in organizations. Chang and Chuang (2011) suggested a combination of intense interactions and a sense of belonging provides intrinsic motivation to transfer knowledge. Yeon et al. stated enjoyment in helping others is the strongest motivation factor in knowledge transfer. Older adults display intrinsic motivation to share knowledge with younger

employees. Personal reward and job satisfaction perceived by older workers correlates with intrinsic motivation (Newman, 2011). Although intrinsic motivation is important, individuals also expect something in response to their knowledge transfer efforts. Public recognition and economic benefits may serve to promote knowledge transfer activity (Yeon et al., 2015).

Willingness is another intrinsic motivation for individuals to engage in knowledge transfer activities. van den Hooff, Schouten, and Simonovski (2012) described willingness as the extent to which an individual is willing to share intellectual capital with other individuals. Individual willingness to transfer knowledge affects knowledge transfer activities (Evans, 2013).

Evans (2013) found a positive correlation between the level of intention, or willingness, to share knowledge and knowledge transfer behavior. Social identification with a group, trust, and rewards are factors individuals consider when determining a personal willingness to transfer knowledge (Evans, 2013; Martín-Pérez et al., 2012; Swift & Hwang, 2013). An individual's participation in group interactions and anticipation of receiving knowledge in exchange for knowledge given are positive intrinsic motivations for willingness to transfer knowledge.

The goal orientation of individuals is also a factor in willingness to share information. Individuals consider the costs and benefits of knowledge sharing and act in their own best interests (Lu et al., 2012). van der Hooff et al. (2012) found pride of the individuals directly correlated to willingness and eagerness to transfer knowledge. Joia and Lemos (2010) found increased willingness to transfer knowledge when managers of

organizations implement personalized strategies including mentoring and reward systems. Appelbaum, Benyo et al. (2012) stated individual motivation changed with older workers who found social incentives preferable to financial incentives when transferring knowledge to younger workers. Similarly, Markova and Ford (2010) stated financial incentives had little effect on employee motivation to complete discretionary work activities.

The differences in motivation described by researchers indicate motivation is specific to individuals. Extrinsic and extrinsic motivation affects the efficacy of knowledge transfer. An implication for managers desiring to promote knowledge transfer is to determine the motivation factors for individual employees. Managers should provide extrinsic motivation methods to promote knowledge transfer only if the employee is not already highly intrinsically motivated.

Trust. Trust is an essential component to knowledge transfer in organizations (Huang, et al., 2011; Joia & Lemos, 2010; Sankowska, 2013). Sankowska defined trust as a condition in which individuals take risks and effectively accept any vulnerability associated with the risk-taking action. In terms of knowledge transfer, individuals who do not trust are less willing to transfer knowledge to others. Swift and Hwang (2013) and Huang et al. (2011) described two types of trust needed for knowledge sharing and transfer of tacit knowledge. Individuals exhibit affect-based trust as an outcome of feelings of mutual care and concern among individuals. Individuals build affect-based trust through personal interactions. Cognition-based trust is dependent upon an individual believing other individuals are reliable and competent (Huang et al., 2011; Swift &

Hwang, 2013) leading to respect of individuals with whom to share knowledge. Individual exhibition of affect-based and cognition-based trust relates to an individual's willingness to share and use tacit knowledge. Swift and Hwang found affect-based trust correlates significantly to knowledge sharing whereas cognition-based trust significantly affects organizational learning, of which knowledge sharing is a part. Evans (2013) supported the effect of trust on knowledge sharing; finding trust is the most important influence upon an individual's willingness to share knowledge over other factors such as shared vision and the length of the relationship between individuals. Additionally, Goh and Nee (2015) found trust reduced the instances of pseudo-knowledge sharing in which employees may provide false knowledge if trust in the organization was low. The implication for managers is to build a culture of trust by fostering employee relationships and providing extrinsic motivation described by Appelbaum, Benyo et al. (2012), Evans Joia and Lemos (2010), and Olatokun and Nwafor (2012).

Lack of trust among individuals may result in lowered frequency and quality of communication among individuals (Sankowska, 2013). Sankowska (2013) found strong links between organizational trust and knowledge transfer. Organizations with a strong culture of trust have employees who exhibit a higher degree of willingness to share knowledge and, as Sankowska observed, organizations with higher trust have a higher degree of competitive advantage compared to organizations in which employees are not trusting. However, Amayah (2013) found trust was not a significant predictor of knowledge transfer in public service employees. Amayah suggested a perception of power loss in public employees is a factor in unwillingness to share knowledge.

Several factors involving trust among individuals exist in organizations. McNichols (2010) found respect linked to trust in the relationship among Baby Boomers and Generation X employees. McNichols observed Baby Boomers withheld information from Generation X employees if the Baby Boomers did not perceive respect from the Generation X employees. Disrespect and lack of trust leading to reduced communication negatively affects the efficiency of mentoring (McNichols, 2010). Individuals' perceptions affect trust, even if the intent of individuals is not to display mistrust. Gururajan and Fink (2010) found time-constrained individuals with heavy workloads gave the impression of distrust. If one individual consistently cancels or postpones meetings with another employee, a feeling of distrust may develop. Employees may reduce communication during social interactions leading to reduced efficiency in knowledge transfer. Organizational culture reflects trust among individuals. Individuals who work in organizations in which managers promote a culture of team trust and collaboration show higher degrees of trust than those working in individual-centric organizations (Chow, 2012).

Organizational culture. Researchers found correlations between factors of organizational culture and knowledge transfer (Al-Adaileh & Al-Atawi, 2011; Joia & Lemos, 2010; Luu, 2014; Martín-Pérez et al., 2012; Sahaya, 2012). Factors influencing organizational cultures include trust, reward, and supervision (Al-Adaileh & Al-Atawi, 2011). Al-Adaileh and Al-Atawi (2011) found trust, rewards, and methods of supervision affect the quality and level of knowledge transfer activities. Organizations with managers who promote their own management involvement, human orientation, communication,

and collaboration exhibit higher effectiveness in managing knowledge than those organizations with managers who do not promote these activities. Managers affect knowledge transfer by determining the knowledge management culture through the development of learning from other employees' experiences (Chow, 2012). Similarly, Levy (2011) recommended managers pursue an aligned approach of human-oriented and technology-based knowledge practices. Likewise, Karlsen, Hagman, and Pedersen (2011) stated human-oriented practices and knowledge-oriented cultures are essential to employee use of knowledge management tools. Managers should develop processes to help employees manage time and document explicit knowledge to promote effective practices in the organization (Levy, 2011).

Organization culture types affect knowledge transfer. Joia and Lemos (2010) described how flexible organizational cultures increase the tendency for individuals to transfer tacit knowledge. In flexible organizational cultures, individuals may build relationships with other individuals throughout the organization allowing access to tacit knowledge when needed.

Luu (2014) found individuals in adhocracy, clan, or market cultures were more motivated to share than were individuals in hierarchy cultures. In adhocracy cultures, individuals often have momentum to change and innovate in the workplace. Individuals in clan cultures often have a sense of family in the workplace and wish to help others in work and learning. In market cultures, knowledge sharing by employees is a less altruistic activity as employees share in an externally competitive environment focused upon customer needs (Luu, 2011). Rules and policies followed involuntarily are

indications of a hierarchical culture. Individuals working in a hierarchical culture often view knowledge as an asset leveraged to remain personally relevant to the organization rather than viewing knowledge as an asset shared for the benefit of the organization. Many government organizations have hierarchical cultures (Buheji, Al-Hasan, Thomas, & Melle, 2014). Luu (2011) found competition for knowledge a negative factor in individual knowledge sharing.

Individuals who work for nonprofit organizations may exhibit high intrinsic motivation to transfer knowledge. Martín-Pérez et al. (2012) found employees in a non-profit organization studied intrinsically motivated to transfer knowledge. Individuals who work for nonprofit organizations, especially social action-based organizations, exhibit a dedication to the cause of the organization. The organizational culture found in nonprofit organizations is conducive to intrinsic motivation rather than extrinsic means including monetary rewards (Martín-Pérez et al., 2012). The implication of Martín-Pérez's et al. findings is managers who want employees to transfer knowledge must promote an organizational culture of involvement similar to the culture found in nonprofit organizations.

Language. The ability of individuals to communicate affects the quality and quantities of knowledge transfer. When individuals do not share a common language, absorption of knowledge is difficult (Gururajan & Fink, 2010). Examples of common languages include cultural language and technical language. Individuals who speak English only will have difficulty understanding individuals who speak German only. Similarly, if one individual does not understand the jargon used to describe actions,

misunderstanding may occur. Joia and Lemos (2010) emphasized common language as an essential condition for knowledge transfer. If a receiver has difficulty in understanding the language used, less knowledge transfer occurs because of reduced opportunities for effective two-way communication (Chen & McQueen, 2010).

Workplace design. Physical workplace design affects knowledge transfer. Akhbar and Musa (2012) asserted proximity as one important requirement for knowledge sharing. As individuals moved on a regular basis, increased contacts between employees occur and consequently, increased knowledge sharing occurs. Haynes (2011) stated individuals in open plan environments might eavesdrop on older workers, thereby increasing knowledge transfer opportunities. Open plan environments also include planned informal interaction areas throughout a building in addition to open workspaces. Joy and Haynes (2011) studied the workspace preferences of a multigenerational workforce engaged in knowledge transfer activities. Similar to Haynes' findings, Joy and Haynes (2011) found open spaces were conducive to knowledge transfer activities. When co-located, individuals across generations transfer knowledge using collaboration. Atriums contain informal meeting spaces and areas where individuals may gather socially to exchange knowledge. However, for work requiring concentration or confidential discussions, Joy and Haynes recommended private meeting rooms. In addition to open spaces, building designers should also create walkways, vending machine areas, and kitchens, which encourage workers to meet one another when walking from one place to another, thereby increasing the opportunity for interaction among individuals and increased knowledge sharing (Joy & Haynes, 2011).

Transition and Summary

Section 1 was an introduction to knowledge transfer in organizations. Forgoing knowledge transfer may lead to reductions in competitive advantage, organizational effectiveness, and institutional memory (Fredericksen, 2010; Joe et al., 2013; Lewis & Cho, 2011). Reductions in competitive advantage, organizational effectiveness, and institutional memory are serious issues to managers because of the projection that over 38% of the United States workforce will likely retire by 2030 (Neumark et al., 2013). This effect is significant in state and federal government agencies as the public workforce has more workers nearing retirement than found in private industry (Lewis & Cho, 2011).

Although managers may believe a lack of knowledge transfer may not be an immediate problem, managers may want to start knowledge transfer practices before the rate of retirements increase. True knowledge transfer is a complex process occurring over time (Appelbaum, Benyo et al., 2012; Brondyk & Searby, 2013; Levy, 2011). Knowledge transfer is complex as (a) individuals learn differently, (b) expertise is individual, (c) individuals encounter barriers to knowledge transfer, and (d) knowledge content is variable (Joia & Lemos, 2010; Nonaka & Krogh, 2009).

Many studies summarizing different types of knowledge are available (Nonaka & Krogh, 2009; Polanyi, 1966). Polanyi (1966) and Nonaka and Krogh (2009) presented explanations of the difference between explicit and tacit knowledge. Individuals transfer explicit knowledge through formal and systematic methods whereas individuals transfer tacit knowledge through experience shared among individuals over time. Individuals may transfer explicit knowledge via documentation, electronic records, and e-learning (Kiniti

& Standing, 2013; Levy, 2011; Nonaka, 1994). Individuals share tacit knowledge through personal interactions such as mentoring, team interactions, and meetings (Levy, 2011; McNichols, 2010).

When an individual exhibits a preference for an action, implied is the motivation to act. However, individuals experience barriers to the action of knowledge transfer. Barriers to knowledge transfer found in the literature include (a) formalization of transfer practices, (b) different learning styles, (c) cognitive ability, (d) motivation, (e) trust, (f) organizational culture, (g) language, and (h) workspace designs in which separation of individuals results in low interaction. In the literature reviewed, only one researcher found a preference for one method over others by individuals (McNichols, 2010). The lack of consensus found supports the need to study the knowledge transfer preferences of expert employees nearing retirement.

Section 1 included the purpose of the study, the business problem studied, and literature-based descriptions of knowledge and knowledge transfer. The business case is clear: without knowledge transfer from expert employees who are retiring, organizations risk losing institutional knowledge resulting in reduced production, competitive advantage, and institutional memory. The results of the literature review indicated rich descriptions of knowledge, knowledge transfer practices, and barriers to knowledge transfer; however, research on how preferences affect knowledge transfer in organizations is not available.

Section 2 includes information linking the purpose of the research to the practicality of studying the preferences of expert employees eligible for retirement.

Presented in Section 2 is a description of the research method and design, collection of data, data analysis techniques used, and methods to maintain data reliability and validity. In Section 3, I provide an overview of the study, the findings of the research in relation to business practices and social change, and recommendations for future research.

Section 2: The Project

The knowledge transfer preference of expert employees nearing retirement was the focus of this study. Section 2 includes a description of the purpose of the study and the role of the researcher. I also present the rationale for the envisioned method and design of the study. Elements of the study design include (a) descriptions of the participants, (b) the research method and design, (c) participant population and sampling, and (d) how ethical research practices maintain an appropriate level of confidentiality to protect study participants from perceived or practical harm. Next, presented are discussions of (a) data collection instruments, (b) data collection techniques, (c) data organizational techniques, and (d) data analysis methods to complete the study. Finally, discussed are the concepts of reliability and validity as applicable to the study. Consideration of each project component is essential to developing a quality case study.

Purpose Statement

The purpose of this qualitative, single-site case study was to explore the knowledge transfer preferences of expert scientific support employees nearing retirement to enable mangers to develop knowledge transfer strategies. The study took place at a United States national laboratory in northern California. The laboratory has more than 4,200 employees; 1,500 employees are scientific support employees. Participants were employees expecting to retire within 5 years who have at least 10 years of current job experience. I interviewed 24 scientific support employees to achieve data saturation (Guest et al., 2006).

The results from this study may help managers of organizations develop strategies to maintain or increase productivity prior to employee retirement. Understanding the preferences of employees nearing retirement may allow managers of organizations to affect the business practice of promoting organizational learning through knowledge transfer from expert employees. Results of organizational learning through enhanced business practices might include increased competitive advantage, higher employee retention, and job satisfaction (Sabir & Kalyar, 2013). Public research organization managers implementing effective knowledge transfer programs may increase the potential for scientific discoveries affecting social change through increased prosperity of citizens who benefit from advances in energy research.

Role of the Researcher

A researcher conducting a case study is responsible for (a) designing the study, (b) collecting evidence, (c) analyzing evidence, and (d) reporting results of the study (Yin, 2014). Yin (2014) identified the following characteristics for a case study investigator: (a) possessing the ability to ask questions, (b) able to be flexible in asking questions, (c) maintaining personal knowledge of issues in the field of study, and (d) understanding how to avoid bias. Resulting from my 25 years of experience as a successful training and organizational development professional, I have experience in asking questions of subject experts in a knowledgeable, flexible, and unbiased manner.

As a professional in training and employee development, my experience in conducting participant interviews for the purpose of gathering information used in developing corporate education courses helped guide the interview process. I am a

current employee of a Unites States national laboratory and have first person knowledge of the lack of formalized knowledge transfer practices within the organization. No participant was in my immediate workgroup or had a manager-employee relationship with me.

Participants

Participants for the qualitative single-site case study came from the population of scientific support employees at the United States national laboratory used as the site of this case study. The employee population numbers approximately 1,500. The population was a sufficient resource of scientific support employees expecting to retire within 5 years and who have a minimum of 10 years of job experience. Each participant lived within the San Francisco Bay area. Selection of local individuals allowed me to conduct in-person interviews.

To recruit participants, the study organization's chief operating officer sent an email on my behalf to scientific support staff in his organization. The text of the email is in Appendix A. To address the primary research question, I used purposeful sampling to identify and interview a pool of 24 participants. Purposeful sampling is appropriate for selecting participants based upon specific characteristics and the information available about potential participants (Tashakkori & Teddlie, 1998). To be eligible, participants were within 5 years of anticipated retirement and had at least 10 years of job experience. I concluded the interviews when data saturation occurred (Kisely & Kendall, 2011; Trotter II, 2012).

To establish a working relationship with participants, I sent a personal email to potential participants based upon their response to the recruitment email. The email outlined (a) the purpose of the study, (b) the intended audience of the results, (c) the eligibility criteria, (d) an electronic copy of the informed consent form (Appendix B), and (e) a request to set up an appointment time. Participants chose times and locations for interviews.

Confidentiality of participants is an essential factor in assuring adherence to ethical standards of human research. Researchers must take care to protect the confidentiality of the participants (Ketefian, 2015). The validity of research is incumbent upon accurate and truthful data collected from participants (Adinoff, Conley, Taylor, & Chezem, 2013). I used several methods to maintain confidentiality of participants.

First, I separated each name from the interview notes. Notes contained a participant number assigned prior to any interviews. A master list containing participant's names and assigned numbers is in a lockbox in my home attic where the list shall be stored for a minimum of 5 years from the date of the interview. The lockbox is out of reach of others.

Second, I provided an informed consent form to each participant prior to an interview. Appendix B includes the informed consent form provided to potential participants. The informed consent form includes (a) my identification, (b) my contact information, (c) the sponsoring institution, (d) the participant selection criteria, (e) the purpose of the research, (f) potential risks to participation, (g) notification of how the participant may opt-out, and (h) methods used to provide data confidentiality. Prior to

collecting data in an interview, participants had an opportunity to ask questions, read the sections on the informed consent form related to confidentiality, and gained assurance interview notes remain confidential.

Research Method and Design

Choices are available among research methods and designs when determining the approach taken to study an identified problem. The problem described in this study is the loss of organizational knowledge when expert employees retire without transferring knowledge resulting in reduced skills and productivity of employees (Calo, 2008; Fredericksen, 2010). The purpose of this study was to explore the knowledge transfer preferences of expert employees nearing retirement. Managers of organizations may use the results of the study to design programs enhancing knowledge transfer from near-retirement employees. This heading includes a description and rationale for using a qualitative, case study design to explore the knowledge transfer preferences of expert employees nearing retirement at a United States national laboratory.

Method

Researchers must choose between three methods of inquiry based upon the problem and purpose of the study. The methods available are qualitative, quantitative, and mixed methods studies. Researchers employ quantitative methods to test theories by examining relationships between dependent and independent variables by stating hypotheses in advance (Bettany-Saltikov & Whittaker, 2014). Measurement of dependent and independent variables, using instruments designed to provide numerical data analyzed using statistical procedures, is a method researchers use in quantitative studies.

Using quantitative methods in this manner allows researchers to compare states of being or how an action may affect an outcome.

Previous researchers used *quantitative* research regarding knowledge transfer in organizations to describe willingness to share knowledge (Evans, 2013), knowledge sharing effects on firm performance (Wang & Wang, 2012), and determinants of knowledge sharing (Amayah, 2013). Evans (2013) used a survey and correlation analysis to discover the effect of social and cognitive factors on knowledge sharing effectiveness. Wang and Wang (2012) also used a survey and multiple statistical analysis methods to determine the effect of tacit and explicit knowledge on operational and financial performance of an organization. Amayah (2012) used questionnaires and multiple regression techniques to investigate motivators, enablers, and barriers to knowledge sharing.

Qualitative methods require using data collection to explore the *meaning* individuals give to the world. Researchers use qualitative research to explore meanings in situations for which experimental control of variables is impossible or unreasonable (Yin, 2014). Qualitative researchers may use open-ended questions and observations to build themes leading to interpretations of the implication of the data (Ryan & Bernard, 2003).

Several researchers (Chien-Hsing et al., 2010; Dinur, 2011) performed qualitative research studies exploring effective methods of transferring different types of knowledge in organizations and the differences between tacit and explicit knowledge. Dinur (2011) explored the definitions of tacit and explicit knowledge to understand the differences between these types of knowledge. Chien-Hsing et al. (2010) compared the efficiencies

of knowledge transfer methods. A common theme found in studies regarding efficiency of knowledge transfer is how the relationship between the giver and receiver, in addition to the type of knowledge transferred, has an effect on the retention of organizational knowledge (Chien-Hsing et al., 2010). Another common theme is knowledge transfer is not accidental. Knowledge transfer is a purposeful activity accomplished when emphasized as a standard practice in organizations.

The mixed methods approach is a combination of qualitative and quantitative methods (Migiro & Magangi, 2011; Ozawa & Pongpirul, 2014). Two primary strategies are available to conduct mixed methods studies. Sequential mixed methods is a serial approach to research. For example, a researcher may first conduct a quantitative analysis to determine the effects of an action and subsequently use a qualitative approach to conduct a detailed exploration of the results with select individuals or cases. Researchers using concurrent mixed methods integrate qualitative and quantitative methods to increase the richness of results interpretation. As an example, researchers may use surveys containing both open-ended and closed-ended questions when conducting a mixed methods approach (Migiro & Magangi, 2011).

Several researchers (Tortoriello, Reagans, & McEvily, 2011; Ward et al., 2012; Zhang, de Pablos, & Xu, 2014) completed mixed methods research studies on knowledge transfer in organizations. Tortoriello, Reagans, and McEvily (2011) used a sequential mixed methods approach to evaluating network features and the related effect upon knowledge transfer across organizations. Tortoriello et al. used a phenomenological approach followed by an experimental approach. Tortoriello et al. found tie strength,

network cohesion, and network range had positive effects on knowledge transfers between units. Zhang et al. (2014) used a sequential mixed method approach including case study followed by a quantitative survey to discover how cultural values affect knowledge transfer. Ward et al. (2012) studied knowledge brokering by using a sequential mixed method approach including a literature review followed by a quantitative inquiry.

For this study, a qualitative method was the best approach to explore the central research question determining the knowledge transfer preferences of expert employees nearing retirement. A quantitative method was not appropriate because of the lack of dependent and independent variables. In addition, researchers must control the experimental environment when using quantitative methods. Employees nearing retirement are a dynamic population with varied opinions and approaches so an exploration of employee perceptions was most appropriate in comparison to an experiment in which a researcher influences a variable to affect opinions. Finally, quantitative approaches are appropriate when (a) factors are apparent in influencing an outcome, (b) utilizing an intervention to affect a dependent variable is effective, or (c) if a researcher wants to understand the best predictors of an outcome. For the same reasons a quantitative approach was not appropriate, a mixed methods approach was not appropriate as mixed methods approaches require qualitative and quantitative analysis (Tashakkori & Teddlie, 1998). Quantitative research for exploring knowledge transfer methods was not necessary because of the availability of previous research describing knowledge transfer methods (Appelbaum, Benyo, et al., 2012; Chien-Hsing et al., 2010;

Gururajan & Fink, 2010; Levy, 2011; Lewis & Cho, 2011; Mayfield, 2010; McNichols, 2010; Pollack, 2012).

To summarize, a quantitative research methodology requires the researcher to compare sets of data and proving or disproving hypotheses (Bettany-Saltikov & Whittaker, 2014); qualitative research is narrative and does not have distinct comparisons between groups nor do researchers use qualitative research to test theories or variables (Yin, 2014). In qualitative research, the researcher is the primary instrument, using an emergent technique of interviewing, case study, or questionnaires to derive context from the participants or processes studied (Moustakas, 1994; Yin, 2014). Whereas quantitative studies reflect the measure of surveys or experiments numerically, qualitative studies derive themes by the researcher's work in coding data obtained from participants (Yin, 2014). A qualitative methodology was appropriate to study the knowledge transfer preferences of expert employee nearing retirement and associated context in relation to stated preferences.

Research Design

In addition to choosing an appropriate methodology for study, researchers must also choose an appropriate research design, also known as a strategy of inquiry, to answer the posed research questions. Five common qualitative designs are (a) narrative, (b) phenomenological, (c) grounded theory, (d) ethnography, and (e) case study designs. For this study, a qualitative case study was most appropriate to answer the research question regarding knowledge transfer preferences of expert employees nearing retirement.

To determine the case study method as the most appropriate research design, I eliminated other designs based upon how researchers use those designs in practice. Researchers use life stories in narrative research designs (Clandinin & Connelly, 2000). However, an investigation of the isolated event of retirement and current work preferences of employees nearing retirement did not require the context of lifetime experiences. A grounded theory approach was not pertinent as no intention existed to create formal theories from data analyzed (Corbin & Strauss, 2015). Scarduzio et al. (2011) described ethnographic design involving the long-term study of a group by sense making and storytelling. The intention for this study was to perform an exploration of individual preferences at one point in time so a long-term approach using an ethnographic method was not appropriate.

Though the elimination of narrative, grounded theory, and ethnographic designs was relatively simple, the decision between a phenomenological and case study design was more difficult. Based on the studies presented in this literature review, researchers used case study and phenomenological methods for qualitative research on knowledge transfer. Chien-Hsing et al. (2010) used phenomenological methods to interview individuals who have practiced knowledge transfer. Dinur (2011) used a case study to investigate methods and linkages of knowledge transfer types to methods of knowledge transfer. Zhang et al. (2014) used a mixed method approach including case study to show how cultural values have effects upon knowledge transfer. Karlsen et al. (2011) acknowledged the difficulty in studying the knowledge transfer process attributable to the inability of a researcher to observe the process directly. Consequently, Karlsen et al. used

a case study approach to explore the perceptions of individuals involved in knowledge transfer. Karlsen et al. found knowledge-oriented cultures more influential than knowledge management systems in effective knowledge transfer.

A primary factor researchers use to differentiate between phenomenological and case study approaches is the experience of the participants studied. Researchers conducting phenomenological studies investigate the *lived experience* of individuals who may articulate the *how* and *what* of experiences of a phenomenon (Moustakas, 1994). Case studies are appropriate for investigating the *how* and *why* of a condition, often investigating contextual reasons for the reasons causing a phenomenon (Yin, 2014). The central research question posed requires investigation of the perceptions of individuals who have not yet experienced the phenomenon of knowledge transfer prior to retirement. An essential factor of the study was individual perceptions of preferences for knowledge transfer methods not experienced so a phenomenological study was not appropriate. An exploratory case study method was appropriate for the study.

Population and Sampling

The population for this study was a United States national laboratory with more than 4,200 employees of which approximately 2,700 are scientists and the remaining 1,500 employees support scientific efforts. Based upon the purpose of this study, I focused upon employees in scientific support roles because of their direct effect on the productivity of laboratory operations. Although the output of the laboratory is scientific discovery, the laboratory is not a true revenue-generating center but rather a cost center. Income generation is from direct government funding and grants funded by non-

governmental organizations. The productivity of the organization is a result of how effective the scientific support staff may be managing the costs associated with scientific efforts. To address the business problem of how increasing retirement and knowledge loss affects productivity, the scientific support employees of a national laboratory were the population of this study.

I used purposeful sampling to select scientific support participants from the population. Purposeful sampling is an appropriate approach for selecting individuals who must meet specific characteristics in contrast to random sampling methods (Tashakkori & Teddlie, 1998). Selected participants had a minimum of 10 years of job experience in their current role within the laboratory and had the potential to retire within 5 years.

To achieve an appropriate degree of certainty for data, I conducted in-depth interviews with 24 participants who met the selection criteria. As this was a qualitative case study, a power analysis was not appropriate to determine the appropriate number of participants to study based upon the total population size (Trotter II, 2012). For qualitative case studies, a small sample size is appropriate for exploratory, case-based research (Guest et al., 2006; Yin, 2014). Researchers must continue to conduct interviews until reaching redundancy or saturation (Kisely & Kendall, 2011; Trotter II, 2012).

The sample size of 24 participants was adequate to demonstrate data saturation (Guest et al., 2006) as no new themes emerged after interviewing 12 participants. As 24 individuals volunteered to be participants, I decided to interview each volunteer regardless of the number at which achievement of data saturation occurred. In addition to the 24 participants, three other individuals agreed to participate in the pilot study.

Ethical Research

Researchers are responsible for conducting research in an ethical manner and protecting the participants of a study. Ethical research considerations are essential to preventing any harm to study participants caused by involvement in this study. Ethical researchers gain informed consent from participants, avoid any use of deception, and protect the privacy of participants (Yin, 2014).

Activities conducted in this study complied with the ethical standards of Walden University and the participant organization. Prior to initiating contact with any participants, I obtained Institutional Review Board (IRB) approval from Walden University and the organization employing the study participants. The Walden University approval number is 02-03-14-0293430. The study organization's IRB approval number is 330H001-6AP2015.

Gaining informed consent is a vital step in conducting ethical research (Yin, 2014). Prior to participation, each participant read and signed an informed consent form. To provide transparency, the informed consent form (see Appendix B) included (a) my contact information, (b) the sponsoring institution, (c) participant selection criteria, (d) the purpose of the research, (e) any potential risks resulting from participation, (f) the voluntary nature of participation, and (g) information how participants may withdraw from participation at any time. Participants had the opportunity to read the informed consent form and ask questions prior to interviews. Participants did not receive incentives for participation.

To maintain the participants' confidentiality, I only describe participants by number, using no names in the study text. A matrix of names associated with participant numbers is available only by retrieval from a locked box kept in a secured location at my residence. Electronic notes and recordings obtained were on a password-protected computer during the study. Electronic files are on a memory stick located in a separate lockbox, in a different section of my residence. Keys to lockboxes remain out of reach of others by storing the keys in a desk drawer. Secure maintenance of records will be no fewer than 5 years. Destruction of records by shredding or permanent erasure will occur after 5 years.

Data Collection

Data collection for qualitative researchers may be a complex process; however, with appropriate preparation by the researcher, the data should be reliable and valid. Yin (2014) stated preparation in the areas of desired researcher skills training, protocol development, case screening, and pilot studies are essential for efficient and valid data collection. In addition, identification of multiple sources of evidence is preferable for adequate collection of data in a case study (Yin, 2014). Each of the preparations listed by Yin was completed and described in the next section regarding instruments, data collection techniques, and data organization techniques.

Instruments

I used an interview template as the instrument in this case study. Yin (2014) specified the need for a well-trained investigator to conduct a high-quality case study. To prepare to collect interview data free from questions of reliability or validity, personal

preparation in the areas interviewing techniques and understanding of knowledge transfer methods is complete and described next.

Yin (2014) described the characteristics of a competent case study investigator. A competent case study investigator asks appropriate questions, listens skillfully, and maintains flexibility in interviewing participants. The case study investigator also has a strong understanding of the research issues and does not have preconceived notions prior to data collection. As an experienced and successful training professional, asking questions to gain understanding, uncover themes, and adapting to issues arising from data different from originally expected are skills practiced daily.

After completing the literature review section of this study, I possess a strong understanding of knowledge transfer methods and issues. The issues, which I understand, include definitions of terms related to knowledge transfer, knowledge transfer methods, and factors affecting knowledge transfer. Finally, studying warnings about bias described by Yin (2014) and Tashakkori and Teddlie (1998) provided me an opportunity to realize the potential pitfalls of preconceptions and the importance of bias wariness.

The interview instrument found in Appendix C includes open-ended questions used to explore perceptions of individual knowledge transfer preferences prior to retirement. Two sections comprise the structure of the interview questions. Questions 1 through 5 are simple questions designed to elicit background information and help increase the participant's comfort with the interview process. Questions 6 through 14 are exploratory questions designed to help answer the primary research question:

How do expert scientific support employees nearing retirement prefer to transfer knowledge?

To increase the reliability of the data collection process, preapproved digital recording and subsequent transcription of the verbal participant answers occurred. In addition, I took notes in a field notebook. Raw data are available upon request and approval from the study organization and Walden University.

To assess the reliability and validity of the interview template, I conducted a pilot study upon the study's approval from the Walden University and study organization's Institutional Review Boards (IRB). The pilot study consisted of three individuals who would consider each of the questions on the interview template. Each pilot study participant would meet the same criteria as the target participants. After each pilot study participant considered the questions provided, the participants answered questions designed to elicit feedback regarding the usefulness and clarity of the questions listed in the interview template. These questions were:

1. Is each question clear to you? If not, which question(s) are not clear to you?
2. In your opinion, are any of the questions too sensitive in nature, potentially leading to hesitation to provide accurate answers? If so, which question(s) are of concern to you?
3. Do you think any questions are redundant? If so, which question(s) are redundant?
4. Do you have any other feedback you would like to provide about the questions as presented to you?

5. Given the purpose of the study is to explore the knowledge transfer preferences of expert scientific support staff nearing retirement, what, if any, additional interview questions should be added?

Based upon the feedback from the pilot participants, modifications to the interview template were not necessary.

In addition to interviews, I used two additional sources of evidence derived from available documentation and physical artifacts. Yin (2014) recommended case study researchers use multiple sources of evidence when conducting a compelling case study to promote convincing and accurate findings. Yin identified six potential sources of evidence to include *documentation*, *archival records*, *interviews*, *direct observations*, *participant-observation,* and *physical artifacts*. Archival records, direct observations, and participant-observation were not appropriate for this study. Archival records such as individual employee data were not available because of employee confidentiality requirements. Direct and participant-observation sources were not appropriate because the intent of the study to explore the future preferences of employees who have not yet retired so data collection included using interviews, documentation, and physical artifacts.

For this study, I collected documentation in the form of human resource policies and processes related to retiring employees. This documentation was useful to explore how employees chose to participate in knowledge transfer activities prior to retirement. Collection of physical artifacts in the form of technologies available to allow employees to transfer knowledge was also helpful. As recommended by Yin (2014), the use of data

from multiple sources such as interviews, documentation, and physical artifacts was helpful in promoting a comprehensive case study by using convergence of data sources.

Data Collection Technique

I collected data from three sources: (a) participant interviews, (b) documentary information, and (c) physical artifacts. The process for collecting participant data included face-to-face interviews using an interview template containing interview questions in Appendix C of this study. A digital recording device recorded the participant's voice for later transcription to text. Each participant consented to the use of a digital recording device prior to use. Other tools used during data collection included a field notebook to take notes, mechanical pencils for note taking, a laptop computer for securely archiving electronic voice and text files, and a watch used to monitor the time of the day as a courtesy to the participant when undergoing the interview.

Upon receipt of IRB approval from Walden University and the study organization before any data collection from participants, I conducted a pilot study to assess the reliability and validity of the interview template used for obtaining the response data. Appendix C includes a list of the interview questions in the template. Three individuals meeting the same criteria as the target population comprised the pilot study population.

The pilot study participants reviewed the questions on the interview template and answered several questions to assess the clarity and usefulness of each question. Based upon feedback from the pilot study participants, no need existed to adjust interview questions, as no question was unclear, redundant, or useless in collecting data. The intent was to create an interview template used for collecting data relevant to the purpose of the

study and to respect each participant's time availability, confidentiality, and capability to answer the questions asked.

Conducting participant interviews took the participant's time and effort into account by catering to the participant's schedule and availability as recommended by Yin (2014). I conducted interviews at a time and location agreeable to the participants. At the time of scheduling and at least one day prior to an interview, each participant received a personal phone call or e-mail confirming the date, time, location, and anticipated length of the interview.

Prior to beginning an interview, I reminded each participant of the purpose of the study, confirmed the time commitment needed for the interview, ensured completion of a signed consent form, and reminded the participant that, upon request, the interview may stop at any time. Reaffirmation of the confidentiality of the interview data and confirmation of the participant's consent to digital recording for transcription purposes occurred. After the interview was complete, each participant had the opportunity to review a transcript of the digital recording taken during the interview.

To collect documentation relevant to the central research question of this study, I used the website from the study site. Human resources policies and processes are publicly available. Collection of data from websites did not require any additional confidentiality approvals from the study organization site. I copied website data verbatim and documented locations of website pages in electronic notes maintained on a password-protected laptop computer.

I collected physical artifact data by researching external and internal websites to determine the availability of internal desk guides, videos, and other electronic methods of knowledge transfer methods. Physical artifacts of knowledge transfer methods included (a) WIKIs, (b) electronic bulletin boards, and (c) document repository systems. A password-protected laptop computer is the repository for documentation of physical artifacts found.

Data Organization Techniques

Organization of data collected maintains order, recall, and confidentiality. I collected data in the forms of (a) journal notes, (b) digital recordings, and (c) transcripts. A notebook and folder containing a list of the interview question answers is the location for handwritten notes taken during interviews. During the study, a password-protected laptop computer was the repository for digital recordings, transcripts, examples of documentation, and notes regarding the existence of physical artifacts. Upon the completion of the study, electronic files are on a memory stick located in a lockbox located in my residence.

To maintain confidentiality of participants, notes taken during interviews, recordings, and transcripts have codes associated in place of names. I used codes such as PS1, PS2, and PS3 for files relating to the pilot study participants. Codes for study participants included P1, P2, and P3. Electronic filenames contain participant codes only. During the data collection process, a master matrix of participant study codes was only available from a locked storage box maintained at my home and from the password-protected laptop computer. Records are available for review from a lockbox maintained

at my home for 5 years from the date of the study conclusion. Review of records shall occur only if granted permission from Walden University and the study organization. I shall destroy paper documentation by shredding and electronic documentation by digital erasure of memory devices after 5 years.

Data Analysis Technique

In this study, I asked questions using an interview template and gathered documentation and physical artifact sources to collect data regarding the main research question: How do expert scientific support employees nearing retirement prefer to transfer knowledge? Appendix C includes a full list of interview questions. Prior to data collection and subsequent data analysis, I conducted a pilot study to assess the reliability and validity of the interview template used for obtaining the response data.

Qualitative data analysis commenced after obtaining data using the interview template in addition to the documentation and physical artifact review. Qualitative data analysis required the identification of emerging themes found (a) from a researcher's literature review, (b) during data collection, and (c) after data collection. Coding is the discovery of themes from text (Ryan & Bernard, 2003). To develop codes and, subsequently, themes, several approaches are available to researchers. The approaches include coding the data by identifying segments of data and assigning names to the segments, combining codes into broader categories, and finally, presenting an analysis of the categories through text, graphs, charts, or graphics as appropriate and helpful to a reader (Ryan & Bernard, 2003).

Using the described approach to coding, I identified themes in data collected in a revelatory manner. As this was an exploratory case study, determining themes prior to data collection or analysis was not appropriate. Emergence of themes from an unbiased view of the data collected is appropriate (Yin, 2014). The data analysis occurred via the software program, HyperRESEARCH, and the *pawing method* described by Ryan and Bernard (2003).

The analysis of data occurred in an iterative, three-step manner. First, I read the text of data collected and used highlights to note different themes. Evaluating available data is one method to a high-quality analysis (Yin, 2014). In this first step, identification of many themes, broad and narrow-focused, was the goal. Next, data review occurred a second time and codes assigned to each of the highlighted segments of text. Word counts and common words in context searches (Ryan & Bernard, 2003) were outputs from the software program HyperRESEARCH. Using HyperRESEARCH was valuable for assisting me to determine themes as I learned the program quickly and the reports provided were easy to read. This process was similar to the cutting and sorting method described by Ryan and Bernard (2003). Finally, a third review occurred to evaluate similar themes for consolidation, highlight additional text noting additional themes found, and assign final codes.

I used the iterative process to analyze available evidence in a broad manner and concurrently focused upon the research questions and conceptual framework relating to systems theory (von Bertalanffy, 1950), organization learning theory (Argyris & Schön, 1978), knowledge management theory (Nonaka, 1994; Polanyi, 1966), and expectancy

theory (Vroom, 1964). Categorization and analysis occurred through coding and retention of data within the software program using a database method as suggested by Yin (2014). The use of the software program HyperRESEARCH assisted me in categorizing and organizing themes and sub-themes.

To prevent possible loss of focus upon the purpose of this study, I continuously referred to the research questions during the (a) pawing, (b) cutting and sorting, and (c) scrutinization phases of data analysis. Methods employed to scrutinize data and identify themes included repetition, determining similarities and differences, and identifying missing data (Ryan & Bernard, 2003; Yin, 2014). Identification of missing data helped me to recommend future studies (Yin, 2014). Using the methods described by Yin (2014) and Ryan and Bernard (2003) helped produce a high quality analysis and evaluation.

I compared the findings to several researchers' theories. von Bertalanffy (1950) stated general systems theory as the whole comprising more than the sum of parts. Knowledge transfer among employees is a complex activity involving employees who are parts of an organizational system. Employees transfer explicit and tacit knowledge as described by Nonaka (1994) and Polanyi (1966) based upon individual motivation explained in expectancy theory by Vroom (1964). Argyris and Schön (1978) and Dodgson (1993) described organizational learning theory by illustrating how organizations use knowledge and routines to influence organizational efficiency. I compared my conclusions to each theory within the conceptual framework, analyzed how expert employees prefer to transfer knowledge prior to retirement, and discovered

potential effects of the preferences described on organizational productivity. Section 3 contains details of the comparisons and findings.

Reliability and Validity

Researchers using a qualitative methodology should demonstrate rigor in conducting research to establish trustworthiness in the results of a research study (Thomas & Magilvy, 2011, Yin 2014). Thomas and Magilvy (2011) described rigor as a means to establish consistent methods allowing researchers to replicate a study thereby establishing credibility, transferability, dependability, and confirmability of research results. Although replication of the results of a case study is not necessary to establish reliability (Thomas & Magilvy, 2011), richly documenting the research methods may help readers trust results of a study as products of sound scientific procedure (Thomas & Magilvy, 2011; Yin, 2014). Consequently, readers may consider the results trustworthy and reliable (Kisely & Kendall, 2011; Thomas & Magilvy, 2011).

Researchers may assess the quality of research design based upon four tests described by Yin (2014). Testing for reliability demonstrates repeatability of test procedures such as data collection procedures. Validity testing includes external and internal validity measures (Yin, 2014).

Researchers establish reliability by developing and documenting stepwise procedures so others using the same case may obtain identical results. Results considered reliable do not contain biases or errors (Yin, 2014). Establishing the reliability of data collected is essential to establish trustworthiness in a research study (Kisely & Kendall, 2011).

Researchers test construct validity by identifying subjective measures used to collect data. Subjective measures may include peer debriefing and member checking (Tashakkori & Teddlie, 1998). Exploring and clearly establishing relationships among variables or events in quantitative research or qualitative case studies may help researchers succeed in achieving internal validity (Tashakkori & Teddlie, 1998; Yin, 2014). Generalization of study findings is a condition for external validity difficult to achieve in case study research (Yin, 2014). Providing detailed descriptions of the population studied, sources of evidence collected, demographics, and boundaries of the study are methods to achieve external validity, also known as *transferability* (Thomas & Magilvy, 2011; Yin, 2014). Finally, researchers achieve transparency by providing detailed descriptions of participants, procedures, and assumptions related to data collection, analysis, and interpretation to enable other researchers' external validity assessment, or for justifying generalizations of results (Yin, 2014).

Reliability

Reliability in research is dependent upon the process used to gather evidence leading to a dependable outcome (Street & Ward, 2012). The perceptions of the data and subsequent inferences made by researchers are factors in the reliability of a study (Kisely & Kendall, 2011; Tashakkori & Teddlie, 1998). Yin (2014) recommended documentation of case study processes in a manner allowing others to replicate the methods in a subsequent case study. Thomas and Magilvy (2011) recommended researchers establish dependability and reliability by engaging in peer review of results, richly describing research methods and, if feasible, repeating the study to determine if the results are

similar. Thomas and Magilvy used the term *dependability* as synonymous with reliability. To establish reliability of the study, I used two processes.

I interviewed participants using an interview template containing open-ended questions each participant answered. Pilot studies are useful to test questionnaire design and reliability of results (Pritchard & Whiting, 2012). Three individuals meeting the target population criteria participated in a review of the interview template questions. Participants focused upon the clarity of the interview questions and provided feedback. Based upon the pilot participants' feedback, modifications to the interview were not necessary.

Second, I used a professional transcriptionist to transcribe interview recordings. Transcripts of interviews must be error-free to achieve reliability. Verification of transcript accuracy is essential to establish credibility (Kisely & Kendall, 2011). A transcriptionist transcribed the recordings of interviews and provided text files. The transcriptionist served as an independent third party producing text files for later analysis. Comparisons of the sound recordings to the transcription texts confirmed the accuracy of the text prior to coding and analysis.

Validity

Although different methods of data interpretation may exist, no single standard for ensuring a study's validity exists (Ryan & Bernard, 2003; Yin 2014). Clear explanations of assumptions and researchers' judgments may lead to a higher degree of internal validity (Ryan & Bernard, 2003). Larger sample sizes may lead to generalization of results and external validity (Yin, 2014). Achievement of data saturation in a

qualitative case study with small sample sizes may infer the results are externally valid for similar cases (Guest et al., 2006).

To assure internal validity (credibility), I employed member checking and peer debriefing. Tashakkori and Teddlie (1998) and Thomas and Magilvy (2011) described member checking as a beneficial method to assure credibility. For member checking, the intent was to provide an opportunity for the study participants to provide feedback upon the interview data from the participants and the inferences the researchers make from the data (Thomas & Magilvy, 2011). Member checking helped me ensure the accuracy of data collected from the interview but also to identify any inadvertent biases or misunderstandings of the collected data (Maxwell, 2005). Each participant received a transcript of the interview conducted and the opportunity to provide comments on the transcript. A total of 12/24 (50%) of participants chose to provide comments regarding the transcripts. Responding participants agreed with the content of the transcripts indicating no inadvertent biases or misunderstandings.

In addition, I implemented a peer debriefing session to address internal credibility. Peer debriefing provides additional feedback from a peer reviewer who may use questions to clarify interpretations and identify bias (Tashakkori & Teddlie, 1998). One impartial peer compared the presentation of the findings and agreed with my summary of the interview results and answer to the main research question.

Establishing external validity (transferability) may lead to generalization of results and conclusions to a larger population (Yin, 2014). In case studies, the focus of a researcher is upon exploring the depth of an individual case, not an entire population

(Kisely & Kendall, 2011; Thomas & Magilvy, 2011). Yin (2014) suggested the results of case studies might be externally valid if the results lead to other generalizable cases. Maxwell (2005) suggested the value of a qualitative study is not in its generalizability, but rather the rich description of a unique case. This rich description may include data collection from multiple sources (Maxwell, 2005; Yin, 2014). In addition, the achievement of saturation in a qualitative case study may infer the results are externally valid for similar cases (Guest et al., 2006). Even though external validity is not the focus of a case study, the results may become a foundation for additional studies or inferences to similar cases.

To address external validity (transferability), I used multiple sources of data and provided details of the study population including the geographic boundaries of the study. The *population, sampling, data collection methods, and participants* sections contain detailed descriptions of methods for this study. Consequently, other researchers may use the described methods to study knowledge transfer preferences of employees in similar organizations, a potential outcome of external validity and transferability (Thomas & Magilvy, 2011). Multiple sources of data include participant interviews, documentation, and physical artifact collection. Using multiple sources of data may lead to increased credibility and transferability versus a limitation to a single source of data (Maxwell, 2005).

Transition and Summary

The content of Section 2 related to the research project designed to address the business problem described in Section 1. The increasing incidence of employee

retirement leads to reductions in competitive advantage, organizational effectiveness, and institutional memory (Fredericksen, 2010; Joe et al., 2013; Lewis & Cho, 2011). The section begins with a statement of the purpose of the study*:* to explore the knowledge transfer preferences of expert scientific support employees nearing retirement. The remainder of the section includes a description of the study design and considerations made in the design of the research project.

Research design considerations described in Section 2 include defining the study methods, research design, participant criteria, target population, sampling method, and how ethical treatment of individuals shall prevent harm resulting from participation in the study. In addition, I describe how I collected, organized, and analyzed data derived from documentation, physical artifact collection, and interviews with participants who are eligible for retirement and considered experts. Finally, presented is a description of how (a) reliability, (b) internal validity, and (c) external validity affect the perception of a quality case study by readers.

Section 3 includes descriptions of how others may apply findings and conclusions from this study to professional practice and the implications for change. The section contains an overview of the study, a presentation of findings, applicability to professional practice, and implications for social change. In addition, I provide recommendations for action and further study based upon the results of this study. The section concludes with a reflection of my experience with the research process, how my thinking may have changed resulting from the experience of the research process, and a conclusive summary of the study.

Section 3: Application to Professional Practice and Implications for Change

Knowledge transfer preferences of expert employees nearing retirement were the focus of this study. Section 3 contains an overview of the completed study, a presentation of the findings, applications of the study to professional practice, and implications for social change. In addition, I provide recommendations for action and further study based on the findings. This section concludes with a reflection of my experience with the research process and a summary of the study.

Overview of Study

The purpose of this qualitative, single-site case study was to explore the knowledge transfer preferences of expert scientific support employees nearing retirement to enable mangers to develop knowledge transfer strategies.

The central research question for this study was: How do expert scientific support employees nearing retirement prefer to transfer knowledge? The following research subquestions were fundamental to supporting the central research question and were the basis for development of interview questions.

1. What knowledge transfer techniques are available to employees?
2. What do employees recommend as preferred knowledge transfer techniques?
3. What barriers may prevent knowledge transfer from employees?
4. What suggestions do employees offer to overcome knowledge transfer barriers?

From the data collected, I identified four primary themes in relation to the knowledge transfer preferences of expert employees nearing retirement. The themes were:

1. Mentoring is the preferred knowledge transfer method
2. Barriers to knowledge transfer exist
3. Multiple types of knowledge to transfer exist
4. Lack of knowledge transfer affects productivity

The next heading contains the findings related to each theme. Included in the discussion of themes are data summaries of each theme.

Presentation of the Findings

This section contains a discussion of the data collected to answer the central research question: How do expert scientific support employees nearing retirement prefer to transfer knowledge? First, provided is a description of the participants. I then discuss each theme resulting from my data analysis in relation to current business literature and the conceptual framework in Section 1 of this study. The heading concludes with a summary of the conclusions addressing the central research question and the following research subquestions:

1. What knowledge transfer techniques are available to employees?
2. What do employees recommend as preferred knowledge transfer techniques?
3. What barriers may prevent knowledge transfer from employees?
4. What suggestions do employees offer to overcome knowledge transfer barriers?

Participants' Descriptive Data

Using Interview Questions 1 through 5 found in Appendix C, I obtained background information from the participants. The population of participants consisted of 24 scientific support employees from a single national laboratory. Every participant, 24/24 (100%), stated a plan to retire within 5 years of the interview date and had at least 10 years of experience in their field. The length of experience of participants in their field ranged from 12 to 50 years; the average years of experience were 32.2 years. The length of employment at the organization ranged from 1 year to 25 years, averaging 18.8 years. A total of 15/24 (62.5%) participants held managerial roles, and 9/24 (37.5%) participants were individual contributors to the organization. A total of 9/24 (37.5%) of participants held roles in program or project management, 7/24 (29%) participants had technical roles, 6/24 (25%) participants performed financial services functions, and 2/24 (8%) participants held senior management positions. A total of 11/24 (46%) of participants knew of plans to backfill their positions upon retirement. In contrast, 8/24 (33%) of participants were unaware of any backfill plans and 5/24 (21%) of participants said no backfill plans existed. Table 1 contains a summary of the participants' demographic and background information.

Table 1

Participant Demographics and Background Information

Invariant constituent	# of participants	% of total participants	Participants
Scope of influence			
Managers	15	62.5%	P2, P4, P5, P8, P9, P10, P11, P12, P14, P15, P16, P18, P20, P22, P24
Individual contributors	9	37.5%	P1, P3, P6, P7, P13, P17, P19, P21, P23
Roles in the organization			
Program or project management	9	37.5%	P5, P9, P10, P11, P12, P15, P18, P20, P24
Technical	7	29%	P4, P13, P17, P19, P21, P22, P23
Financial services	6	25%	P1, P2, P3, P6, P7, P8
Senior management	2	8%	P14, P16
Backfill plan knowledge			
Knew of plans to backfill position upon retirement	11	46%	P4, P7, P8, P12, P14, P15, P18, P19, P21, P22, P23
Unaware of any plan to backfill position	8	33%	P1, P2, P5, P6, P10, P11, P13, P24
Stated no plans to backfill position exist	5	21%	P3, P9, P16, P17, P20

Theme 1: Mentoring is the Preferred Knowledge Transfer Method

Mentoring involves exchanges of knowledge, skills, and social networks over time (Brondyk & Searby, 2013). A total of 16/24 (67%) of participants stated mentoring was the preferred method to transfer knowledge. Of the remaining participants, 3/24 (12.5%) participants preferred using documentation, 2/24 (8%) participants preferred using direct *hands-on* activities, and 3/24 (12.5%) participants stated no preference for a method of knowledge transfer. Table 2 contains supporting participant comments regarding mentoring.

Table 2

Theme 1: Mentoring Is the Preferred Knowledge Transfer Method

Participant	Participant comment
P3	My most preferred method would be to have someone to hire before I leave and a slightly junior position and we could work side by side, and I could have them do simple things, and then I could really train them while we work closely with each other.
P4	The method that I think works best is to have someone do the job and I shadow versus someone shadow me. I think people learn by doing.
P5	Because that personal relationship that you need between us and them or the scientists was very hard to put down on paper. And so, I again had to sit in and help mentor those people and get them trained because they all know, you need to talk to them. Again, with our type of work, a lot of it is the personal relationship you get, you build up with the people and the confidence you build up in the people in you that helped them work better with you.
P6	Well, as soon as they were on board, we'd sit down and start going through the desk requirements, what has to be done on a monthly basis, quarterly basis, annual basis, whatever. Yeah, and go through a cycle of everything and then see if they have questions and they need to take their own notes because everybody translates things differently.
P7	Person sits next to me; and watch and learn. I guess the other thing is, what my supervisors tells me to--I tend to do certain things on a more detailed level. And so, he may have the other person understand how I got there, by maybe have him look at it a different way of getting the same result, but maybe streamlining it a little bit or train in different ways so that.
P22	One of the things I like to do when somebody is going to leave is to have them start mentoring the heir apparent. Have them start going out with them you know learning, getting to know the people the customers getting to know the area.
P24	So, I think, you know ideally, I have one of my staff positioned to go through that implementation so we now have someone who will know it thoroughly inside and out from a system perspective and she will be working in the process for two years before that. I assigned it to it this year to work with me on it. So, I think at the real technical functional level we'll have someone who will be really solid.

Participants expressed an awareness of multiple transfer methods available, ranging from two to five methods per participant. Participants stated mentoring, followed by documentation, cross training, and the use of rehired retirees as the four most common knowledge transfer methods. The variety of methods the participants identified may be a positive indication of current knowledge transfer efforts. Gagnon (2011) and Lewis and Cho (2011) stated multiple methods are necessary to transfer knowledge effectively based upon the circumstances and preferences of the individuals transferring knowledge. In addition, the variety of knowledge transfer methods may be an indication the participants understood how explicit and tacit knowledge transfer is important for continued organizational learning (Dodgson, 1993; Nonaka, 1994; Polanyi, 1966). Table 3 contains a summary of participant responses regarding available knowledge transfer methods.

Table 3

Participant Awareness of Available Knowledge Transfer Methods

Knowledge transfer method	# of participants aware of method	Participants aware of method
Mentoring	18	P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13, P15, P16, P18, P19, P20, P21, P23
Documentation	18	P3, P4, P5, P6, P7, P9, P10, P11, P12, P14, P16, P17, P18, P19, P20, P22, P23, P24
Cross training	12	P1, P5, P6, P9, P12, P14, P15, P16, P18, P19, P21, P22
Using rehired retirees	10	P3, P4, P6, P8, P10, P14, P19, P20, P21, P22
Job shadowing	6	P3, P7, P11, P12, P17, P20
Hands-on	5	P1, P4, P9, P13, P18, P21
Collaboration software	4	P4, P10, P15, P18
Brown bag sessions	2	P1, P24
Meetings	2	P2, P15
Video	2	P8, P15
Email files	1	P3
Formal training courses	1	P1
Interviews	1	P10
Online learning	1	P21
Pictures	1	P3
Podcasts	1	P4
Tape recordings	1	P4

My review of the website of the study organization identified the same number and type of methods available to employees. In other words, the aggregate list of knowledge transfer methods known to the participants is a complete list of methods currently available within the organization.

Theme 2: Barriers to Knowledge Transfer Exist

In total, participants cited 10 different perceived barriers affecting knowledge transfer from themselves to other employees. Each participant stated a minimum of one barrier to knowledge transfer exists and two participants cited five barriers to knowledge transfer exist. Participants stated the four most frequent barriers to knowledge transfer were (a) not enough dedicated time for knowledge transfer activities, (b) the unavailability of an employee to which knowledge transfer may occur, (c) a lack of skills on the part of the new employee, and (d) lack of management support for knowledge transfer activities. Table 4 contains a list of barriers to knowledge transfer cited by participants.

Table 4

Barriers to Knowledge Transfer Cited by Participants

Barrier	# of participants stating barrier exists	Participants stating barrier exists
Not enough dedicated time	14	P1, P3, P5, P7, P9, P10, P11, P12, P15, P16, P18, P19, P21, P22
Replacement employee not available	11	P2, P3, P4, P6, P8, P10, P11, P18, P19, P20, P22
Inadequate skillset of learner	8	P1, P2, P6, P7, P11, P14, P19, P22
Lack of management support	7	P1, P2, P9, P17, P18, P23, P24
Unwillingness of retiree	5	P2, P3, P13, P15, P22
Personality differences	3	P10, P15, P23
Unwillingness of learner	3	P1, P16, P22
Documentation difficult to find	2	P7, P9
Fair treatment of individuals	1	P2
No institutional knowledge transfer program	1	P3
Time between learning and skill use	1	P4
Variability of situational knowledge	1	P23

The majority of participants, 22/24 (92%), stated operational barriers to knowledge transfer exist such as time and availability of replacement employees and fewer participants, 14/24 (58%), cited limitations related to individual abilities or willingness. Each participant, 24/24 (100%), was intrinsically motivated to share knowledge, as managers at the organization do not provide specific rewards. Based upon

Vroom's (1964) expectancy theory, this finding may indicate participants accrue another type of personal intrinsic motivation or reward. This intrinsic motivation is congruent with the assertions of Martín-Pérez et al. (2012) who found a higher intrinsic motivation to share knowledge by individuals working in nonprofit organizations. Similarly, this finding may be an indication of a culture of collaboration promoting knowledge transfer described by Chow (2012). Unfortunately, even though individuals may exhibit motivation to transfer knowledge, the lack of replacement employees prevents knowledge transfer. Participant P6 summarized the reason for this stating, "It's hard because usually we don't have the funding to have double employees in the same position."

Participants offered eleven solutions to knowledge transfer barriers. Solutions included (a) ensuring a replacement employee is hired prior to an employee retiring, (b) building knowledge in team members over time so no one person holds knowledge in a specific job skill, (c) increasing management support for knowledge transfer efforts, (d) creating a formalized knowledge transfer program, and (e) rehiring retirees to conduct knowledge transfer with new employees. Table 5 contains a list of solutions provided to overcome knowledge transfer barriers.

Table 5

Solutions to Barriers to Knowledge Transfer Cited by Participants

Solution to barrier	# of participants offering solution	Participants offering solution
Hire replacement employee prior to retirement	10	P3, P4, P6, P9, P10, P11, P12, P19, P20, P23
Build knowledge in the retiree's team over time	9	P1, P2, P13, P15, P16, P19, P20, P22, P24
Increase management emphasis on knowledge transfer efforts	8	P10, P14, P17, P18, P20, P21, P22, P23
Create formal program for knowledge transfer	7	P3, P5, P10, P15, P20, P21, P23
Rehire the retiree	6	P3, P8, P12, P18, P19, P23
Encourage retirees to communicate intent to retire early	4	P3, P4, P9, P19
Reduce current workload of retiree to make more time	3	P12, P21, P22
Retiree makes the time to transfer knowledge	2	P1, P7

The most frequent solution offered by participants was to hire a replacement employee prior to an employee retiring. However, funding issues are the primary barriers to the offered solution. A total of 9/24 (37.5%) participants offered a solution with no direct costs by advocating knowledge transfer to existing team members over time prior to retirement. The next two most frequent solutions were increasing management support and creating a formal knowledge transfer program. Participant P10 noted one method to

create a formal program for knowledge transfer is to incorporate knowledge transfer activities into formal job descriptions,

> So, if it's in the position description now, it could be a tool for a management to say, 'Hey, we want you to do this', and now, it's the manager's responsibility to say, 'Hey! Now, I need to give you time to do this.'"

Several, 10/24 (42%), participants' desire for management support and formalized transfer practices are congruent with the findings of Mayfield (2010), Harvey (2012), and Lindner and Wald (2011) who concluded formalized knowledge transfer practices improve knowledge sharing among individuals. In addition, participant statements offering solutions to barriers, even though no rewards exist, are consistent with the expectancy theory described by Vroom (1964). Participants P1 and P7 were most notable by their statements that each would just make time to conduct knowledge transfer activities, even if not provided with time by managers. This may be an indication of those employees believing the extra effort expended satisfied a perceived need to transfer knowledge to another employee.

Interestingly, one participant observed that managers of organizations may not realize what types of knowledge is important to transfer until after the retiree leaves. Participant P14 stated,

> Gee, you know, Jim was a great project manager and we never had him transfer that ability to us. Somehow, he managed a project, construction project, which by the way, is true. So there's a void, but initially when he left, we didn't have that

> need. And so, nobody said anything. But then, suddenly we have a construction project and realize none of our current people had that experience.

A formal knowledge transfer program may be ineffective if the managers of an organization cannot foresee the types of knowledge to transfer. Managers' inability to determine types of knowledge to transfer may be one reason for formalized transfer program ineffectiveness as indicated by Lambe (2011). However, managers may be able to overcome this deficiency through developing a program identifying critical skills based upon the organizational learning theory offered by Argyris and Schön (1978). The development of a systematic approach to identification of critical skills may prevent the loss of tacit and explicit knowledge described by Polanyi (1966) and Nonaka (1994). In addition, Durst & Wilhelm (2011) recommended managers create a *knowledge map* to determine the most important knowledge to transfer.

Theme 3: Multiple Types of Knowledge to Transfer

Participants cited seven types of knowledge to transfer including (a) organizational-specific history, (b) external rules and regulations applying to the organization, (d) procedural information, and (e) the key organizational members. Table 6 contains a list of the types and frequencies of knowledge to transfer the participants mentioned.

Table 6

Types of Knowledge to Transfer Cited by Participants

Type of knowledge	# of participants citing type of knowledge to transfer	Participants citing type of knowledge to transfer
Why the organization does things the way it does	13	P2, P3, P4, P5, P7, P8, P12, P15, P16, P17, P20, P23, P24
External standards and requirements	9	P6, P9, P10, P11, P12, P13, P16, P21
Procedural information	9	P6, P10, P11, P15, P18, P19, P20, P21, P23
Knowing who are the key organizational members	8	P6, P7, P12, P15, P16, P19, P20, P22
How the organization conducts business	7	P2, P7, P11, P12, P15, P19, P22
Where to find documentation	2	P7, P9
Evaluation of subcontractors	2	P1, P11
Budgeting processes	1	P15
Compliance activities	1	P13
Strategic planning	1	P14

The multiple types of knowledge participants indicated to transfer are congruent with systems theory described by von Bertalanffy (1950) as the whole comprising more than the sum of parts of the organization. Understanding the importance of why the organization functions as it does and who the key organizational players are may result in a new employee's success after an expert employee transfers organizational knowledge. Participant P5 described the importance of learning how to interact with customers by

knowing “the stuff between the lines” which is similar to Polanyi’s (1966) description of tacit knowledge as knowledge that “we can know more than we can tell” (p. 4).

Although participants cited many types of knowledge to transfer, Participant P4 observed that some knowledge might not be useful to transfer: “Sometimes I'm not sure that all knowledge needs to be [transferred]. I mean, you know the world changes so fast and information and knowledge do separate things.” Participant P5 also described the challenge of knowing what knowledge to transfer stating,

> How do you quantify it [knowledge] because it’s a big ball of wax? But, it’s a ball of wax that's ever changing. And so, some of the things that I know, and learned before, some experience doesn't apply anymore. And some kind of do, but you kind of don't know which one -- which one is doing, which ones don't.

Participants P4 and P5 made the same assertion as Chatti, et al. (2012) who noted knowledge changes quickly and may become useless and out-of-date. Managers implementing knowledge transfer programs should recognize some knowledge may not be useful to transfer.

Theme 4: Lack of Knowledge Transfer Affects Productivity

The majority of participants (20/24) cited an efficiency loss when expert employees leave the organization without knowledge transfer. This finding is congruent with the conclusions of Lewis and Cho (2011) and Wang and Wang (2012) stating knowledge transfer is important to organizational effectiveness and innovation. Participants P4, P20, and P24 stated that an individual would have to “reinvent the wheel” because of a lack of knowledge transfer. Other effects on the organization

included frustration by remaining workers, risks to the organization resulting from non-compliance with external rules or regulations, and the loss of historic context with which to make informed decisions. Table 7 contains a list of the effects of a lack of knowledge transfer upon an organization cited by the participants.

Table 7

Effects of Lack of Knowledge Transfer on Organizational Productivity Cited by Participants

Effect of lack of knowledge transfer	# of participants citing type of effect	Participants citing type of effect
Organization is temporarily less efficient	20	P1, P2, P4, P5, P6, P7, P8, P9, P10, P11, P13, P15, P16, P17, P18, P19, P20, P22, P23, P24
Frustration experienced by remaining employees	11	P3, P4, P6, P9, P10, P11, P12, P13, P20, P21, P22
Non-compliance with external regulations	4	P9, P13, P18, P19
Loss of institutional history from which decisions are made	4	P2, P6, P20, P24
Rework of previously completed work	3	P4, P20, P24
Delayed or damaged research	1	P13
Feeling of personal loss	1	P21

The participants' second most frequently stated effect of lack of knowledge transfer is the frustration level of employees remaining after the retiree leaves the organization. Managers may find a relationship between the frustration level of employees and the expectancy theory offered by Vroom (1964). Vroom posited

individual behavior results from choices made to maximize pleasure or minimize pain. The high degree of intrinsic motivation of participants may be an indication participants wished to minimize pain of others in the organization through knowledge transfer. As indicated in Table 8, 4/24 (17%) participants noted negative past experiences when starting their jobs.

Table 8

Past Experience of Participants When Starting a New Job

Participant	Participant comment
P6	I've never had any kind of -- every time I've started a job where it was meant or just like I am now, I never had a set of instructions so I just sort of had to figure it out.
P11	When I first came here, I really sort of learned this stuff by myself.
P13	When I started doing that, there was one other person at the lab that had been doing it, then I took it over from that person and I remember coming in one morning and he said, “Well I'm sick today, somebody over here wants to ship something so see you later.” Okay, that was the extent of the turnover from and I don’t want that to happen because that was just -- I was -- I thought I was going to get fired or something. You know, because I have just taken the training but that -- but in taking the training, you don’t have any experience. You know, it took me all day to do one little shipment, and I wouldn’t want that to happen.
P21	Unfortunately, when this was dumped on me from the previous guy retired, that the transition was that he had been out on several types on medical and I was just backup and so I kind of learned by the seat of my pants.

To answer the primary research question: How do expert scientific support employees nearing retirement prefer to transfer knowledge, mentoring is the preferred method of knowledge transfer by the majority participants interviewed. Each participant

acknowledged multiple methods of knowledge transfer are available in the study organization in addition to mentoring including documentation, cross-training, using rehired retirees, and job shadowing. Participants stated many types of knowledge are important to transfer including why the organization does things the way it does, external standards and requirements, procedural information, and knowing who are the key organizational members. Each participant noted one or more barriers to successful knowledge transfer including lack of availability of someone to mentor, lack of time to conduct mentoring activities, a lack of skills on the part of the new employee, and lack of management support. To overcome these barriers, participants offered several solutions including hiring a replacement employee prior to an employee retiring, building knowledge in the retiree's team over time, increasing management emphasis on knowledge transfer efforts, and creating formal knowledge transfer programs. Collectively, participants stated a lack of knowledge transfer affects productivity because of issues such as organizational efficiency loss, frustration experience by remaining employees, non-compliance with external regulations, a loss of institutional history of decisions, and rework of previously completed work. The findings of this study are congruent with the conceptual frameworks of systems theory (von Bertalanffy, 1950), organizational learning theory (Dodgson, 1993), explicit and tacit knowledge (Polanyi, 1966), expectancy theory (Vroom, 1964), and the professional and academic literature presented in Section 1. The next heading contains the applicability of the findings to professional practice.

Applications to Professional Practice

Retaining knowledge of employees may be critical to the success of an organization (Bal et al., 2012). An increasing number of employees are eligible for retirement in the United States workforce population. As an increasing number of expert employees retire, organizations without knowledge transfer strategies may experience decreased organizational productivity, output, and reductions in competitive advantage (Calo, 2008; Cochran et al., 2012; Joe et al., 2013; Sirmon et al., 2011). Factors affecting knowledge transfer in organizations include (a) organizational culture, (b) learning ability of employees, (c) motivation, (d) trust, (e) language, and (f) workplace design.

The focus of this study was to investigate the preferred method of knowledge transfer of expert scientific support employees at a United States national laboratory prior to retirement to enable mangers to develop knowledge transfer strategies. Participants in this study stated mentoring was the preferred method for knowledge transfer followed by documentation and direct hands-on activities. Understanding how employees prefer to transfer knowledge may help managers to develop strategies for overcoming implementation barriers including the unavailability of other employees to which knowledge transfer may occur, lack of formalized knowledge transfer practices, and unwillingness to transfer knowledge.

The findings from this study might help managers create and implement successful knowledge transfer strategies by considering how expert employees prefer to transfer knowledge to remaining employees prior to retirement. The results of this study may help managers to create knowledge transfer practices that encourage tacit and

explicit knowledge sharing by designing processes from which employees may transfer knowledge overcoming organizational and personal barriers. The most frequent barriers participants identified were the lack of time and unavailability of another employee to transfer knowledge. The results of improved knowledge transfer practices may result in increased organizational productivity by reducing organizational knowledge loss when expert employees retire.

Implications for Social Change

Understanding the knowledge transfer preferences of employees, potential barriers perceived, and solutions to overcome barriers to knowledge transfer, may help managers create effective knowledge transfer strategies. An effective knowledge transfer program may result in an increase in the performance of an organization and, for organizations engaged in public scientific research, increase the potential for discoveries benefiting the citizens of the world. As organizational learning is linked to job satisfaction (Sabir & Kalyar, 2013), knowledge transfer practices may be a factor in positive social change resulting from higher job satisfaction. Employees with high job satisfaction are more innovative and participative in learning cultures compared to employees in organizations with low employee satisfaction (Kalyar & Rafi, 2013). Organizations with strong learning cultures promote scientific innovation (Kalyar & Rafi, 2013). Increased scientific innovation may promote the prosperity of citizens who may benefit from advances in energy research and technology.

A reduction in government services available to citizens is one potential outcome of knowledge loss attributable to increasing retirement rates in the federal workforce.

Employees who transfer explicit and tacit knowledge prior to retirement may reduce productivity losses, and increase the ability of the remaining organizational employees to achieve the mission of the organization (López-Nicolás & Meroño-Cerdán, 2011; Mills & Smith, 2011). United States national laboratories employ individuals who develop scientific and technological solutions to energy and environmental challenges. The solutions created by employees of national laboratories benefit the citizens of the United States and the world by providing sustainable energy practices and public policy promoting scarce energy resource conservation. At United States national laboratories, managers implementing knowledge transfer strategies for expert scientific support employee retirements may enhance the scientific discovery available to the citizens of the country, thereby causing a potential positive effect on social change. The results of this study may have an effect on managers who support social change resulting from employee satisfaction through learning and scientific discoveries for increasing productivity and quality of life.

Recommendations for Action

A concern for managers is 38% of the current United States workforce will likely retire by 2030 (Neumark et al., 2013). Expert employees may take years of tacit and explicit knowledge from organizations when retiring. Loss of knowledge from organizations may cause institutional memory loss (Lewis & Cho, 2011) leading to decreased organizational effectiveness (Fredericksen, 2010; Lewis & Cho, 2011), reduced competitive advantage (Joe et al., 2013; Sirmon et al., 2011), and decreased organizational financial performance (Wang & Wang, 2012). To help organizational

success, managers must implement practices to promote transfer of organizational knowledge when expert employees retire. Based upon the results of this study, I recommend the following actions:

1. Managers develop knowledge transfer programs using mentorship as a key component of activity. The results of this study revealed mentoring is the preferred method of knowledge transfer by expert scientific support employees nearing retirement. Mentorship programs are effective in intergenerational knowledge transfer (Harvey, 2012). Mentors need time to spend with other employees to transfer tact and explicit knowledge. Mentoring programs may need to be 3 to 6 months to enable mentors to facilitate retention of knowledge based upon the tacitness and complexity of the knowledge (Appelbaum, Benyo et al., 2012; Levy, 2011).
2. Managers use forward planning to hire new employees or make existing employees available to receive knowledge from expert employees prior to retirement. Although expert employees may be willing and ready to transfer knowledge, no transfer will occur without another employee to receive the knowledge. Managers should first create a relationship of trust with employees nearing retirement so advance identification of retirement intentions takes place when possible. Employees' advance notice of intent to retire may allow managers time to plan budgets to hire individuals to engage in knowledge transfer activities to assume retirees' job responsibilities prior to retirement of expert employees. Managers

engaging in strategic workforce planning may determine methods to pay for the employment overlap needed for knowledge transfer activities. For individuals employed and prepared to receive knowledge, managers must provide employees and mentors with time segmented from other work responsibilities to engage in knowledge transfer activities.

3. Managers openly support knowledge transfer needs and practices to promote knowledge transfer activities. Management support is critical to the sustainability quality of knowledge transfer programs (Al-Adaileh & Al-Atawi, 2011; Pollack, 2012). Managers affect knowledge transfer by determining the knowledge management culture through the development of learning from other employees' experiences (Chow, 2012). Managers should receive training in knowledge transfer best practices and guidance from the organization's senior management regarding how to support knowledge transfer activities involving retiring employees.

To disseminate the results of this study and recommendation for action, several actions shall occur. After study approval, I will send each participant an email with a link to the abstract and a one-page summary of my conclusions and recommendations. In addition, I will conduct a presentation describing the results and recommendations for action to interested organizational stakeholders of the study site.

Recommendations for Further Study

In this study, I found mentoring was the preferred knowledge transfer preference of expert scientific support employees at a United States national laboratory. As this

study was a single site case study based at a single national laboratory in the United States, the results may not be generalizable to other organizations. Further research at other national laboratories, and in different industry sectors, may have different results. Future researchers may use results from this study as the basis for additional studies in other national laboratories or industries. In addition, the participant pool was scientific support employees at a national laboratory. National laboratories also employee many scientists and further research of a population comprised of scientists may be beneficial for identifying any differences in knowledge transfer preferences that may exist between scientists and scientific support employees. Finally, researchers may choose to investigate how Generation X and Generation Y employees prefer to obtain tacit and explicit knowledge from retiring employees.

Reflections

The purpose of this study was to explore the knowledge transfer preferences of expert scientific support employees nearing retirement to enable mangers to develop knowledge transfer strategies. At the outset of this study, other than recognizing that employees would have a variety of preferences, I had no preconceived thoughts about the possible findings. The majority of participants stated mentoring as the preferred method of knowledge transfer. However, the participants acknowledged a variety of other methods was available.

As an internal researcher employed by the same organization as the study site, I held a concern I would not receive enough participants to demonstrate data saturation and provide a rich description of the participant responses. Fortunately, the sponsorship of the

participant email by the study organization's chief operating officer was a key to obtaining 24 participants freely willing to share preferences and thoughts for addressing the research question. The willingness of participants to share experiences and concerns was personally encouraging as each stated an appreciation for the undertaking of the study.

During the course if this study, I had several revelations regarding the study process. First, analyzing data using a predefined method is important. Using a predefined method to code text of participant responses was essential to preventing inadvertent bias. Using a software program combined with the *pawing method* (Ryan & Bernard, 2003) helped the identification of themes and provided a facilitative process for data analysis. Finally, the rigor needed to develop a literature review was daunting but improved my ability to use disparate sources of data and summarize concepts into themes to inform others.

I acknowledge the admiration I have for the individuals employed at the study site. In each interview, the passion for the mission of the organization and the strong commitment to provide support to accomplish organizational goals was consistent and clear. The participants demonstrated an ubiquitous sense of caring and willingness to overcome any barrier to achieving organizational goals. I have gained an increased respect for the employees supporting scientific discovery resulting from interactions with the participants of this study.

Summary and Study Conclusions

The purpose of this qualitative, single-site case study was to explore the knowledge transfer preferences of expert scientific support employees nearing retirement to enable mangers to develop knowledge transfer strategies. As an increasing number of employees become eligible for retirement in the United States (Neumark et al., 2013), the failure to develop and deploy strategies for knowledge transfer to remaining employees has resulted in reduced organizational productivity (Calo, 2008; Cochran et al., 2012; Joe et al., 2013). A total of 24 participants from a national laboratory participated in semistructured interviews to answer the central research question: How do expert scientific support employees nearing retirement prefer to transfer knowledge?

The four main themes that emerged from this study were (a) mentoring is the preferred method of knowledge transfer, (b) barriers to knowledge transfer exist, (c) multiple types of knowledge to transfer exist, and (d) a lack of knowledge transfer affects productivity. Leaders and managers may use these themes to develop effective knowledge transfer strategies and programs to reduce organizational knowledge loss and productivity decreases occurring from failures to transfer tacit and explicit knowledge from expert employees. Strategic and operational planning for knowledge transfer activities, including formal mentorship, and increasing management support for promoting other knowledge transfer activities are recommendations for actions of leaders and managers developing knowledge transfer strategies and derivative programs. Implementing knowledge transfer programs and practices in national laboratories may result in enhanced performance of research organizations resulting in increasing the

potential for scientific discoveries of solutions to global problems and creating derivative benefits for citizens throughout the world.

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Appendix A: Email Invitation to Potential Participants

Good day to you,

My name is Phillip Weiss, and I am an employee of the Berkeley Lab and a doctoral student at Walden University. I am conducting research on how expert scientific support employees wish to transfer their knowledge to others prior to retiring. I would like gain your perspective on how you would prefer to transfer knowledge to others if and when ready to retire. If you are thinking you may be within five years of retirement, are a scientific support (non-scientist) employee of the Lab, and have 10 or more years of experience in your field, you are a candidate for participation in this research. The goal of this research is to help organizations create knowledge transfer programs to better support the scientific community engaged in research.

My research involves an interview of less than 60 minutes. If you are willing, I would arrange for us to speak at a time and place convenient to you in which I will ask you several questions about your current experience, how you want to transfer your knowledge to others, potential barriers in transferring your knowledge, and any other thoughts you have to conduct knowledge transfer prior to retiring. I will maintain your confidentiality in this research by using codes instead of your name on all research data collected. If you consent to voice recording for note taking purposes only, I will destroy the digital files after transcription. After the interview, I will ensure you have the opportunity to review all transcripts for accuracy. All data reported in the research report will contain no names or any other identifying characteristics.

If you are willing to participate in this research project, and/or if you have any questions, please simply contact me via reply email as soon as convenient so I may complete this valuable research as soon as possible.

I thank you in advance for your consideration and your contributions to the work performed at the Berkeley Lab.

Best regards,

Phillip Weiss
E: pweiss@lbl.gov
P:
Walden Student #: A00293430
Walden University IRB Approval Number: 02-03-14-0293430
Berkeley Lab IRB Approval Number: 330H001-6AP2015

Appendix B: Informed Consent Form

You have the opportunity to take part in a research study of how expert individuals in organizations prefer to transfer knowledge prior to retiring. The researcher is inviting scientific support (non-scientist) employees who are within five years of potential retirement and have worked in their current role or organization for at least 10 years to participate. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

A researcher named Phillip Weiss, a doctoral student at Walden University, is conducting this study. You may already know the researcher as a colleague, but this study is separate from that role. No participants who are direct reporting employees of the researcher or in the researcher's immediate workgroup shall be participants to avoid any real or perceived conflicts of interest.

Background Information:
The purpose of this study is to explore the knowledge transfer preferences of expert scientific support employees who are nearing retirement.

- For this study, *nearing retirement* is the state of being eligible for retirement within five years of (a) any employee-stated date, (b) the date on which an employee could receive monthly retirement income from the managing agency, the University of California, or (c) age 62 based upon Social Security Administration eligibility.
- For this study, an *expert* is an individual employed in the same role or organization for 10 years or more or considered an expert by others based upon high achievement in their domain through years of experience.
- For this study, *scientific support employees* are employees who provide support services to scientists and do not engage directly in scientific discovery.

Procedures:
If you agree to be in this study, you may:

- Participate in a 60-minute interview electronically recorded and later transcribed.
- Validate the transcription of the recording.
- Review the researcher's initial findings and interpretations of aggregated data, if desired.

Here are some sample questions:

1. What techniques are available to you to transfer your expert knowledge before you retire?
2. What techniques will you employ personally to transfer your expert knowledge to other employees?

3. From the list of techniques you will use personally, which is your most preferred method?

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at your organization, or the researcher, will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind during or after the study. You may stop at any time even after the interview is complete after which, upon your request, destruction of any records, handwritten or recorded will occur.

Risks and Benefits of Being in the Study:
Being in this type of study involves some risk of the minor discomforts encountered in daily life, such as fatigue during the interview. There is no expected risk to your safety or well-being. However, if you feel any risk to your well-being, you may contact your organization's employee referral program. The researcher has contact information for the organization's employee referral program available to you upon request.

The benefit of this study will be a raised organizational awareness of knowledge transfer preferences and resources needed to reduce organizational knowledge loss and productivity when expert employees retire. Upon completion of the study, you will have the opportunity to receive an electronic copy of the abstract and a one-page summary of the study results.

Payment:
No payment in exchange for your time is available. Participation is voluntary and appreciated.

Privacy:
All information provided is confidential unless you report criminal activity. The researcher is responsible to report criminal activity to the study organization. The researcher will not use your personal information for any purposes outside of this research project. The researcher will not associate your name directly to any notes, recordings, or study reports; researcher-generated participant codes will be the only identification available. The researcher will keep data secure by password-encrypted security for a period of at least 5 years and then destroyed as required by the university.

Contacts and Questions:
You may ask any questions you have now. Alternatively, if you have questions later, you may contact the researcher via phone (XXX-XXX-XXXX) or e-mail (phillip.weiss@waldenu.edu). If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 1-800-925-3368, extension 3121210.

Walden University's approval number for this study is **02-03-14-0293430,** and it expires on **February 2, 2015.** The researcher will give you a copy of this form to keep.

Statement of Consent:
I have read the above information, and I understand the study well enough to make a decision about my involvement. By signing below, I understand I am agreeing to the terms described above.

Printed Name of Participant _____

Date of Consent _____

Participant's Signature _____

Researcher's Signature _____

Appendix C: Interview Questions

1. What is your current position in your organization?
2. How many years have you worked for the Laboratory?
3. How many years of experience do you have in your field?
4. What is your desired timeframe for retirement?
5. When you retire, what plan is in place to backfill your position?
6. Please describe the 2–3 most important parts of your job.
7. What kinds of knowledge do you think are important to transfer to others?
8. What techniques do you have available to transfer your expert knowledge to other employees before you retire?
9. What techniques may you employ personally to transfer your expert knowledge to other employees?
10. From the list of techniques you will use personally, which is your most preferred method to transfer knowledge to other employees?
11. What barriers may prevent you from transferring your expert knowledge to other employees?
12. What suggestions do you have for overcoming any barriers preventing you from transferring your expert knowledge to other employees?
13. What concerns do you have about transferring your expert knowledge to other employees?
14. What concerns do you have about knowledge loss in organizations when employees leave?