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Organizational Strategies for Developing New STEM Talent

Keri Allen
Walden University

Walden University

College of Management and Technology

This is to certify that the doctoral study by

Keri Coleman-Allen

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Review Committee
Dr. Olivia Herriford, Committee Chairperson, Doctor of Business Administration Faculty

Dr. Lynn Szostek, Committee Member, Doctor of Business Administration Faculty

Dr. Charles Needham Jr, University Reviewer, Doctor of Business Administration Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2017

Abstract

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by

Keri Coleman-Allen

MS, Teachers College, 2010

BS, Touro College, 2008

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

U.S. business leaders are experiencing a deficiency within STEM skill sets in newly hired employees, resulting in challenges to business sustainability. The purpose of this case study was to identify strategies used to develop new STEM employees for business sustainability. Participants included 5 IT business leaders who had experience developing new STEM employees in a technology organization in New York. The 3-part theory of knowledge management, knowledge creation, and knowledge transfer was the conceptual framework for this study. Data collection included face-to-face interviews and analyses of company training plans, videos, and internal websites. Methodological triangulation of the analysis technique included organizing, collecting, and comparing data. Data analysis included a generic coding process to identify 3 themes: (a) strategies for organizational effectiveness, (b) strategies for new IT employee enrichment, and (c) strategies for improving business productivity. The results of the study indicated strategies to deliver employee training and development systems leveraging internal knowledge management and transfer could provide business leaders with effective ways to increase productivity and maintain organizational effectiveness. The social implications of the study include the potential to improve the economic strength of the local community because new insights on the development of STEM employees may lead to increased hiring and business sustainability.

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Dedication

I dedicate this study to my Lord and Savior, Jesus Christ, who encouraged me throughout this journey. Through God's word and walking by faith, God has shown me that I have access to everything that He has made available on the earth. The only requirement is that I believe. He says that I can do all things through Christ who strengthens me. His word tells me that I am his masterpiece. God's love and provisions have made this dream a reality. I give special mention to my wonderful daughter, Britni Allen, my blessing from God, who exemplified an abundance of patience throughout this process. My mother provided extraordinary support throughout this doctoral journey, and encouraged me to press on and stay focused.

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Section 1: Foundation of the Study

Business leaders who discover effective ways of supporting the science, technology, engineering, and mathematics (STEM) talent support their employees in improving their workplace performance. The ability to develop new employees and transfer knowledge from existing and skilled STEM employees contributes to the growth of STEM knowledge throughout an organization (Eastin, Cicchirillo, & Mabry, 2015). Employees who desire to meet the needs of the economy are dependent on the business's ability to obtain, share, circulate, and apply existing knowledge. STEM employees who receive professional development could benefit from fact comparison while exchanging knowledge with experienced peers. Business leaders who focus on professional development in the workplace achieve results in positive business sustainability (Grashel, 2014). The purpose of this study was to explore strategies some business leaders use to develop the skills new STEM employees need for business sustainability.

Background of the Problem

For the United States to continue to operate as the innovation engine of the world, STEM employees must be sophisticated and highly innovative (Lin, Ku, & Huang, 2014). The sustainability of STEM-related businesses involves a need for qualified and prepared employees in STEM occupations (Economics & Statistics Administration, 2014). New STEM employees must be equipped with the necessary resources to obtain training and higher levels of professional skills (Eastin, Cicchirillo, & Mabry, 2015). With limited resources to invest, leaders with a development plan could provide the support that new STEM employees need for productivity in the workplace.

The necessity to hire underdeveloped STEM talent raises financial concern because business leaders are experiencing budget restrictions when providing employee professional development or training (Lin et al., 2014). Although cutbacks in the area of training are sometimes necessary, resources for employee development should remain part of a sustainable solution (Lin et al., 2014). Business leaders must identify which STEM skills are lacking and develop employees with the desired foundational skills to achieve the expected level of productivity (Gonzalez-Rodriguez & Kostakis, 2015). With an urgency to hire STEM employees, employers may have to take a different approach and change their development strategies and standards.

Problem Statement

U.S. business leaders are experiencing a deficiency within STEM skill sets in newly hired employees, resulting in challenges to business sustainability (Eastin et al., 2015). By 2018, the U.S. Department of Labor forecasts 23% of new STEM employees will lack many of the appropriate skills for business sustainability (Economics & Statistics Administration, 2014). The general business problem was business leaders face the challenge of developing new technology employees to support business sustainability. The specific business problem was some information technology (IT) business leaders lack strategies to develop the skills new STEM employees need for business sustainability.

Purpose Statement

The purpose of this qualitative single case study was to explore strategies some IT business leaders use to develop the skills STEM employees need for business sustainability. The targeted population consisted of business leaders within an IT

organization in New York, NY who have had success in developing new STEM employees. The implications for positive social change included the potential to improve the economic strength of the local community because new insights on strategies to develop information technology or STEM employees may lead to more hiring and increased sustainability.

Nature of the Study

The three research methods included qualitative, quantitative, and mixed methods (Imran & Yusoff, 2015). Yin (2014) suggested using a qualitative method to gather and reconstruct stories of participants on a conceptual level. In contrast, quantitative researchers use closed questions to test hypotheses (Lunde, Heggen, & Strand, 2013). The qualitative single case study does not warrant a quantitative or mixed-methods approach because the intention is not to quantify relationships or test theories.

I considered four research designs for a qualitative study: (a) phenomenological, (b) ethnographic, (c) narrative, and (d) case study. A phenomenological design focuses on individuals' lived experiences (Tomkins & Eatough, 2013). Phenomenology was not an appropriate design for the current study because the purpose was not to focus on lived experiences influenced by personal opinions. An ethnographic design requires the researcher to become an integral part of a cultural group, clarifying the behaviors of the culture (Cunliffe & Karunanayake, 2013). This study did not include an investigation of cultures or communities; therefore, ethnography was not an appropriate design for this study. A narrative study addresses the lives of individuals told through their own stories (Brown & Thompson, 2013). Narrative research was not an appropriate design for the current study because the purpose was to explore practiced occurrences. A case study

design is suitable for studying complex systems (Yin, 2014). A case study design was appropriate for this research project because of the emphasis on discovery.

Research Question

The research question was what strategies do some information technology (IT) business leaders use to develop new STEM employees for business sustainability? The interview questions for the study were as follows:

1. What strategies have you put into place that enhances IT employee proficiencies?
2. What resources does your organization use with new IT employees to develop the skills necessary to keep your business competitive?
3. What strategies do your leaders use to motivate and integrate workplace productivity?
4. How important is the use of technology in the development of new IT employees in your organization?
5. How are you using collaboration with experienced peers to meet the needs of new IT employee development?
6. What additional information can you share regarding strategies to enhance new STEM employee proficiencies?

Conceptual Framework

The three-part theory of knowledge management, knowledge creation, and knowledge transfer was the conceptual framework for this study. Nonaka and Takeuchi (1995) introduced the theory of organizational knowledge creation and transfer. Knowledge management, knowledge creation, and knowledge transfer embodied

throughout the organization benefited employee development leading to business sustainability (Lindlöf, Söderberg, & Persson, 2013). The driving idea behind organizational knowledge creation theory is the concept of tacit and explicit knowledge created through the continuous social interaction of knowledge involving socialization, externalization, collaboration, and internalization (Glisby & Holden, 2003; Nonaka & Takeuchi, 1995). A business leader's ability to motivate and train employees focuses on four areas: (a) technical workshops, (b) conferences, (c) presentations, and (d) training initiatives (Lindlöf et al., 2013). The theory emphasizes building STEM skills in the workplace and the effect it will have on business sustainability (Economics & Statistics Administration, 2014). Providing effective employee training and development systems could reduce the gap between STEM employee supply and demand (Lindlöf et al., 2013). The three-part theory of knowledge management, knowledge creation, and knowledge transfer aligned with this study addressing the need for continuous social interaction of knowledge.

Operational Definitions

Knowledge creation: Knowledge creation is the ability to create new knowledge for organizational competitive advantage (Lindlöf et al., 2013).

Knowledge management: Knowledge management is a tool used for the acceleration of individual self-learning or relearning (Shahbazova, 2014).

Knowledge transfer: Knowledge transfer is the exchange of tacit knowledge and skill set, which is difficult to articulate once mastered because of principles behind technical or scientific skills learned (Nonaka & Takeuchi, 1995). Knowledge transfer can

be useful when delivered by observation, imitation, or practice (Koppman & Gupta, 2014).

Underdeveloped: Underdeveloped refers to the inability to master a skill set because of restricted or limited knowledge (Eastin et al., 2015).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions are facts assumed to be true without verification (Roy & Pacuit, 2013). Assumptions are different ideas presumed to be truthful (Yin, 2014). The first assumption was that participants were truthful when sharing their various strategies. The second assumption participants would not adjust their hiring, training, and development practices. I analyzed the interview results by reapplying the questions and determined that all IT business leaders had appropriate responses concerning their professional experience. I obtained consistent feedback from each IT business leader that aligned with professional development practices.

Limitations

Limitations of a study are potential weaknesses (Skottun & Skoyles, 2014). A limitation of this study was a lack of confidentiality which might affect the honesty and openness of participant responses to interview questions. The study participants did not withhold essential information based on the study results reached by data saturation. Limitations were that participants who voluntarily agreed to participate in the study might not have represented the views of all IT business leaders. The findings from the study may reflect the perspectives of similar populations of business leaders, but the results may not reflect the views of other STEM business leaders.

Delimitations

Delimitations refer to the limitations purposefully placed on the scope of a study (Frels & Onwuegbuzie, 2013). The scope of this study was what technology business leaders are doing internally versus externally to develop new STEM employees. The population included members of the executive team only. The research took place in New York within a STEM business as opposed to a non-STEM business that hires STEM talent. The geographical area was limited to New York IT businesses. The participants were IT business leaders only.

Significance of the Study

Contribution to Business Practice

The results of this study may provide new insights on business strategies to develop employees who can benefit from STEM training. Business leaders who combine internal knowledge with rigorous job-related training will offer critical experience to STEM workers (Schumann, Leye, & Popov, 2015). Successful business leaders link STEM development with other employers and training providers (Schumann et al., 2015). The idea of linking employers to other training providers was to increase the business leader's ability to motivate and train employees using technical workshops, conferences, presentations, and training initiatives.

STEM employees are significant to the growth of the U.S. economy (Eastin et al., 2015). As the demand for STEM talent grows, the supply of higher-educated and qualified applicants is not increasing (Economics & Statistics Administration, 2014). STEM talent with minimal higher education is reflective of underdeveloped STEM employees (Economics & Statistics Administration, 2014). Nonaka and Takeuchi (1995)

argued that knowledge creation, knowledge management, and knowledge transfer embodied throughout the organization establishes business development and sustainability.

Implications for Social Change

The qualitative single case study results may reveal an effective development framework contributing to more developed skill sets for STEM workers lacking required proficiency. Results may contribute to the development of employees who lack STEM training. The benefits of high-performing employees could positively influence the economy through enhanced ability to obtain, share, circulate, and apply existing knowledge through a knowledge management system. IT leaders who include knowledge transfer and knowledge management throughout the organization provide support to new STEM employees (Piksööt & Sarapuu, 2014).

Transferring knowledge from one individual to another enhances skills. Individuals are not likely to be successful without knowledge transfer (Marincic et al., 2013). Transferring knowledge is important, but the organization that has a knowledge-transferring culture, technology, and leadership increases business sustainability (Piksööt & Sarapuu, 2014). Knowledge sharing with other individuals outside of the organization occurs because of knowledge transferring. Knowledge transfer beyond the organization happens when individuals share with others outside of the organization (Vissers & Dankbaar, 2013). IT employees at the center of knowledge creation, knowledge transfer, and knowledge management influence internal and external communities improving STEM proficiency (Vissers & Dankbaar, 2013).

According to officials from the U.S. Department of Labor (2014), the demand for IT professionals is rising and will grow more rapidly than in other industries. Understanding what strategies IT leaders are implementing to develop and retain professionals contributes to the growth of STEM knowledge. From a social change perspective, the qualitative single case research may be valuable to society through the identification of strategies to build and sustain the local IT workforce. The transfer of knowledge throughout an organization exposes continuous social interaction with others outside the organization and throughout the community. Knowledge management systems that include development activities influence the knowledge transferring process. IT leaders of an organization need to implement knowledge transferring for it to occur (Piksööt & Sarapuu, 2014).

A Review of the Professional and Academic Literature

Business leaders who focus on professional development in the workplace achieve positive results in business sustainability (Grashel, 2014). The literature review supports the problem that some information technology (IT) business leaders lack strategies to develop the skills new STEM employees need for business sustainability. Furthermore, the review of the professional and peer-reviewed literature informs the three-part conceptual framework of the study: knowledge management, knowledge creation, and knowledge transfer. Each component of knowledge management (how an organization maintains information), knowledge creation (new knowledge), and knowledge transfer (sharing information) are strategies used in STEM professional advancement. I conducted a review of the literature on STEM training strategies for new

employees, synthesizing the relevant research. Secondary research revealed related resources for other effective employee training systems.

I used various research repositories including the Walden University library databases such as ProQuest, INC, Computers and Applied Science Complete, Information Systems and Technology Research, Academic Search Complete, Business Source Complete, EBSCOhost, Premier Sage, Science Direct, ABI/Inform and Lexis Nexis, Emerald, and Accountant Tax. The search terms included *STEM leadership development*, *professional technology industry*, *technology leaders and management*, *knowledge creation significance*, *STEM industry demand*, *workers improve technical skills*, *technology on the job training*, *how technology employees remain successful*, *gaming training methods*, *successful technology employees*, *technology innovation management*, *knowledge management systems*, *knowledge creation*, and *knowledge transfer*. Texts and periodicals from various universities and public libraries are also included in the literature review.

Additional Internet searches consisted of commercial search engines such as Google Scholar. The search terms included *innovation strategy*, *global innovation*, *STEM*, *technology-staffing process*, *STEM strategic recruitment*, *supply chain management*, *resources for staff training*, *STEM leadership development*, and *STEM employment.* The study consisted of 96 peer-reviewed journal articles, reviews, and other scholarly sources on this topic published within the last 5 years. Table 1 provides a summary of the sources reviewed.

Table 1

Synopsis of Literature Review Sources

Reference type	Total	% Peer reviewed	Total 2013 to 2017	% of sources less than 5 years from completion date	Older than 2013
Peer-reviewed journals	94	96%	90	94%	2
Books	3		1		2
Other references	3		3		
Total	100	96%	94	94%	4

In this review, I organized the literature, including studies that addressed strategies for development of new STEM talent. The subheadings for topics in support of the conceptual framework include knowledge creation, knowledge transfer, and knowledge management. The knowledge creation subheading includes discussion of innovation and collaboration. Topics under the knowledge transfer subheading are (a) organizational sustainability through technology infusion; (b) linking training programs to employee, STEM talent, and labor market needs; and (c) products and services. The knowledge management discussion includes (a) understanding technology and its diverse nature, (b) internal workplace training and opportunities for STEM advancement, (c) training design, (d) interventions and effectiveness, (e) discovering training needs and environment, (f) enhancing employee performance, and (g) time management. In the final section, I analyze and synthesize the literature and explore its relationship to the research problem.

Conceptual Framework

The purpose of this qualitative single case study was to explore strategies some IT business leaders use to develop the skills STEM employees need for business sustainability. The three-part theory of knowledge creation, knowledge transfer, and knowledge management constituted the framework for this study. The research in this review emphasized a theoretical model of organizational knowledge creation. Nonaka and Takeuchi (1995) described a knowledge creation organization as having the ability to create new knowledge, disseminate it throughout the organization, and embody it in products, services, and systems.

The driving idea behind organizational knowledge creation theory was the concept of tacit and explicit knowledge created through the continuous social interaction of knowledge involving socialization, externalization, collaboration, and internalization (Glisby & Holden, 2003; Nonaka & Takeuchi, 1995). Nonaka and Takeuchi (1995) argued that circulating knowledge throughout the workplace strengthens business sustainability. The literature includes two epistemologies (explicit and tacit) and three frameworks that begin with knowledge creation for STEM employees and progress to new knowledge for the organization.

Nonaka and Takeuchi (1995) explained that information expands into knowledge for the purposes of creating new knowledge. Harada (2014) further clarified that creating a system structured to share knowledge could center attention on job performance. Once discovered, knowledge creation flows from socialization. Harada posited that knowledge between individuals materializes through externalization and distribution. Externalization is necessary for knowledge to materialize into workplace performance

(Harada, 2014). The externalization process happens through interaction with other employees. The process leads to combinations or linkages and circulation to other employees and groups. Moreover, the personalized development gained from internalization benefits the entire organization when understood by the group (Piksööt & Sarapuu, 2014). Once an understanding of knowledge occurs, socialization happens by combining tacit knowledge through shared experiences in an informal setting (Nonaka & Takeuchi, 1995). However, knowledge exists in the individual and is always personal.

In this study, the discourse included the evolution of knowledge creation from some of the oldest viewpoints progressing forward. Key elements included organizational sustainability, labor and marketing needs, internal workplace development, training design, time management, and enhancing employee performance. Specifically, an analysis of the academic literature resulted in explorative methodology learning. The analysis assisted with the evaluation of the central study question regarding strategies some information technology (IT) business leaders use to develop new STEM employees for business sustainability.

Three-Part Theory

Some qualitative and quantitative researchers have studied various aspects affecting knowledge creation and knowledge transfer. Sankowska (2013) demonstrated a quantitative approach and asserted that knowledge creation and knowledge transfer result in originality. Schultz (2014) stated businesses that quickly adjust to an evolving marketplace propose solutions that include knowledge transfer to remain sustainable. Marincic, Mader, Wieringa, and Lucas (2013) added that both components working together enhance the quality of products. Lucas, Bulbul, and Anumba (2013) argued that

staff development is necessary to increase knowledge creation and understand the significance of knowledge transfer. Skok, Clarke, and Krishnappa (2013) used a case study approach to show the importance of employees who gain access to knowledge and, more importantly, share that information with other groups within the organization.

Theodosiou and Amir-Aslani (2013) noted that relying solely on sharing information with employees and groups, business management could identify strategies and expertise to contribute to IT development leading to future opportunities. Knowledge management systems are responsible for structuring and dispensing knowledge content that could serve as a storehouse. Hyun, Mukhopadhyay, and Kraut (2016) contended that unlike knowledge content and knowledge sharing, knowledge management acts as a host for professional training techniques. Gonzalez-Rodriguez and Kostakis (2015) stated that although autopoietic systems share information from one to another, the professional development system generates digital information for web resources for organizational growth.

The difference between tacit knowledge and explicit knowledge is that tacit knowledge is difficult to make known to others because it is intellectual knowledge that resists linguistic expression. In contrast, explicit knowledge is stored for sharing with others (Nonaka & Takeuchi, 1995). Developing individual (tacit) knowledge to produce (explicit) products and services increases organizational sustainability. Skok et al. (2013) stated that individual development leads to organizational growth. Tacit knowledge that transitions into explicit knowledge occurs through individual workplace performance. Lechner and Gudmundsson (2014) explained how the influence of individual relationships contributes to job effectiveness. The authors emphasized that socialization

occurs through the interaction between tacit and explicit knowledge transferred from the individual to the organization. Reflection or externalization happens when tacit knowledge turns into explicit knowledge (Nonaka & Takeuchi, 1995).

According to Nonaka and Takeuchi (1995), new knowledge is transferred through content, ideas, systems, and active knowledge. The ability to create new knowledge in the workplace increases through social, tacit and explicit knowledge. Nonaka and Takeuchi suggested that these modes of knowledge conversion trigger interaction, embodiment, reflection, and intellectually linked behaviors. Comprehensive training methods circulate and transfer knowledge into productivity (Holtgrewe, 2014). Combination happens when elements of explicit knowledge link with other explicit knowledge, forming a circulatory distribution system throughout the organization (Nonaka & Takeuchi, 1995). Internalization is the transformation of explicit to tacit knowledge for the benefit of workplace performance.

Knowledge creation is an autopoietic system for the individual and is similar to group collaboration (Gonzalez-Rodriguez & Kostakis, 2015). The difference is the measure by which knowledge creation happens. At different levels of measure, either the individual or the group is a self-sufficient observing system. One difference between the individual and the group is that knowledge exists within an individual, making the experience personal. In contrast, tacit knowledge creates knowledge for the group and explicit knowledge forms a circulatory distribution system throughout the organization (Gonzalez-Rodriguez & Kostakis, 2015). Hall, Bachor, and Matos (2014) agreed that knowledge transferred or distributed sets the atmosphere for development. Unsuccessful

circulatory distribution could result in organizational and social uncertainties if communication is broken.

To develop an individual's knowledge base and successfully transfer that information to the group, communication and trust are critical to autopoietic systems. Communication and trust are also important to the group accepting knowledge from individuals. Communication happens through social dynamics such as Web interactivity, which produces worldwide repositories (Gonzalez-Rodriguez & Kostakis, 2015). Baghdadi (2013) stated that communication is important to business production and to the business as a whole. Baghdadi analyzed the world of knowledge creation that causes value for the whole organization through communication. Social interaction makes the flow of knowledge possible (McIver, 2013). Social interaction makes the possibility of a sustainable organization a reality. Social interaction between employees produces new knowledge (Baghdadi, 2013). Individual knowledge transferred to the group becomes collaborative knowledge (Baghdadi, 2013). McIver, Lengnick-Hall, Lengnick-Hall, and McIver (2013) stated that knowledge activities as a social construct is based on the social interactions and the developmental needs of the workplace.

The process of creating knowledge from social interactions includes knowledge in practice. McIver et al. (2013) agreed that when knowledge is practiced, original knowledge shows in job performance. The interaction encourages openness, collaboration, and participation emphasizing knowledge formation (Baghdadi, 2013). Nonaka and Takeuchi (1995) argued that knowledge creation, knowledge transfer, and knowledge management are the frameworks for this process. Based on these

expectations, an individual maximizes workplace performance. As information expands, the set of expectations and understanding of knowledge improves.

Knowledge Creation

Nonaka and Takeuchi (1995) introduced the theory of tacit and explicit knowledge created through the continuous social interaction of knowledge involving socialization, externalization, collaboration, and internalization (Glisby & Holden, 2003). Knowledge creation is an essential sustainable solution for organizations that include knowledge-sharing activities (Gonzalez-Rodriguez & Kostakis, 2015). Business leaders should focus employee attention on disseminating knowledge while reapplying existing knowledge to gain competitive advantage (Sankowska, 2013). Positively applied learning can expose original knowledge when reused (Marincic et al., 2013). Creating and maintaining knowledge that is original and relevant is important to organizational growth and competitiveness (Sankowska, 2013). Emphasizing a positive working environment sets the atmosphere for candidates to develop and acquire IT skills (Schultz, 2014).

Extending and advancing STEM talent often derives from comprehensive existing knowledge. New knowledge exists when reused for creativity (Marincic et al., 2013). In contrast, workplace collaboration that emphasizes internal interdependence and integration with other STEM professionals is not easy to obtain (Matsui, 2015). Instruction and skill building are critical to the successful work of STEM employee development.

Adequate employee training within organizations should emphasize the importance of developing and disbursing STEM skills (Baghdadi, 2013). Development,

disbursement, and knowledge creation happen throughout the process of sharing and learning. Each component of knowledge creation (a collection of information formed within an organization) and knowledge transfer (accessible and shared information) accentuates organizational strategies that improve STEM talent (Matsui, 2015). Collaboration enhances knowledge creation activities emphasizing the growth of employees in training. The potential to achieve new knowledge increases through a dynamic environment. Reusing learned knowledge positively replicates originality (Marincic et al., 2013). Business leaders should also focus employee attention on disseminating knowledge while reapplying existing knowledge to gain competitive advantage (Matsui, 2015).

Innovation and Collaboration

Many businesses collaborate with local universities, government agencies, and corporate laboratories (Baghdadi, 2013). Professionals in the STEM field studied innovation and reflected on the changing dynamics of innovation in the workplace (Schultz, 2014). The investigation results concluded that the need for STEM development, innovation, and product capabilities would generate new business prospects starting with the development of employee training (Baghdadi, 2013). Business leaders should generate training plans for other professionals to help improve productivity in the workplace. Staff dedicated to the improvement of new and existing technology address constant change (Marincic et al., 2013).

STEM employees should investigate which technological changes are necessary when seeking marketplace solutions. Qualified STEM talent provides a strategy for technological transformation. Providing the most effective business solutions for

technological transformation requires trained and developed STEM talent (Skok et al., 2013). STEM employees who remain ahead of business needs are prepared to enhance services through the expansion of technology (Holtgrewe, 2014). Business leaders are aware of the need for STEM talent in the roles of scientists, engineers, high-skilled technical workers, and highly trained medical personnel (Lucas, Bulbul, & Anumba, 2013). Business leaders who identify and reinforce unique STEM talent, cultivate originality through collaboration. In another case, business leaders who challenge and reinforce cultivation of talent should reward their staff, which might inspire the need for further training and development (Skok et al., 2013).

The innovative ideas of trained STEM talent are limitless. STEM talent is successful because of creativity formed through learned knowledge and technologies (Baghdadi, 2013). The purpose of creativity is to discover and expand on technological services (Skok et al., 2013). Business leaders who focus on success train STEM employees to distinguish between potential innovations while developing the businesses technological needs (Skok et al., 2013).

Aligning company goals with the needs of the economy and staff development is strategic (Gonzalez-Rodriguez & Kostakis, 2015). To further strategize and develop such initiatives, staff development might include technical group discussions, conferences, and demonstrations. STEM employees who gain experience through training strengthen their performance.

Business leaders who include collaboration and knowledge sharing into workplace performance promote an ongoing flow of information (Baghdadi, 2013). Providing knowledge sharing through collaborative presentations emphasizes crucial

understanding when obtaining new information (Holtgrewe, 2014). Business leaders should incorporate collaboration among staff to provide an ongoing flow of knowledge within the workplace (Gonzalez-Rodriguez & Kostakis, 2015). Shared innovation is highly important due to the accelerated use of technologies. For this reason, business leaders have the unique challenge of ensuring STEM employees meet the needs of the workplace, customers, suppliers, and stakeholders through training (Baghdadi, 2013). Effective STEM employees incorporate knowledge sharing to enhance creativity (Baghdadi, 2013).

Skok, Clarke, and Krishnappa (2013) stated information developed internally is difficult to duplicate. In this case, structuring a well-informed strategic alliance with other experts would create rigorous projects challenging employees and emphasizing the need for an internal training program (Baghdadi, 2013). Developing STEM employees internally using tacit knowledge can increase business sustainability. The transfer of tacit knowledge occurs through the sharing of critical knowledge that is not easy to put in writing or train, such as innovation and aesthetic abilities (Baghdadi, 2013). Collaboration with other businesses and colleges can provide ongoing personalized information that can improve productivity and quality (Miltenberger, 2013). Collaboration with stakeholders enhances the development and profitability of the organization. As an illustration, stakeholders who share their observations and reflect on the expansions and capabilities of new technologies encourage growth within an organization. The shared information transpired between all stakeholders' links employee performance with needs of the users, changes in markets, products, services, and technology (Skok et al., 2013).

Establishing collaborative relationships with customers encourages awareness, insight, and understanding as to the imminent needs of customers. Including customer needs in the learning process encourages growth and channels the direction of employee development (Skok et al., 2013). Co-creation among STEM employees and customers will encourage questions and openness, thereby adding value to the development of innovation. Collaboration brings attention to external resources for businesses. Business leaders who form relationships with customers should collaboratively reflect on the quality of products and service (Skok et al., 2013). Businesses that make innovation-friendly environments a priority enhance learning and employee development (Skok et al., 2013). The development of employees is important because the discovery could solve problems. Identifying technological problems means thinking beyond what one can see (Skok et al., 2013). STEM talent who think beyond what they can see engages in creativity.

Baghdadi (2013) stated that the discovery of new resources would help STEM employees share information creating product awareness. Discovering and evaluating potential new technologies demand discipline and focus (Skok et al., 2013). Educational history, on-the-job training, originality, and drive all play an important role in the problem-solving capabilities of knowledge workers (Baghdadi, 2013). Businesses need proficient workplace learning methods within IT organizations.

Knowledge Transfer

Nonaka and Takeuchi (1995) developed the theory that knowledge transfer embodied throughout the organization enhances employee development leading to business sustainability. Knowledge transfer is the course of action necessary for business

leaders to develop STEM talent. Knowledge transfer enhances STEM talent who creates access, disseminate, and adopt new knowledge (Koppman & Gupta, 2014). Experienced STEM talent uses successful creation and applications as a demonstration of knowledge transfer. Disseminating knowledge among workers is often difficult due to communication barriers or a false sense of ownership (Koppman & Gupta, 2014).

STEM professionals are essential to improving productivity and contributing to a healthy economy (Koppman & Gupta, 2014). Business leaders who adhere to this important revelation understand that transfer of knowledge between STEM employees must occur. Scheduling learning tasks that vigorously engage STEM talent in the learning process increases the probability of knowledge access. Businesses that encourage knowledge transfer expose employees to a repository of reusable information (Marincic et al., 2013).

Multimedia includes different types of communication. The different types of communication include interactive websites, videos, and webinars. Multimedia environments may expose employees to knowledge through multifaceted learning situations (Ricciardi & De Paolis, 2014). Multimedia learning environments demonstrate existing knowledge and new knowledge (Marincic et al., 2013). To understand the complex phenomena of knowledge, a person has to understand the three-part theory of knowledge creation, knowledge transfer, and knowledge management. Learned information takes place from one task to another with the clarity of concept. Lateral and vertical knowledge transfer is two ways of acquiring complex knowledge (Piksööt & Sarapuu, 2014). STEM employees experience lateral knowledge transfer on one level and apply it to other contexts. Vertical transfer can occur when learning less

sophisticated knowledge affects the learning of more complex knowledge (Piksööt & Sarapuu, 2014). Equally important is a questioning strategy used to share information within knowledge transfer learning environments. Questions will probe the learner to examine significant concepts and the knowledge transferred between two vertical realities. Questioning also indicates a learning strategy that will effectively enhance knowledge transfer in complex, cognitively high-demanding domains such as IT (Piksööt & Sarapuu, 2014).

Organizational Sustainability Through Technology Infusion

Leaders and stakeholders should measure the quality of their current technology while forecasting the possibility of futuristic IT opportunities. The successful infusion of technology greatly depends on leadership's ability to gauge the productivity of existing and future technology needs (Theodosiou & Amir-Aslani, 2013). Yang and Wang (2014) stated although organizations may be effective in some areas of technology, low competitive advantage may express managerial incompetence. For this reason, the growth of an organization is contingent upon the skillful allocation of STEM talent (Yang & Wang, 2014). The expectations of business leaders are to see the need for technological innovation and gain organizational sustainability (Iyengar, Sweeney, & Montealegre, 2015). Management expertise can contribute to strategically guiding the acquisition and operation of technical resources for competitive growth (Baghdadi, 2013). Successful implementation of technological innovation may happen with changes to normal organizational practice.

Managerial awareness relevant to the use of technology in an organization is important because technology is always changing (Hall, Bachor & Matos, 2014).

Promoting an awareness of organizational and technological uncertainties is imperative in the development of new STEM hires (Hall, Bachor & Matos, 2014). A STEM employee who creates technology that adapts to the needs of the user also remains adaptive to change (Sankowska, 2013). Marketplace awareness exposes the need for more resources and STEM development (Phelps, 2014). With the limited skill sets of new STEM employees, training centers attention on meeting the technology needs of companies.

Providing relevant technology and resources for training STEM talent can advance business value (Sankowska, 2013). As an illustration, professional development can add lasting competitive advantage to business processes. Process-driven organizations benefit from incorporating proficiency, practical learning strategies, and knowledge creation (Sankowska, 2013). Building a process driven organization includes regularly updating and preparing training plans to meet the needs of the business. Business leaders that link experiential learning and knowledge tailor the learning experience to the needs of the business (Skok, Clarke, & Krishnappa, 2013). Unending development and technology inclusion will encourage management directives (Sankowska, 2013). Using technology managers' ability to interlink knowledge creation, knowledge transfer, and innovation places attention on a higher job performance level (Sankowska, 2013). Transfer of knowledge, interactive professional development and the inclusion of new technologies improve individual productivity (Sankowska, 2013). An understanding of technological diffusion and diversity enhances flexibility concerning STEM talent, development, and opportunity issues (Hall, Bachor & Matos, 2014). STEM employees require technical skills driving operational improvement.

Properly trained STEM employees help to connect effective business leaders to ongoing successful partnerships (Phelps, 2014). STEM-related knowledge and productivity are significant to partners desiring to receive the most up-to-date information. The training of STEM talent can benefit assessing the worth of technology investments to improve and enable business potential (Fischer, 2014).

Business leaders can also provide benchmarks as measures of growth to guide the development of new STEM hires (Fischer, 2014). Benchmarks can assist and guide managers with operational progression (Phelps, 2014). De Faria, Schmitz, Juarez, Ferreira da Silva, and Sotirios (2015) stated business leaders could benefit from managing learning and operational progression since technology opportunities are agile and an enormous asset to businesses. The fast growth of information systems integrates business and leadership practices (De Faria et al., 2015). Preparing STEM applicants to bridge gaps using technology improves the competitive business advantage. Information management systems (IMS) require a specific, concrete implementation skill set. Business leaders who embrace IMS show an understanding of the relationship between technology and competitive advantage (De Faria et al., 2015).

Leaders improve system operational processes (Phelps, 2014). Improving the operational process means advancing STEM talent expertise, which brings recognition to the business due to their STEM skills. Business leaders who develop STEM employees with expert capabilities attract the attention of other IT organizations and offer training expertise. Business leaders who cultivate permanence of successful IT strategic leadership will have the benefit of sustainable IT performance (Lim, Stratopoulos, & Wirjanto, 2013). The business leader who receives this kind of publicity gains

recognition for their operational expertise. Business leaders, who establish a pattern for other businesses, invest in improving skills (Phelps, 2014).

Successful business leaders understand that on-the-job training develops skills and expert power. Business leaders invest in their businesses by training their internal workers to enhance their skills and by motivating other businesses in areas of weakness (Phelps, 2014). Business leaders need to ensure that STEM employee skills are valued in the IT organizations and that they are able to accomplish complex tasks. Dedicated and persistent leaders can link teams together for collaboration and skill development encouraging success (Miltenberger, 2013).

Linking Training Programs to Employer, STEM Talent, and Labor Market Needs

Employee efficiency is significant to business productivity. More specifically, business leaders should have a plan, which includes training for STEM talent that does not demand long periods away from the workplace (Gray & Albert, 2013). Informal and formal training produces many benefits toward growth (Gray & Albert, 2013). Business leaders may benefit from the use of a collaborative planning process. The planning process might include fundamental principles needed to enhance STEM talent. Businesses that include professional development in the workplace move toward competitive advantage (Grashel, 2014). Professional advancement within the workplace is cost-effective, timely, and applicable to workforce value (Grashel, 2014).

Successful workplace productivity encourages the use of technology to enhance products and services (Grashel, 2014). Grashel (2014) indicated professional development increases STEM talent effectiveness after comprehensive use of technology. To demonstrate, Lucas, Bulbul, and Anumba (2013) explained knowing how to code and

utilize certain machinery means an enthusiastic future for STEM employees because such skills are in great demand. In another case, business leaders who use technology integration coaches and professional learning communities increase their comprehension of STEM awareness (Grashel, 2014). Further research shows the effectiveness of STEM employees who receive integrated technology usage. Integrated technology might include on the job training and development (Grashel, 2014). Another example might include, the use of digital integration to solve problems, create information collaboratively, and share learning experiences with others. For this to occur effectively, STEM employees must be prepared to use digital tools as a business solution. McEdwards (2014) added technology integration that includes rigorous one-to-one instruction conducted over a period of time perfects skills. STEM employees who attend regular professional development and training increase their confidence in technology (Grashel, 2014).

STEM employees should engage in a robust training and development process. A commitment to training helps STEM employees to embrace new technology and social media indicating positive advanced business solutions. McEdwards (2014) explained expectations for learning new technology should involve challenging workplace assignments. Workplace tasks should include knowledge development as a strategy for developing employees (Friedman, 2014). Business leaders who demonstrate alignment and collaboration with workplace development positively influence business productivity.

Workplace productivity that includes difficult tasks for STEM employees benefits from an in-depth comprehensive process. On-the-job performance includes repetition of

skills that require STEM employees to reinvent products (McEdwards, 2014). Business leaders who find professional, effective ways of supporting the STEM talent assist their employees in improving their performance. A STEM employee who receives professional training and makes a conscious effort to put new tools into practice encourages growth tremendously in the workplace (Friedman, 2014). Business leaders must make a conscious effort to incorporate knowledge creation and knowledge transfer into the workday along with professional development.

Products and Services

Providing products and services remains challenging due to the STEM talent shortage (Srivastava & Shainesh, 2015). Shared knowledge can involve value creation when creating products and services for providers and users (Srivastava & Shainesh, 2015). To meet the demands of the marketplace, businesses must continually upgrade the skills of current and new STEM employees (Mouza & Karchmer-Klein, 2013). STEM employees including services and products maintain a level of skill that will affect productivity positively (Srivastava & Shainesh, 2015). STEM employees can develop knowledge through workplace development and utilize it for competitive advantage. Business leaders add value to their business when they provide professional training for their employees (Mouza & Karchmer-Klein, 2013). STEM employees can utilize the knowledge developed to collaborate and develop business solutions. Newly applied knowledge gained through collaboration is significant to STEM employees (Holtgrewe, 2014). Newly applied knowledge through workplace training indicates a high level of business achievement and success (Mouza & Karchmer-Klein, 2013).

Internal knowledge combined with innovation involves creating competitive products and services. Competitive products and services originate from workplace knowledge and intense rigor (Srivastava & Shainesh, 2015). STEM employees who become proficient with the skills learned may benefit marketplace and further advance technological growth (Holtgrewe, 2014). STEM employees who promote technology further advance the marketplace. Employees trained to create and embrace innovation identify future trends in involving services and products for businesses and consumers (Holtgrewe, 2014). (Mouza & Karchmer-Klein, 2013) argue employees who are committed to developing products and services rarely exist externally. Businesses investing in STEM employees should provide ongoing internal knowledge to evolve innovation. The expectation is that knowledge will advance and expand on prior creativity.

Business leaders who instill within STEM employees that new ideas are an extension of reused knowledge could potentially promote profitability (Friedman, 2014). Linking workplace development to STEM talent is possible using new and old knowledge (Friedman, 2014). The formation of new and old knowledge that evolves and enhances technological change benefits the marketplace. Workplace training and development enhances STEM employees with the most desired skills in the marketplace (Srivastava & Shainesh, 2015). The learning process should include knowledge and provisions for collaboration. Business leaders who provide STEM employees with an in-depth comprehensive knowledge of collaboration and innovation understand the importance of competitive productivity (Grashel, 2014).

Knowledge learned strengthens and leads to the competitiveness of our economy. The value of business strategy formed through knowledge and creative growth benefits the marketplace (Holtgrewe, 2014). Resourceful workplaces built on practical creative knowledge can advance products and services. Practical learning derived from creating and sharing knowledge exposes STEM talent (Mouza & Karchmer-Klein, 2013). Business leaders should provide knowledge that is rigorous, which can be crucial to the success of STEM organizations. Providing STEM employees with rigorous workplace tasks can prepare them to meet the needs of the economy, competitively, based on the business's ability to obtain, share, circulate, and apply existing knowledge (Shahbazova, 2014). STEM employees trained to utilize existing knowledge will also understand the significance of creating specific knowledge for workplace competitive advantage (Lindlöf et al., 2013).

Knowledge Management

Nonaka and Takeuchi (1995) framed knowledge management as a component used to enhance STEM employees. A productive learning environment includes control of (a) knowledge, (b) factual knowledge, and (c) skills; all of which guide organizations gain a competitive advantage in the marketplace (Shahbazova, 2014). Successful knowledge management environments can disclose various benefits to organizations (Shahbazova, 2014). The benefits of knowledge management include agile communication, improved staff involvement, and reduced problem-solving time. Repositories known as knowledge management systems (KMS) include a host for professional training (Shimrit, Keith, & Dotsika, 2014). Shimrit et al. (2014) suggested a repository be implemented using internal social networking. A KMS, which should

include collaboration, socialization, and internalization, advances employees to various levels. STEM talent veterans provide an influx of information for KMS to share with incoming STEM talent (Shimrit et al., 2014). Business leaders can challenge employees with new knowledge creation maintained through KMS (Marincic et al., 2013). KMS are competitive, successful, and have a prolonged existence (Shahbazova, 2014). KMS also provide a resource for people to collaborate with others in the organization (Marincic et al., 2013). Enforcing the promotion of STEM innovation is through applied knowledge and organizational trust (Sankowska, 2013).

Understanding Technology and Its Diverse Nature

Business leaders who create an environment of knowledge development for their STEM employees are competitive (Hyun, Mukhopadhyay, & Kraut, 2016). Understanding the importance of how technology will advance a particular organization leads to new ideas driven to advance the business (Lindlöf et al., 2013). Establishing a system for structuring and distributing knowledge content could enhance employee performance (Harada, 2014). Knowledge management systems that contain large amounts of information provide benefit in the area of managing technology (Shahbazova, 2014). Businesses include knowledge management as a tool to encourage the use of mini self-help lessons setting attention immediate solutions for newly implemented technology (Srivastava & Shainesh, 2015). Utilizing various technologies to guide self-help models for STEM talent can offer new knowledge and skills. A self-directed structure involves knowledge and content meant to develop individuals at different levels and stages. The system could provide individuals with diverse ways to access relevant knowledge tailored to the needs of the organization (Lindlöf et al., 2013). Creating a knowledge sharing and

management system to obtain information from internal and external sources profits the organization (Shahbazova, 2014). Obtaining information from various sources can enhance knowledge and skill development for STEM employees (Hall, Bachor & Matos, 2014).

The development of organizational routines and resources are essential to corporate growth (Baghdadi, 2013). Organizations are changing whether forcefully or in stages (Baghdadi, 2013). Supplying new knowledge leads to organizational improvement. Likewise, authenticating, swapping and updating existing knowledge is equally as important (Holtgrewe, 2014). Ren and Dewan (2015) acknowledged without a thorough technology system to monitor activity, organizations would appear at risk. STEM employees can meet the talent needs of technological expansion processes.

Often, innovation created through the utilization of STEM employees infuses growth and sustainability needed for success. The development of STEM talent is imperative to the inventive ways of integrating existing or emerging technologies into business solutions. Increasing, STEM talent and innovation are necessary for every 21st-century business solution (Baghdadi, 2013). Business leaders promoting new ideas should prepare to develop rising STEM talent.

New technology could assist with energy transformation. New technologies encourage multiple ways of utilizing technologies that include smart appliances and electric vehicles (Skok, Clarke, & Krishnappa, 2013). STEM talent would need ongoing advanced training to assist with meeting the emerging energy requirements of the 21st century. The technological process could include the deployment of energy technology

(Skok et al., 2013). STEM talent would need ongoing advanced training to assist with meeting the emerging energy requirements of the 21st-century.

Businesses should operate with an effective technological plan and a well-developed staff. Simultaneously, businesses with staff capable of providing an ongoing flow of creativity to support the technological expansion process should prepare to provide business solutions (Skok et al., 2013). Providing a business plan is a benefit that could potentially link emerging technologies to the wealth of knowledge that would guide technological expansion in the 21st-century. More specifically, providing STEM talent with an understanding of the emerging technologies will lay a foundation for training and development. Replicating relevant knowledge will enhance work quality leading to a competitive technological expansion (Mariani, Curcuruto, & Gaetani, 2013). Information technology is a world in which technology include comprehensive competition while advancing the effectiveness of innovative risk-taking in banks and other profitable services (Sevrani, Gorica, & Kordha, 2013). More specifically, providing STEM talent with an understanding of the emerging technologies will increase the flow of relevant knowledge for training and development.

Other areas with the necessity for talent development include safety, health, and the environment (Skok et al., 2013). The implementation of electronic health record systems continues to evolve because of the expansion of technology in the (Nanavati, Colp, Aiello, & Warfield, 2014). Training is required to manage technology projects containing medical information (Srivastava & Shainesh, 2015). Trained STEM applicants provide business solutions and are equipped to promote 21st-century social

change (Baghdadi, 2013). Knowledge management, knowledge creation, and knowledge transfer include a key component that adds to the success of effective employee training.

Business leaders prepared to provide effective employee training in the workplace can advance social settings. By creating effective employee training, technology solutions and innovation will become more diverse and comprehensive (Nanavati et al., 2014). Solutions might include IT, which supports activities such as acquisition, storage, retrieval, data mining, and data sharing (Nanavati et al., 2014). The increased comprehensive awareness could increase the quality of workplace service along with the economy's competitive advantage (Nanavati et al., 2014).

STEM employees must communicate, solve problems, and create new ideas in preparation of emerging digital trends (Laferrière, Hamel, & Searson, 2013). In the same way, business leaders who wish to develop STEM employees should train individuals according to technological advancements that are challenging and shaping users' expectations. Shaping user expectations means the restructuring of business in a way that can increase the speed of business capabilities (Laferrière et al., 2013). The incorporation of new technologies into daily work activities is progressing at a rapid rate. Plans for STEM employees to support the IT requirements are important for organizational continuity (Brueller, Carmeli, & Drori, 2014). An increased awareness of digital business is being elevated in the areas of (a) analytics, (b) mobility, (c) social, (d) cloud, and (e) cyber security (Nanavati et al., 2014). These five technology forces can largely disrupt businesses (Nanavati et al., 2014). Trained STEM employees should reinforce and embrace this new technology in order to guide a smooth transition within the workplace. STEM employees who understand the purpose of technology and how to use

it will expand business capabilities (Brueller, Carmeli, & Drori, 2014). Encouraging innovation will involve a dynamic approach to the merger of technology advancement (Brueller et al., 2014).

Maximizing the full potential of technology for STEM employees requires strategic planning and an integration of shared services within the workplace (Brueller et al., 2014). Strategic planning can include sharing information collaboratively to increase employee proficiency. Holtgrewe (2014) acknowledged advancing in the areas of new technologies and innovation involves accumulating and sharing information for distribution. Business leaders who provide an ongoing circulation of new and existing knowledge emphasis the importance of accessing shared information (Holtgrewe, 2014). Business leaders who circulate a continual flow of information within the organization help employees discover knowledge (Nanavati et al., 2014).

Internal Workplace Training

Encouraging ways of incorporating knowledge while processing that information internally could enhance employee performance and company competitive advantage. Guided information could involve a wide flow of internal knowledge to STEM employees (Seungsu, 2016). Internal training systems may include knowledge management, knowledge creation, and knowledge transfer. Such systems are critical to STEM employees in the workplace and could positively affect the economy (Matsui, 2015). Matsui (2015) indicated that knowledge is profoundly critical to the training and development process of learning. Knowledge management is critical to STEM employees because it can include an exchange of collaborative analysis and correction (Seungsu, 2016).

STEM employees in training could also benefit from fact comparison while exchanging knowledge with veteran peers. STEM employees put in a position to obtain ongoing relevant knowledge can provide business solutions in their daily workplace activities using internal training systems (Seungsu, 2016). Providing in-depth comprehensive solutions for difficult tasks is primary to business productivity (Matsui, 2015). STEM employees who attend regular professional development and training gain knowledge constantly. The employee gains confidence, thereby gaining newly created knowledge continually (Matsui, 2015). The edification and on-the-job training of knowledge workers produce originality and problem-solving capabilities (Seungsu, 2016). Businesses need to implement proficient workplace learning methods to help close the STEM talent gap.

Constant learning develops employees with intellectual capabilities and a desire to invest in the future of our economy (Matsui, 2015). STEM talent is important to the future of our economic growth. The contribution to the economy encourages marketplace and technological changes (Matsui, 2015). To summarize, training must engage STEM employees with high-quality content (Seungsu, 2016).

Opportunities for STEM Advancement

Increasing STEM opportunities in the workplace could happen by creating new knowledge using modern technology such as virtual reality, e-learning, multimedia, and gamification (Ricciardi & De Paolis, 2014). STEM employees who receive supported learning, user-centered learning, as well as self-directed training, may find that professional opportunities and advancements are easier to obtain. Seungsu (2016) stated knowledge creation by way of self-directed technology training is self-fulfilling and an

opportunity to transfer newly attained knowledge into daily tasks. Professional development training that includes user-centered collaboration enhances STEM talent with evaluations and feedback to further advancement (Ricciardi & De Paolis, 2014). Learners using this approach could potentially embed an emergence of ideas that support STEM talent empowerment and originality. Incorporating multimedia and gamification training involves many facets of learning that includes invention, customization, and teamwork (Israel, Marino, Basham, & Spivak, 2013). Learners benefit from the opportunity to advance using professional development training plans of their choice (Seungsu, 2016).

Professional training should include employees in the design process for an authentic and meaningful outcome. Employees who participate in the training process will most likely benefit from the instructional design framework (Israel et al., 2013). STEM employees who apply individual knowledge and understanding to workplace tasks create user-centered opportunities (Seungsu, 2016). Involving learners in the construction and design process as collaborators prepares them for opportunities and advancements (Israel et al., 2013).

Game-based learning is an opportunity to incorporate ideas that can advance the training outcome. Involving STEM employees in technology, multimedia, or gamification collaborative learning environments leads to opportunities for risk-taking, attention to detail, and problem-solving (Israel et al., 2013). Learning environments that are conducive to the learner's ability to participate in the construction of the training process promote engagement and expectations for future prospects (Israel et al., 2013).

Continuous training is extremely important to STEM talent, and new

technologies, including gaming, can provide opportunities to achieve this goal. Incorporating practices such as simulators introduces a favorable experience. Providing experiences develops skill sets (Ricciardi & De Paolis, 2014). The technology used to train and develop while remaining pleasurable enhances engagement (Ricciardi & De Paolis, 2014). Engaging STEM talent in this way may lead to a critical learning approach. Business leaders who consider the use of gamification for staff development can prepare trainees for new opportunities. These new advancements appear in the areas of team building, production enhancement, guidance, sustainability, and innovation (Israel et al., 2013).

Business leaders can also utilize gamification for the benefit of assigning rewards and recognition to staff by engaging in learning activities. Leaders might benefit from the support, enhancement, and supplemental learning that multimedia and gamification can provide for trainees integrated into actual work activities (Israel et al., 2013). The use of the latest technologies could be more cost-effective than other training methods (Ricciardi & De Paolis, 2014). Employees who train using new technologies may experience an increase in learning along with a display of advanced performance (Ricciardi & De Paolis, 2014). Continuing development will increase skills and help to retain new information for future STEM advancement and opportunities.

Training Design, Interventions, and Effectiveness

Training leads to positive results in the workplace (Mariani, Curcuruto, & Gaetani, 2013). Israel et al. (2013) found businesses increase staff effectiveness to improve the value of their goods and services. Developing technical skills will increase staff effectiveness and various training plans could increase staff productivity. Training

tailored to the needs of the organization benefits staff productivity (Gonzalez-Rodriguez & Kostakis, 2015).

Incorporating business fundamentals might need to include (a) organizational essentials, (b) organizational values, (c) motivation, and (d) rewards (Gonzalez-Rodriguez & Kostakis, 2015). The learning effects of STEM employee training appear rewarding to staff when new knowledge and prior experience intersect (Mariani et al., 2013). Training is a necessity; however, an effective plan may look more advantageous when implemented in multifaceted ways. Training plans, which include transferring knowledge, increase the possibility of on the job productivity (Gonzalez-Rodriguez & Kostakis, 2015).

Strategies that include organizational fundamentals, knowledge transfer techniques, and personal development increase the probability of a successful training plan. Businesses that include training plans operate using multifaceted strategies. STEM employees who engage in a successful training plan should receive information that will increase job productivity and competitive advantage (Gonzalez-Rodriguez & Kostakis, 2015).

Discovering Training Needs and Environment

Businesses are under increased demands to increase the quality of their services (Mouza, & Karchmer-Klein, 2013). As a result, a change in training and development could help improve the quality of workplace performance. An analysis of training needs is a preliminary step to creating the training plan for the business (Gonzalez-Rodriguez & Kostakis, 2015). Training-needs assessment may outline areas where training is required and may disclose extensive details on why certain areas are failing. In another example,

the training-needs assessment could disclose extensive information regarding training requirements (Mariani, Curcuruto, & Gaetani, 2013). Accomplishing an overall systematic need assessment can drastically make a difference in the effectiveness and quality of training plans (Gonzalez-Rodriguez & Kostakis, 2015).

A business that designs training plans and includes employee needs places importance on the inclusion of the staff (Israel et al., 2013). The inclusion of staff involvement is important for a more productive job performance. Employers who provide skill sets of interest engage employees in the training plan process Israel et al., 2013. Employees who take part in the training plan process usually are determined to participate in the training (Gonzalez-Rodriguez & Kostakis, 2015). Shifting business strategies are significant in training and development activities (Felix, 2015). Routinely changing the quality of training and development enhances workflow productivity (Gonzalez-Rodriguez & Kostakis, 2015). When there is quality in training and an increase in knowledge, the employee's mindset works towards sustainable business solutions.

Enhancing Employee Performance

Training that includes organizational knowledge strengthens and develops staff. McEdwards (2014) stated employee output is essential to business sustainability. The training plans made available should align with employee expectations. Plans that include intentionally guided practice and rigorous training lead to advanced on-the-job performances (McEdwards, 2014). Employees who engage in the electronic learning environment take advantage of customizable training made available by businesses (McEdwards, 2014). Employees who take advantage of the electronic learning

environment and the information technology that undergirds the organization's workforce development can benefit from the training process (Ricciardi & De Paolis, 2014). Electronic learning environments might include interactive websites, videos, and webinars.

Collaborative websites include career opportunities along with training and development (Ricciardi & De Paolis, 2014). These types of interactive multimedia resources provide multifaceted ways of sharing tools and resources (Ricciardi & De Paolis, 2014). The use of web pages can provide (a) live interactive meetings, (b) the use of wikis for sharing various information and topics, and (c) storing documentation for future collaborative usage (Israel et al., 2013). Various new technologies created many more options for developing staff. Videos and video conferencing provide training development no matter where the location may be (Srivastava & Shainesh, 2015). Video conferencing includes interactive sound and visuals in addition to presentations. Enhancing employee performance should include rigor when increasing the use of new technologies to improve competency. Engaging employees is vital for motivating organizational performance (Israel et al., 2013). Engaging employees with new and innovative methods such as online assessments and videos provide informal learning resources in ways to improve performance (Israel et al., 2013). Providing new and innovative learning opportunities that are engaging will provide exercises that will stimulate growth (Ricciardi & De Paolis, 2014). Providing innovative learning opportunities that are engaging may require advanced hardware and technology (Israel et al., 2013).

McEdwards (2014) explained trainer involvement in a training plan is essential for immediate feedback, informal assessment, and group discussions. All assignments created for the training plan assessment, coached or self-guided, should be original and challenging to individual work tasks (McEdwards, 2014). Businesses who are thoroughly dedicated to STEM employee performance create a training plan to prepare them for the emerging global labor market (McEdwards, 2014).

Time Management

STEM employees who are willing to work tirelessly to achieve company goals aim to meet company expectations (Israel et al., 2013). McEdwards (2014) stated creating expectations of the goals helps to predict and target a timeline for success. Levels of training may increase employee skills to complete performance expectations; therefore, intensive training should be a factor. Intensifying training is necessary due to the rapid growth and complexity of technology. The need for ongoing training should be irrefutable (McEdwards, 2014). Formal training should be a priority before challenges occur with job-related tasks for individuals (McEdwards, 2014). Planning, with the goals of successful completion of job-related tasks, increases on the job productivity (Grashel, 2014). Explicit, assessable, attainable, realistic, and time bound frameworks for personal achievement provide a balanced environment (McEdwards, 2014). Formal training will prepare STEM employees to meet or surpass customer wishes and assist co-workers with challenges related to tasks on the job. Creating time management goals are important to verify accuracy and to provide deadlines for training completion (Cheng, Wu, Dan, & Van Roy, 2013).

Staff whose knowledge and work experience is moderate might benefit from self-development as it applies to specific tasks. Self-development while on the job may provide limited knowledge (McEdwards, 2014). Tasks can sometimes become complex and involve training that is more formal. Formal training must be ongoing (McEdwards, 2014). Self-development increases understanding of job-related information. Continued development should include researching opportunities to address the complexities of organizational and individual growth (McEdwards, 2014). Discovering technologies that reinforce work-life ethics and choices is important to individual growth. Finding technology that enhances personal and business lives to work harmoniously is important (McEdwards, 2014).

Transition

Some IT organizations face a challenge as business leaders are experiencing a deficiency within STEM skill sets in newly hired employees, resulting in challenges to business sustainability. Exploring strategies some IT business leaders use was the motivation for developing the skills STEM employees need for business sustainability. The first section of the study consisted of the Foundation of the Study components as required by Walden University, Doctor of Business Administration. Section 1 contained (a) background of the study, problem statement, purpose statements, (b) nature of the study and (c) research question. The section also include (a) conceptual framework, and operational definitions, (b) assumptions, limitations, and delimitations, (c) significance of the study, and (d) review of the professional and academic literature. The review of literature includes sources relevant to successful STEM employee training and development ranging from 2013 to 2017.

In section 2, I include a summary of (a) purpose statement, and the role of the researcher, (b) participant selection, study population, and sampling methods; and (c) ethical research. Section 2 concludes with a description of (a) data collection instruments, (b) data collection techniques, (c) data analysis and (d) reliability and validity criteria for qualitative studies. In section 3, I provide a summary of the research findings and a discussion on the application of (a) professional practice, (b) implications for social change, (c) recommendations for action, and (d) the need for further research. Section 3 concludes with my reflections.

Section 2: The Project

Section 1 presented an argument that business leaders were experiencing a deficiency within STEM skill sets in newly hired employees, resulting in challenges to business sustainability. Data showed that by 2018, an estimated 23% of new STEM employees would lack many of the required skills for business sustainability (Economics & Statistics Administration, 2014). The specific business problem was that some IT business leaders lack strategies to develop the skills new STEM employees need for business sustainability. I explored strategies some IT business leaders were using to develop the skills STEM employees need for business sustainability. Section 2 includes an overview of the study's project methodology and process to explore, investigate, and interpret the business problem. The section also includes the purpose statement, role of the researcher, and participants. I discuss the research method and design, population, sampling, data collection and organization techniques, data analysis, ethical considerations, and framework to assess the quality of the research with reliability and validity criteria.

Purpose Statement

The purpose of this qualitative single case study was to explore strategies some IT business leaders use to develop the skills STEM employees require for business sustainability. The targeted population was business leaders within a technology organization in New York, NY that had success in developing new STEM employees. The implications for positive social change include new insights on strategies to develop employees who can benefit from STEM training.

Role of the Researcher

My role was to select participants, collect data, and organize the study to obtain pertinent findings. My role was to ensure that I had well-formed interviewing skills by studying suitable interview techniques. The success of collected information depends on the quality of interview techniques prepared by the researcher (Lamb, 2013). I chose participants, collected interview data, reviewed data, and journaled my experiences throughout the study.

In the interest of full disclosure and maximum transparency, I am a former technology teacher. My education and training are in business administration. Strategies business leaders use to develop new STEM employees have always been of interest to me. For several years, there were opportunities to know and communicate with other technology networks. Since that time, I have had no business relationships connected to the STEM industry, participants, or any areas related to the study.

I used a consent agreement, assessment of the risk and benefits for participants, and selection criteria to comply with the Belmont Report in research ethics (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978). I adhered to the guidelines of the report to protect participants and researchers. The Belmont Report included a difference between research and practice, with three basic ethical principles and proper application of the principles (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978). Three critical aspects of human subject research include personal respect, beneficence, and justice during the study (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978).

Biases can influence any study and may cause misrepresentations in the data (Finlay, 2014). Identifying individual biases ensures the ethical responsibility of the researcher (Hlady-Rispal & Jouison-Laffitte, 2014). No known biases affected the study. An objective of the interview process was to maintain the highest ethical standards. The interview protocol (Appendix C) ensured that each participant received the same procedural approach. The protocol also ensured that I adhered to Walden University's standards for thorough confidentiality and data security for participants. The objective was to ensure confidentiality and privacy by creating alias identities for participants (see Gibson, Benson, & Brand, 2013). The quality of the interviewing techniques requires being well prepared.

Participants

In qualitative research, the findings depend on participants who lived the experiences (Gibson et al., 2013). I selected participants who had experience with developing new STEM employees. Selection criteria included a minimum of five participants of an executive team within a technology organization located in New York. Failure to choose an accurate number of participants poses a threat to the internal and external validity of a study (Wallace & Sheldon, 2015). The selected participants provided valuable data and viewpoints related to successfully developing new STEM employees (see Burr, King, & Butt, 2014). The most significant undertaking in the design phase was identifying qualified participants for the study (see Gibson et al., 2013). Including qualified participants allows the researcher to acquire unified, valid, and reliable data (Wallace & Sheldon, 2015).

Key strategies for gaining access to participants included human resources management disclosures of potential executive team members throughout the organization. I gained access to participants in person, by phone, or through e-mail. Participants fitting the selection criteria received a formal invitation to participate in the study. I worked with the human resources department for guidance and direction in the selection of participants. Recruiting eligible participants enhances research validity (Wallace & Sheldon, 2015). By following document protocol, researchers can bolster reliability (Grossoehme, 2014). Bristol and Hicks (2013) found full informed consent of each participant resulted in successful research outcomes.

Strategies for establishing a working relationship with participants will link participants' interest to study findings (Hlady-Rispal & Jouison-Laffitte, 2014). Plans for creating a working relationship should include sharing findings for consistency (Yilmaz, 2013). Building a working relationship with participants is essential to successful qualitative research (Yin, 2014). Preferred members shared information honestly and in an open manner by responding to face to-face open-ended questions. Participants provided informed consent before participating in the case study.

I chose participants based on alignment with the specific problem and overarching research question. Qualitative research includes the selection of participants whose experience aligns with the research questions (Gibson et al., 2013). Properly informed participants contribute to a successful research outcome (Hlady-Rispal & Jouison-Laffitte, 2014). I selected participants who had the expertise and experience in developing new STEM employees. Selecting participants who are interested in the questions contribute profound information (Burr et al., 2014).

Research Method and Design

I explored participants' experiences and insight in a descriptive way. Offering knowledge and practices of individuals' experiences is the purpose of qualitative research (Frels & Onwuegbuzie, 2013). Qualitative studies include participants' perspectives and emphasize data collection through participant dialogue (Sarma, 2015). Successfully exploring experiences contributes to data collection. The methods and design chosen in the current study were vital to the research outcome and guided the direction of the study. The research design and method influence the study's results and the conclusions framed by the researcher (Yin, 2014).

Research Method

Qualitative research reflects the participants lived experience confirming the dissimilarity between qualitative and quantitative research methods. The objectives of the two methods are different (Frels & Onwuegbuzie, 2013). Quantitative research includes numerical data to confirm or reject a hypothesis (Hoare & Hoe, 2013). Quantitative researchers also seek to understand the relationships between variables (Hoare & Hoe, 2013). Quantitative research follows a logical process when understanding or investigating facts (Hoare & Hoe, 2013). I used a qualitative method to build a complete understanding of realistic experiences. The study included no precise measurement or predetermined hypotheses. A qualitative study includes a rigorous investigation of facts without using numeric data analysis (Hlady-Rispal & Jouison-Laffitte, 2014). I reported findings in words rather than numbers.

A mixed-methods approach did not fit this study because mixed-methods researchers combine qualitative and quantitative methods (Leedy & Ormrod, 2013).

Mixed methods are applicable when neither a quantitative nor qualitative approach alone can answer the research questions, or when one research method is needed to clarify the other (Sarma, 2015). The quantitative researcher uses closed questions to test hypotheses (Lunde et al., 2013). In this study, the qualitative method was sufficient to answer the research question, which did not require a hypothesis.

I used the social constructivist worldview to discover strategies that technology company leaders used to develop new STEM employees. Yin (2014) suggested using a qualitative method to gather and reconstruct stories of participants on a conceptual level. According to social constructivists, researchers use the qualitative method to explore participants' experiences (Frels & Onwuegbuzie, 2013). The strength of a qualitative approach consists of the participants' perspectives and data collected through interviews (Sarma, 2015).

Research Design

Research designs are unique and each has specific benefits. Qualitative designs include phenomenological, constructivist, ethnographic, narrative, and case study (Hlady-Rispal & Jouison-Laffitte, 2014). A case study design enables a discovery of intricate professional facts of participants in a professional and experienced setting (Hlady-Rispal & Jouison-Laffitte, 2014). Choosing a design involves the researcher disclosing goals and expenses associated with the research (Gibson et al., 2013). In this study, I used a case study design to identify strategies used to develop new STEM employees for business sustainability.

Case study research is appropriate when conducting evaluations, studying the facts in a common environment, or determining what happened or why it happened (Yin,

2013). A case study approach exposes the researcher to topics using a framework of the study (Yin, 2014). Another benefit of a case study is researchers have an opportunity to engage in personal daily interaction with participants about their experiences (Thomas, 2015). I considered a phenomenological design to emphasize the understanding from an individual perspective. The phenomenological design was not the most fitting approach for exploring sustainable developmental strategies for underdeveloped STEM employees. The reason why phenomenology was not the most suitable design was comprehension of individual practice was the objective, not lived experience.

The constructivist approach exposes meanings and facts from the participants' perspective (Buckley, 2013). A constructivist design centers on reconstructing stories of participants on a theoretical level (Yin, 2014). The constructivists collect data to observe participants' behavior through active engagement (Lacerda, Ensslin, Ensslin, & Dutra, 2014). I eliminated the constructivist design because the design emphasizes a reconstruction of the participants' story.

An ethnographic design was not appropriate because it centers on cultural groups in an original environment over an extended period (Garcia & Gluesing, 2013). Ethnographic studies involve the researcher as an integral part of the cultural group to study individuals of the same culture (Schembri & Boyle, 2013). The benefit of ethnographic research is to understand the behaviors of culture (Baskerville & Myers, 2015). For this reason, ethnography was not an appropriate design for this study. Narrative research includes participants who provide individual stories about their lives (Brown & Thompson, 2013). The participants share retold experiences sequentially

(Baskerville & Myers, 2015). Narrative research is typically a case-based design without an exploration of multiple participant occurrences (Dailey & Browning, 2014).

I triangulated the data from interviews, company documents, and archival analysis to validate the study's outcome. Data saturation occurs when continued interviews of participants reveal no new information (Gioia, Corley, & Hamilton, 2013). Reaching data saturation will enhance the legitimacy of the findings (Ekekwe, 2013). I chose five participants to reach data saturation during the interviews. A sample of at least five participants is required to achieve saturation (Gile & Handcock, 2015).

Population and Sampling

The population for the study included business leaders within an IT organization. An exploratory single case study was a suitable design for participants represented in the same setting (Yin, 2014). A purposeful sample benefits a small sample size because of the center of discovery (Gioia et al., 2013). Sample sizes for qualitative studies are much smaller than sample sizes in quantitative studies (Gile & Handcock, 2015).

A small sample size is acceptable in a case study (Molenberghs et al., 2014). I chose participants based on their experience and expertise. I used the purposive nonrandom sampling technique to maximize the diversity relevant to the study. The participants' in this study represented a small sample to meet the criteria for the study's population. The participants had experience with developing strategies for new STEM employees within their organizations. Business leaders within an IT organization define the positions and qualifications of executive team members. Five business leaders within an IT organization shared their best practices for developing new STEM employees in an interview format. A sample size of at least five is suitable for data collection in a case

study (Burr et al., 2014). Interviewing a smaller number of individuals helps to obtain a deeper understanding of the issue (Gioia et al., 2013). A smaller sample enables the researcher to analyze the interview responses in detail and identify thematic expressions (Gile & Handcock, 2015).

Qualitative case studies include at least five participants to achieve saturation (Burr et al., 2014). The sample size should be sufficient to answer the research questions and determine data saturation (Yin, 2013). Fusch and Ness (2015) added that the sample size should be broad enough to answer the research questions. Data saturation occurs when no new information emerges during questioning, no new thematic expressions occur, and the study can be replicated (Gioia et al., 2013). I focused on five experts in an IT organization to achieve data saturation.

Participants in this study participated in an interview process to identify strategies used to train underdeveloped STEM employees. Face-to-face interviews include nonverbal communication and clarification of uncertain points (Khan & Adnan, 2014). Member checking interviews can obtain in-depth information and is a method by which study results reach data saturation (Fusch & Ness, 2015). I scheduled interviews based on the availability of all parties, considering time, date, and location. The interview process included enough time for the participants to provide relevant information for the study. Interviews should take place in private spaces including conference rooms and offices at the current location and last approximately 30-60 minutes (Yin, 2013).

Ethical Research

I requested a participation inquiry from the participants' of the study once permission from the IRB and access to the research site occurred. The ethical and valid

research process includes a fundamental guide (Hays, Wood, Dahl, & Kirk-Jenkins, 2016). I provided an informed consent form to those willing to participate. The form presented in person indicated that participation was voluntary and confidential (see Appendix A). Storage for consent forms is 5 years. Participants confirmed understanding that engaging in the interview process was of their free will. I informed participants that they could withdraw at any time during the interview process. A verbal or written withdrawal was acceptable. The study participants received no incentives for individual participation. Working in alignment with ethical requirements, participants needed to specify their motivation for participating in the study before beginning the interviews. Motivation and discovery happen when interview questions align with participant's experience (Khan & Adnan, 2014).

Before starting the research, I sought the Walden University Institutional Review Board (IRB) approval for the ethical protection of the research. After receiving IRB approval, I received an approval number 03-22-17-0363587. Research ethics should require all studies to go through a rigorous review and IRB approval process (Gibson et al., 2013). The purpose of the IRB is to guarantee that participation sites and participants are accepted to the law on professional conduct and practice standards (Hays et al., 2016). Upon choosing a research site and participants, I requested approval from the participants who met the criteria to complete the study. To ensure privacy, I used fictitious names of participants and their organization. I attained confidentiality by assigning generic codes to each participant. I gave the company a fictitious company name to obscure their identity. I labeled the company ABC Company, and participants as *Participant 1* and *Participant 2*, to ensure confidentiality and privacy. I secured storage

for all digitized data on a password-protected flash drive for easy retrieval. Storage for the flash drive will remain protected for 5 years. Research documentation will remain in a secure filing space. Identities of the participants along with all consent forms, transcripts, notes, and recordings will be shredded and all data stored on a password protected flash drive deleted within 5 years of the project's completion. The objective of the data collection process is to maintain the highest ethical standards for the participants and research (Ekekwe, 2013).

Data Collection

Instruments

Data collection instruments used by researchers include questionnaires, surveys, existing documents and records, and interviews (Dasgupta, 2015). Interviews involve collecting data in qualitative case studies (Yin, 2013). The data collected included company documents and archival records. The data collection process benefits methodological triangulation (Yilmaz, 2013). Actions taken pertaining to the organized data collection protocol adheres to Walden University's thorough confidentiality and data security standards.

A semistructured interview was the primary instrument for data collection. The semistructured interviews disclose trustworthy data, excellent detail, and strengthen the study (Yilmaz, 2013). Semistructured interviews reinforce the instrument decision (Dasgupta, 2015). Before the interview began, the participant reviewed the consent form that explained the purpose and nature of the project, along with the ethical considerations; risks, benefits, and the participant's right to confidentiality. Each interview consisted of six open-ended questions covering the participant's experience and strategies used to

develop new STEM employees (see Appendix A). Triangulating interview data with other multiple sources confirm research validity (Wijnhoven & Brinkhuis, 2015). Company documents, archival analysis, and observations complimented semistructured interviews for data collection.

Semistructured interviews give participants the ability to provide relevant and experienced responses to interview questions. Interviews allow the researcher the ability to probe deeper into the participant's response (Hlady-Rispal & Jouison-Laffitte, 2014). Open-ended questions ensure that interviews collect data (Hlady-Rispal & Jouison-Laffitte, 2014). Questions asked did not lead the interviewee to ensure an opportunity for relevant and factual responses. Interviews enable the researcher to gather in-depth information (Gibson et al., 2013). Qualitative interviewing minimizes the chances of serious errors (Burr, King, & Butt, 2014). Taking notes and repeating the interpretation to the participant during the interviews ensured equivalent understanding. Participants provided relevant information based on the interview and follow-up questions. In-depth probing during the interview was a priority in this study. The researcher checks for accurate interpretation of responses by using member checking to ensure data collection reliability (Ekekwe, 2013).

Member checking is valuable when the researcher documents research procedures during the process in a research journal (Grossoehme, 2014). Member checking is appropriate to validate the work of the researcher and keeps the analysis close to the data (Khan & Adnan, 2014). To ensure reliability, I documented the research process through the stages of data collection, analysis, and interpretation. The data gathering process and procedure center attention on other researchers to replicate the study (Yilmaz, 2013). I

verified the dependability of the study by reapplying the same questions for all interviews. Reapplying the same questions minimized errors. After the first interview, I interpreted and combined what the study participants shared, and reviewed the interpretation with each study participant for validation in a follow-up interview. Sharing the findings with the participants engaged in member checking. The participant confirmed the interpretation or addressed any corrections necessary. I organized, collected, and compared the interview data for data saturation. Methodological triangulation was another method of reaching data saturation by correlating data from multiple data collection methods (Fusch & Ness, 2015).

Data Collection Technique

Case study research involves collecting data from several data sources including interviews (Yin, 2013). Questions for participants by researchers may happen in a specific way; however, questions in a case study interview are likely to be loose rather than rigid (Burr, King, & Butt, 2014). I reviewed collected data and continued to ask why events or facts appear as they do. Data collection and interview techniques are successful when the researcher follows the proper protocol (Lawrence & Tar, 2013)

The interviews took place in an available room or conference room on site. Interviews proceeded for 30-60 minutes. During the interview, I collected documents requested including past and future training plans, videos, and websites used for training. I documented research procedures within a research journal. Notes taken during verbal conversations in conjunction with audiotaping enhanced each interview. The recording was optional, and the participant had the option to opt out at any time. The advantage of interviews includes cost-effectiveness, convenience, and easy access to participants

(Burr, King, & Butt, 2014). Face-to-face interviews were the most practical choice for this study because data quality was certain through the research findings. A critical component of this method was the researcher must keep control of the conversation to avoid running out of time (Khan & Adnan, 2014). A disadvantage of interviewing is the wording and sequence of the interview questions (Lawrence & Tar, 2013). The order of the interview questions should automatically align with the conclusion of the meeting (Khan & Adnan, 2014). Checking the recording device before the interview was best practice (Burr, King, & Butt, 2014). During the interview process, repeating the interpretation to the participant during the interview ensures equal understanding (Grossoehme, 2014). In-depth probing during the interview was preferable in this study. Information that may become relevant to a case study was not easily predictable (Burr, King, & Butt, 2014).

Pilot studies increase the effectiveness of the main study by interviewing other executives who are not participants (Frels & Onwuegbuzie, 2013). I did not implement a pilot study due to redundancy. A repetitive pilot process was unnecessary to the data collection process (Grossoehme, 2014). The goal for the repetitive approach was to validate the interview guide (Appendix C), and the pools of eligible participants were readily available. An advantage of the interview guide was the ability to prepare the interview questions in advance (Lawrence & Tar, 2013). I repeated notes to confirm interpretation during the interviews.

Member checking presents a preliminary interpretation to participants confirming the accuracy of the researchers understanding (Oleinik et al., 2014). I scheduled a follow-up interview to collect feedback. If changes to the notes were necessary, a stored

copy of the original documentation explained all changes made. Sharing the findings with the participants allowed for member checking. Methodological triangulation was another method of reaching data saturation by correlating data from multiple data collection methods (Fusch & Ness, 2015). Burr, King, and Butt (2014) suggested demonstrating proper protocol during data collection and interview techniques for an accurate assessment. Asking single questions and avoiding facial expressions stayed clear of influencing the participant during the interview. The participants had an opportunity to review their responses to the interview questions with the researcher. After the follow-up interview, I interpreted and synthesized what the study participants shared, and reviewed the interpretation with each study participant for validation. Member checking in case study research validates the work of the researcher and keeps the analysis close to the data (Khan & Adnan, 2014).

Data Organization Technique

Storing data in a single place is essential in qualitative research (Oleinik, Popova, Kirdina, & Shatalova, 2014). I attained privacy and confidentiality for each participant by assigning generic codes to each participant. Generic coding is the process of tagging specific data with category names or descriptive words and then grouping the data (Yin, 2014). Coding of data is important for identifying patterns and themes (Frels & Onwuegbuzie, 2013).

A Microsoft Word document contained the transcribed data. I compiled data and textual transcripts into Microsoft Excel from Microsoft Word. The process of compiling is gathering and organizing the data collected (Oleinik et al., 2014). After the compilation of the data, dismounting and coding data takes place (Yin, 2013). Storing

data creates an easy means for retrieval (Frels & Onwuegbuzie, 2013). I created folders containing the transcribed interview content and written records for each study participant. I used Microsoft Excel for tracking, organization, preliminary data analysis, and initial data coding. Storing data confidentially ensure participant protection (Frels & Onwuegbuzie, 2013). I stored data to maintain participant's privacy. I stored data on a password-protected flash drive held in a locked storage cabinet for a minimum of 5 years. The data will then be shredded and destroyed, including the flash drive. Deleting the identity of the participants and the coding that could identify them was a top priority. An objective of the study was to maintain the participants' confidentiality and to maintain ethical standards.

Data Analysis

Relevant case study data requires an examination (Frels & Onwuegbuzie, 2013). Collecting data from face to face interviews, methodological triangulation of other data sources such as company documents includes additional relevant data (Yin, 2013). Training plans, videos, and websites used for training complimented semistructured interviews for data analysis. The rationale of the data analysis is to expose ideas that answer the central research question (Burr, King, & Butt, 2014). Data analysis included a better understanding of how technology company leaders used current strategies to develop new STEM employees to help minimize the STEM talent shortages.

Data analysis involves a methodical assessment of data fundamentals to categorize, understand, and discover underlying imminent information (Frels & Onwuegbuzie, 2013). Data analysis means working through data to uncover meaningful ideas, patterns, and descriptions that answer the central research questions of the study

(Yin, 2014). Coding data is important for the recognition of patterns and themes (Gibson et al., 2013). Coding data into categories was helpful for developing new STEM employees who are underdeveloped. The initial categories originated from the literature review. The approach used to categorize was organizational sustainability through technology infusion, understanding technology, and its diverse nature, innovation and collaboration, linking training programs to the employer, STEM talent and labor market needs, internal workplace training, products and services, opportunities for STEM advancement, training design interventions, and effectiveness. The literature review for this study included the background of the problems that IT business leaders have maintained a fully qualified staff of STEM employees, which results in challenges to business sustainability. For each topic, categories included knowledge creation, knowledge transfer, and knowledge management. An expressive process increases when the research purpose explores experienced facts by three or more participants (Gill, 2014). Other documents included sources such as new STEM employees training plans, videos, and web sites.

I compiled data and imported textual transcripts into Microsoft Excel from Microsoft Word. The process of compiling is gathering and organizing the data collected (Yin, 2014). I compiled the data and then dismounted the data. Dismounting the data involves a recognized procedure of coding data (Yin, 2014). Coding was the method of tagging segmented data with category names or expressive words and then grouping the data (Fusch & Ness, 2015). Coding of data is crucial when recognizing patterns and themes (Frels & Onwuegbuzie, 2013).

After dismounting the data, reconstruction of the data occurred. Dissembling entails a proper procedure of coding data (Yin, 2013). Successfully reconstructing data was evident in the emergence of themes in data analysis (see Yin, 2014). Data analysis assists in explaining the meaning of the data (Khan & Adnan, 2014). Understanding the importance of data is the process of making mental connections with the data (Burr, King, & Butt, 2014). Interpreting the data involves the researcher giving their own meaning to the data (Frels & Onwuegbuzie, 2013). The capability of the researcher to comprehend and express the data was significant during data interpretation (Burr, King, & Butt, 2014). Concluding is the final stage of the process, which describes the findings of a study from the viewpoint of a larger set of ideas (Buchanan, 2013). Finalizing the process of themes and patterns derives from the central research question, which is fundamental in understanding the findings of a qualitative research study (Yin, 2013).

I used data analysis software for creating themes. Excel was appropriate for identifying themes. Excel is a tool used to input, store, code, and explore themes and patterns (Keutel, Michalik, & Richter, 2014). The advantage of using Excel kept data in a single location with easy access to continuous coding (Thomas, 2015). Utilizing Excel intensifies the rigor in qualitative research (Onwuegbuzie et al., 2014) and helps align mounted data with the earlier literature.

The conceptual framework is the correlation linking the literature, methodology, and results of the study (Borrego, Foster, & Froyd, 2014). I cross-referenced data collected with the conceptual framework for greater understanding. The exploration included comprehending the data collected and established theories applicable to the

facts. I used member checking to confirm data correctness and review for regularity of frequent themes that originated within the data.

Reliability and Validity

Reliability

Qualitative scholarly research includes reliability and validity (Yilmaz, 2013). Reliability is the ability of a researcher to replicate a previous study obtaining similar results because of research similarities (Grossoehme, 2014). Reliability and validity help to verify the trustworthiness, integrity, and accuracy of results (Hays, Wood, Dahl & Kirk-Jenkins, 2016). Reliability measures the stability of the researcher's approach (Yin, 2013).

The dependability of research defines the reliability of the study (Hays et al., 2016). Reliability of a study replicates a study generating the same results accomplishing validation (Yin, 2013). Member checking is effective when the researcher documents research procedures during the process in a research journal (Grossoehme, 2014). To ensure reliability, I documented the research process through the stages of data collection, analysis, and interpretation. The data gathering process and procedure ensures other researchers have the ability to replicate the study (Yilmaz, 2013). I verified the dependability of the study by reapplying the same questions for all interviews. Reapplying the same questions minimized errors. Sharing the findings with the participants allowed for member checking. The participant interpreted the analysis addressing the data for corrections necessary. I organized, collected, and compared the interview data for accuracy. I imported information into Microsoft Excel from Microsoft Word to compare the data. To ensure validity and reliability, it is important to carefully

self-check document procedures for accuracy (Yin 2013). Comparing data minimizes errors when collaboratively sharing analysis (Yin, 2013).

Validity

I collected company data, interviewed participants, and took notes to accomplish triangulation. Using protocols and procedures in a qualitative study during the research process may enhance the study's credibility (Hays et al., 2016). Member checking is a participant validation technique created to increase accuracy and improve the reliability of the study (Houghton et al., 2013). In a case study design, saturation occurs once the data repeats continually, and no new information appears (Fusch & Ness, 2015). The sample of five participants and member checking validated methodological triangulation.

Credibility. Credibility involves establishing trustworthy results from the perspective of the participants in the research (Sama, 2015). I used methodological triangulation to assure the trustworthiness of this case study. Hays et al. (2016) suggested that researchers use various strategies to achieve reliability. Creditability assesses whether there was a match between the source data and the researcher's interpretation (Dhanda, 2013). Establishing creditability for a case study includes the use of several sources as evidence (Yin, 2013). I used member checking as a tool to improve accuracy. The preliminary findings and interpretations encouraged participants to authenticate documentation. I used the interview process to validate the creditability of the qualitative study. I conducted the interviews, shared my interpretation of the responses with participants, and allowed them to provide feedback to increase creditability. Member checking is the most effective way to validate the credibility of the study (Hays et al., 2016).

Transferability. Qualitative researchers search for transferable research (Yilmaz, 2013). Research is reliable when results remain the same upon replication and are valid when the findings include an accurate portrayal of the studied facts (Yilmaz, 2013). Probing the ways that qualitative results transfer to another context or setting helps assess transferability (Onwuegbuzie & Byers, 2012). To ensure the validity, I provided a framework for the purposes of data collection and data analysis. Providing a rich description allowed for replicability of the study. I conducted member checking to improve the validity during the interview process. During the interview process, the participants were encouraged to correct errors and challenge the information interpreted through member checking. Member checking offers participants the opportunity to provide feedback and review preliminary findings (Dasgupta, 2015). Trustworthiness translates to confidence in a qualitative study, and triangulation enhances qualitative trustworthiness (Dasgupta, 2015). A semistructured interview was the primary instrument used for data collection. The semistructured interviews included trustworthy data, excellent detail, and strength to the study. Each interview consisted of six open-ended questions covering the participant's experience and strategies used to develop new STEM employees (see Appendix B). I analyzed the data according to the frequent themes that originated in the data.

Confirmability. Confirmability refers to results of a study corroborated by others (Hays et al., 2016). Confirmability demonstrates explanations of the procedures and strategies, which include understanding the basis for participant selection and the researcher roles in the study (Hays et al., 2016). I worked with the human resources department to obtain guidance and direction in the selection of participants. I used

probing interview questions, member checking, and follow-up questions to enhance confirmability. Member checking presents the preliminary results and interpretations to participants confirming the accuracy of the study (Hlady-Rispal & Jouison-Laffitte, 2014). Open-ended, interview questions will ensure effective data collection (Yin, 2013). I used face-to-face interviews to include an opportunity for follow-up questions to clarify important themes. To ensure reliability, the researcher should include documenting the stages of data collection, analysis, and interpretation (Hlady-Rispal & Jouison-Laffitte, 2014). A methodologist reviewed the study to ensure a proper peer evaluation and debriefing. Another way to enhance confirmability is through data saturation (Dasgupta, 2015). Data saturation ensures the validity of the data collected by the researcher (Dasgupta, 2015). I prolonged data saturation until interviews with participants disclosed no new information. Participants shared their best practices for developing new STEM employees in an interview format. Including data saturation will ensure the authenticity of the data collected by the researcher (Ekekwe, 2013). I chose a minimum of five participants to obtain information during the interviews. Data saturation requires at least five participants for qualitative research (Dasgupta, 2015).

Transition and Summary

The purpose of this qualitative single case study was to explore strategies some IT business leaders use to develop the skills STEM employees need for business sustainability. Section 2 included a discussion of the (a) selected research methodology, (b) research design, (c) role of the researcher, and (d) description of the study's participants. Qualitative research requires the validation of the population and sampling method selected for the study, and section two included this information. The participant

consent method and the ethical research to protect the participant and ensure research integrity were also included in Section 2. In qualitative research, the researcher is the primary data collection instrument.

In Section 2, I discussed the data collection instruments, data collection techniques, data organization techniques, data analysis, and study reliability and validity processes. Section 3 included a summary of the of the research findings along with a discussion on the (a) the results of the study (b) a presentation of findings (c) applications to professional practice and (d) implications for social change. Section 3, also included recommendations for future research. Some personal reflections and experiences with completing the study conclude Section 3.

Section 3: Application for Professional Practice and Implications for Social Change

Introduction

The purpose of this qualitative single case study was to explore strategies some IT business leaders use to develop the skills STEM employees need for business sustainability. To discover the business leaders' employee training and development systems used in technology companies, I posed the following research question: What strategies do some IT business leaders use to develop new STEM employees for business sustainability?

The conceptual framework of this study was the theory of organizational knowledge creation (Nonaka & Takeuchi, 1995). I collected data from five executives at an IT company in New York regarding strategies for business sustainability. Comparing all the collected data led to a comprehensive analysis. The three themes to emerge from the methodological triangulation of the data were (a) strategies for organizational effectiveness, (b) strategies for new IT employee enrichment, and (c) strategies for improving business productivity. Findings from the data collected revealed that the three-part conceptual framework of this study (knowledge creation, knowledge transfer, and knowledge management) was a significant model for identifying strategies for organizational sustainability. The findings indicated that effective employee training and development systems are essential to the growth of STEM employees and organizational sustainability.

Presentation of the Findings

The overarching research question was as follows: What strategies do some IT business leaders use to develop new STEM employees for business sustainability? To

answer this question, I used multiple data collection methods including face-to-face interviews, company training plans, videos, and internal websites. The three themes to emerge from the methodological triangulation of the data focused on the steps business leaders used to develop new STEM employees for business sustainability. The themes that surfaced were (a) strategies for organizational effectiveness, (b) strategies for new IT employee enrichment, and (c) strategies for improving business productivity. The linkage to the concepts of organizational knowledge creation theory involved the use of tacit and explicit knowledge for organizational knowledge creation, knowledge transfer, and knowledge management.

I analyzed the data using theme frequency. The subthemes that emerged under organizational effectiveness were (a) training and development, (b) work-life ethics, and (c) advancement opportunities. The subthemes that supported strategies to improve business productivity were (a) increase confidence, (b) innovation, and (c) business sustainability. The subthemes that supported strategies for new IT employee enrichment were (a) sharing documents, (b) conversations, and (c) community. The themes specify actionable steps other business leaders could use to develop new STEM employees for business sustainability. Table 2 shows the frequency of emerging themes.

Table 1

Emerging Themes

Themes	Frequency of mention
Strategies for organizational effectiveness	9
Strategies for new IT employee enrichment	8
Strategies for improving business productivity	5

Theme 1: Strategies for Organizational Effectiveness

The first theme that became evident was strategies for organizational effectiveness. The organization uses organizational effectiveness to influence individual on-the-job development. Promoting organizational knowledge creation was the driving idea for developing new STEM employees within an organization. The findings of the first theme aligned with organizational knowledge creation and knowledge transfer, the conceptual framework for the study. Theme 1 included three subthemes: (a) training and development, (b) work-life ethics, and (c) advancement opportunities. In a statement aligned with strategies for organizational effectiveness, Participant 1 said, "Our organization gains access to high-quality resources through knowledge management repositories to provide contemporary work styles for the staff and organizational effectiveness." The company's professional development strategies included receiving shared information from external sources. STEM employees require technical skill development when transferring and sharing information (Sankowska, 2013). The progression of an organization relies on the skillful allocation and development of STEM

talent (Yang & Wang, 2014). Participants' responses to interview questions expressed their ongoing desire to incorporate organizational effectiveness using knowledge enrichment. Process-driven organizations benefit from incorporating knowledge transfer and knowledge management tasks into the workplace as a practical learning strategy (Sankowska, 2013). I validated the theme in participant responses by reviewing company documents, internal websites, and company training videos. The strategies supported developing new STEM employees and a harmonious work-life environment. Finding technology that improves personal and business lives adds value to the work environment (McEdwards, 2014).

Training and development. A business leader's ability to train and develop employees is significant to the growth of the organization (Sankowska, 2013). Training and development could include (a) technical workshops, (b) conferences, and (c) presentations. The participants' responses along with company documents showed the implementation of various training strategies for organizational effectiveness. Each participant discussed proven ways of circulating and distributing information throughout the organization. Participant 5 noted,

> A good strategy that we put into place for new IT employees is teaming new hires with a more experienced IT employee. This strategy will allow a transfer of knowledge from an experienced employee. The strategy also ensures a smooth transition and helps the new employee adjust to the way our organization functions.

When an understanding of knowledge occurs through collaboration, tacit knowledge transfers from one individual to another (Sankowska, 2013). The company's

internal website revealed strategies for organizational effectiveness designed to improve IT employee productivity that included video training and interactive Web-based training. Participant 1 said, "Providing access to new technology, online training, weekly workshop, and outsourced IT training events are ways that we enhance employee growth." Continuous development and technology usage encourages increased job performance (Sankowska, 2013). Participant 1 noted,

> I believe classes provide an enormous amount of development. Company classes are constantly changing due to the rapid change in software and structure. The biggest challenge is for individuals to remain committed. Gaining knowledge happens by spending days, weeks, and years in constant technology development.

Participant 2 commented,

> There is a rapid evolution of technology due to a movement of the cloud-based application. In addition to classes, new STEM employees are adapting to learning a new application structure. This application structure known as digital transformation provides formal content and informal collaboration for new STEM employees.

Cloud computing provides a way for organizations to store and share data formally and informally (Gonzalez-Rodriguez & Kostakis, 2015). The participants' strategies for training and developing IT employees included explicit knowledge transfer through knowledge management systems. A circulatory distribution system throughout the organization happens when elements of explicit knowledge link with other explicit knowledge (Nonaka & Takeuchi, 1995).

Work-life ethics. Business leaders who influence work-life ethics encourage creating and sharing new information throughout the organization, which promotes organizational effectiveness (Valentine & Godkin, 2016). Continued development addresses the complexities of work-life ethics and individual growth (McEdwards, 2014). Employers who place emphasis on work-life ethics encourage positive work-related outcomes (Valentine & Godkin, 2016). Determining tools that reinforce work-life ethics and choices is important to individual growth. Participant 2 stated, "Employees meet to develop personal performance goals and to discuss job efficiency regularly." Participant 3 indicated, "The company's knowledge management system provides our employees with digital templates for quick access to support new employees while meeting collaboratively." Participant 5 added, "The company continues to include tools and norms that reinforce work-life ethics while promoting individual job performance growth and organizational effectiveness."

Using technology to enhance personal and business lives provides a balanced atmosphere (McEdwards, 2014). Training employees to circulate the values of work-life ethics distributes organizational effectiveness. An organization that distributes organizational effectiveness influence work-life ethics and promotes value in the company. Creating work-life ethics and sharing the responsibility of those values throughout the organization encourage socialization, employee commitment, and higher job performance (Valentine & Godkin, 2016).

Advancement opportunities. Another training-and-development strategy used by the organization is advancement opportunities. Increasing STEM opportunities in the workplace could happen by creating new knowledge using the latest technology

(Ricciardi & De Paolis, 2014). The integration of new technologies into daily work activities is moving ahead at a fast rate (Ricciardi & De Paolis, 2014). Business leaders who consider this approach build employee skills while preparing them for future career opportunities (Israel et al., 2013). As information expands, expectations and understanding of knowledge improves. Advancement opportunities were a recurring topic in Theme 1 Participant 5 stated, "Technology is constantly changing and evolving to new levels, which means advancement opportunities are opening up." Self-directed technology training is self-fulfilling and could be used to transfer newly attained knowledge into daily tasks or other professional opportunities (Seungsu, 2016). Each participant supported professional development and training that leads to advancement opportunities. Participant 3 said,

> Science, technology, engineering, and mathematic talents are creative individuals and there should always be advancement opportunities available for employees to go and grow. Staff receives on-going rewards for their workplace performance. Our organization provides a competitive event and reward system as a way for staff to compete for advancement opportunities.

Advancement opportunities that support IT requirements are important for organizational continuity (Brueller et al., 2014). Participant 4 noted, "There are online training and certifications available for our staff. We believe in professional development to maintain organizational requirements and effectiveness." A review of the internal website indicated that employees who participate in the electronic learning environment take advantage of customizable training resources made available by the organizations. The learning environment includes interactive websites, videos, and

webinars. An electronic learning environment consists of formal and informal advanced training opportunities designed to distribute new and used knowledge (Ricciardi & De Paolis, 2014). Electronic learning environments include organizational strategies used to develop employee potential in organizations. Participant 2 stated,

> Employees receive incentives for workplace development. They deserve recognition and opportunities for certification with the possibility of job advancement. It is important for employees to know they are growing with the company. Becoming an invested employee leads to professional advancement and is to their advantage.

Review of the company's website indicated positive employee comments about additional training for the purposes of advancement. The staff expressed an ongoing need for training and development due to the constant advancement of technology. Ongoing workshops and training initiatives are necessary to advance staff (Holtgrewe, 2014).

Theme 2: Strategies for New IT Employee Enrichment

Another theme that emerged from the data was strategies for new IT employee enrichment. The findings aligned with organizational knowledge creation and transfer, the conceptional framework for the study. Harada (2014) shared that knowledge between individuals happens through externalization and distribution. Networks and various groups can provide linkages to newly developed knowledge. The externalization progression happens through collaboration with other employees (Harada, 2014). The organization uses employee enrichment to influence future capability for competitive advantage. Participant 5 stated, "Social interaction between employees sets an

atmosphere to exchange knowledge." Individual knowledge transferred to other staff becomes shared knowledge (Baghdadi, 2013). Participant 3 also noted, that strategies for new IT employee enrichment include obtaining, distributing, and reusing new and existing knowledge. Participant 4 added, "We collaborate online within our cloud base system. Creating an online community within our facility helps us keep logs of procedures and tasks that can be reviewed by new IT employees. Employee enrichment is our goal." Collaboration happens through social interactions using Web interactivity, which produce worldwide repositories (Gonzalez-Rodriguez & Kostakis, 2015). Successful business leaders disseminate knowledge to the organization and employees (Harada, 2014). Disseminating knowledge motivates employees and perpetuates innovation (Harada, 2014).

Sharing documents. Individual knowledge shared with others creates new knowledge (Nonaka & Takeuchi, 1995). Communication happens through group networks, which generates a repository system (Gonzalez-Rodriguez & Kostakis, 2015). The company's staff places great emphasis on sharing documents as a strategy for new IT employee enrichment. Business leaders at the company emphasized the importance of exchanging knowledge on a regular basis. Microsoft SharePoint is a Web-based collaborative platform used to securely accumulate, arrange, share, and access information. Business leaders who create tasks that circulate a continual flow of information to all levels of the organization provide tools for employee enrichment and improved job performance (Gonzalez-Rodriguez & Kostakis, 2015). SharePoint is an example of how knowledge is stored and exchanged for the purposes of employee enrichment. Participant1 stated,

> The strategies business leaders use to enrich new STEM employees include multiple ways of exchanging knowledge at work. Using tools like Microsoft SharePoint manages documents for reuse when collaborating and exchanging knowledge. Sharing documents empowers organizational relationships. In addition, having a place to share and store documents helps us transfer and discover knowledge.

Participant 3 explained, "The ability to take advantage of current knowledge and exchange the information with new IT employees is important to our success." The company documents supported the participants' responses. A "how to" guide for new IT employees outlined "step-by-step" directives on obtaining, distributing and reusing information.

The results from analyzing the company's archived web documents found several instances of teammates who shared documents and reports in the company's knowledge management system. Innovative STEM employees integrate knowledge sharing to enhance creativity (Baghdadi, 2013). Sharing information formally and informally helps solve problems socially (Harada, 2014). Participant 4 stated, "We use technology that includes keeping employees informed. Shared resources might include files, lists, pages, text images, embedded doc, multimedia and any information groups or individuals really need. Our goal is to provide ongoing employee enrichment." Knowledge resources range from explicit knowledge to tacit knowledge across individual, group, organizational, and inter-organization settings. The interaction between tacit and explicit knowledge is a practice used to develop IT employees throughout an organization (Charlebois, Palmour, & Knoppers, 2016). The company's knowledge management

systems store and transfer data for the purposes of skill development and organizational effectiveness. Interactive multimedia environments expose staff to shared information (Charlebois, Palmour, & Knoppers, 2016).

Conversations. Conversations are a necessary component to individual growth. Findings from the interview questions indicated that conversations are necessary for the informal exchange of knowledge to take place. Ineffective knowledge sharing could result if communication is broken (Hall, Bachor & Matos, 2014). Each participant agreed that sharing conversations is important for new IT employees. Participant 1 said, "Classes are always changing due to the evolution of technology, which means that there are times when private conversations are necessary." Participant 4 said, "Learning is multifaceted and sometimes employees require a linguistic learning style for further comprehension." Participant 2 explained, "In this company, we shadow new employees as a form of mentoring. When employees are shadowed, conversations are ongoing. Further data collected revealed documented meetings and conversations scheduled throughout the month with new IT employee.

Community. The Company's strategies for new IT employee enrichment include group collaboration or a community of people exchanging information. All participants' agreed that community settings allow individuals to retain knowledge and make information available to the entire organization. The continuous social interaction of an organization exposes new and reusable knowledge to others who are outside of the organization and throughout the community (Glisby & Holden, 2003). Microsoft Office 365 is a cloud-based application that consists of employee teamwork and online communication designed to unify employee productivity. Participant 5 stated, " Office

365 is a millennial type of network that includes productivity, collaboration capabilities, device management and security alternatives for devices. Multi threads happen aloud. This works well when problem-solving, especially when working remotely from various locations." Participant 1 said, "The organization has cloud access. Cloud access benefits the entire organization, but especially new IT employees. The cloud system logs all employee technical questions and solution for future troubleshooting issues." Participant 3 added, "New IT employees will trail veteran employees internally from remote locations, speakerphone or on site." The company's website supported the participants' responses and confirmed the importance of new and used knowledge disseminated throughout the organization. The internal website displays employee reviews and conversation regarding the company's knowledge management systems. The employees' comments expressed gratitude for internal, external, and private groups specifically for community access and problem solving.

Theme 3: Strategies to Improve Business Productivity

The third theme that became apparent was strategies to improve business productivity. Business leaders must seek to disseminate knowledge through the entire organization including products, services, and systems. STEM employees who seek on-going professional development and training develop their confidence in technology (Grashel, 2014). Theme 3 included three subthemes: (a) increase confidence, (b) innovation, and (c) business sustainability. Knowledge collected and shared within an organization adds to the continuous development of employees and products.

The participants' responses to interview questions provided insight regarding strategies to improve business productivity. Participants' articulated that development

strategies include ongoing efforts to adjust to technologies rapid change, which significantly affects business productivity. Organizations are altering strategies to improve business productivity whether forcefully or in stages (Baghdadi, 2013).

Increase confidence. Technology integration for new IT employees that include one-to-one instruction increases confidence (Grashel, 2014). Participant 1 noted, the company knowledge management system acts as a one-to-one instructor by answering employee questions while increasing confidence. Increasing the confidence of IT employees improves proficiency and influences social change by linking new and shared knowledge to creativity. The business leaders stated that increasing employee confidence is an act of great leadership and critical to leadership skills. Participant 1 noted, "Office 365 is inclusive of a technical database which shares and manages information. The knowledge management system can be used by employees to search for answers which can increase staff's confidence." Participant 5 stated, "Colleges should interact with local businesses far more to prepare students for the industry." Participant 5 elaborated, "I believe that colleges should be more proactive with local businesses in order to transfer knowledge expectations to individuals, which would help build workplace confidence." Participant 3 said:

> One way that we choose to increase employee confidence and to improve productivity is to have them research for upcoming expos. There are technology expos all around the city during a certain time of the year. Some of our staff have the opportunity to keep us abreast of those dates. Staff will attend those expos and bring back new information hot off the press. Employees are always on the

> moon after those events because they are the first to report the new technology to the organization.

IT employees require skills and confidence that will allocate and produce knowledge (Miltenberger, 2013). Businesses and colleges can provide personalized information that can improve productivity and self-assurance (Miltenberger, 2013). Employees who are equipped to create new ideas and solve problems develop confidence (Grashel, 2014).

Innovation. Leaders who encourage the improvement of new and existing technology understand that innovation is necessary for business productivity (Marincic et al., 2013). Providing the most effective business solutions for technological innovation requires trained and developed STEM talent (Skok et al., 2013). Participants communicated that reinforcing cultivation was a requirement for improving business productivity. Participant 1 said, "Our organization gains access to high-quality resources through various networks to provide contemporary work styles for the staff. Flexibility, mobility and teamwork are work styles that drive innovation leading to business productivity." Participant 4 stated, "The nature of the business is to remain in constant learning mode. How important is on-going development? Participant 4 responded, "You can't stay in the business if you are not continually learning." Participant 5 explained:

> Sometimes we send our staff to outsourced professional development training events. When the staff returns they demonstrate what they have learned. The staff presents what they have learned and how it could benefit our company. When the staff presents the subject, it is normally in an online forum or in a professional development classroom setting.

The strategies analyzed, improved business productivity and supported the study's literature review. Providing comprehensive solutions for workplace tasks will improve business productivity (Matsui, 2015). Businesses that create innovation-friendly environments work toward improving business (Skok et al., 2013).

Business sustainability. Strategies to improve business productivity include consistent patterns to meet specific organizational needs. Integrating fundamental business principles should include: (a) organizational essentials, (b) organizational values, (c) motivation, and (d) rewards (Gonzalez-Rodriguez & Kostakis, 2015). Managerial awareness of the organization's needs is critical because change is constant (Hall, Bachor & Matos, 2014). Each participant agreed that because of the rapid evolution of technology, businesses are constantly changing. The participants added that training plans change regularly to meet the needs of staff and the organization. Participant 3 stated, "Planning and executing workplace activities using knowledge management repositories provide a work and learning environment. The training plan can be altered as technology evolves." Participant 2 explained, "We use a training plan to improve business productivity which is accessible to staff internally or externally from a database that shares and manages information." Based on the training plan reviews from the company's internal website, four-and-five star rating predominantly show that employees agree training plans, videos, and classes were an effective means of productivity. Participant 1 shared, "Our company would not be successful without a training plan. We have new staff that require learning tools. The training plan is one of three necessities. New IT employees must have training plans that include videos and various professional development choices for the purposes of learning."

Business leaders that connect learning and knowledge alter the learning experience to the needs of the business (Skok, Clarke, & Krishnappa, 2013). Continuous development and technology resources will encourage management directives (Sankowska, 2013).

Linkage of Findings to the Conceptual Framework

The linkage of findings to the concepts of organizational knowledge creation theory was the use of tacit and explicit knowledge for organizational knowledge creation, knowledge transfer, and knowledge management. The data collected revealed that (a) strategies for organizational effectiveness, (b) strategies for improving business productivity, and (c) strategies for enriching new IT employees are important concepts of knowledge creation, knowledge transfer, and knowledge management. The findings from all participants and data collected relate to the conceptual framework. The first over-arching theme, strategies for organizational effectiveness, relates to the development of new IT employees, an element of the conceptual framework organizational knowledge creation and transfer theory. Building on the three part-theory conceptual frameworks of knowledge transfer, the research findings indicated that information flowing from internal and external sources benefit the employee development (Peeters & Vaidya, 2016).

Supporting evidence demonstrated functional learning strategies that focused on creating new knowledge, transferring knowledge and knowledge management. The findings aligned with the three-part conceptual framework. Creating new knowledge, knowledge sharing, and knowledge management systems were effective strategies for STEM employee advancement and organizational sustainability. Attaining information

from diverse sources can increase knowledge and skill development for STEM employees (Hall, Bachor & Matos, 2014). Training and development, work-life ethics, and advancement opportunities are multiple strategies for organizational effectiveness. Participant 5 explained, "Sometimes we send our staff to outsourced professional development training events." The conceptual framework and the findings suggest that using one strategy is insufficient for maintaining organizational effectiveness. The data collected supported organizational knowledge creation and knowledge transfer theory confirming the need for multiple strategies. Participant 1 shared, "We have new staff that require various learning strategies. The training plan is one of three necessities. New IT employees must have a training plan that includes various professional development choices for the purposes of learning." Participant 3 added, "New IT employees will trail veteran employees internally from remote locations, speakerphone or on site." Participant 4 stated, "We use technology that includes keeping employees informed and to improve business productivity. Shared resources might include files, lists, pages, text images, embedded doc, multimedia and any information groups or individuals really need." Interactive multimedia resources provide multifaceted ways of sharing tools and resources (Ricciardi & De Paolis, 2014). Business leaders of ABC Company infuse knowledge creation, knowledge management, and knowledge transfer throughout the organization by providing multiple ways of continuous social development. Engaging an organization in web initiatives improves business productivity (Peeters & Vaidya, 2016). Providing pre-existing and innovative learning opportunities which are engaging will provide exercises that will stimulate growth (Ricciardi & De Paolis, 2014). The data analysis aligned with the conceptual framework's organizational knowledge creation and

transfer theory. Successful business leaders promote continuous innovation by exposing employees to a repository of reusable information (Ricciardi & De Paolis, 2014). Knowledge transfer embodied throughout the organization enhances employee development (Nonaka & Takeuchi, 1995). Creating new knowledge and transferring knowledge to other employees was an effective necessary course of action for STEM productivity.

The knowledge management system included formal and informal collaboration for employee development to improve organizational performance. Knowledge management systems include instant feedback to requests for stored information. Websites or video lectures are tools that enhance employee skills for workplace advancements (Gray & Albert, 2013). Building on the conceptual framework of organizational knowledge creation and transfer theory, participants' were passionate about developing a harmonious work experience.

The second theme is consistent with the three-part theory organizational knowledge creation, knowledge management, and transfer theory. Employee enrichment is valuable to an organization when employees engage in explicit and tacit knowledge. Participant 4 said, "Establishing company business goals include IT enrichment and sharing experiences to help bring other STEM employees up to speed." The three subthemes: (a) sharing documents, (b) conversations, and (c) community align with research discussed in the literature review. Social interactions that include Web interactivity produce repositories (Gonzalez-Rodriguez & Kostakis, 2015). Transferring knowledge is the idea of tacit knowledge created through the continuous social interaction involving conversations (Glisby & Holden, 2003; Nonaka & Takeuchi, 1995).

The results of the analysis align with the conceptual framework confirming the importance of formal and informal learning. Articulating and combining knowledge resources in a social setting describes the formation of tacit and explicit knowledge. Transferring knowledge is the idea of tacit knowledge created through the continuous social interaction involving conversations (Glisby & Holden, 2003; Nonaka & Takeuchi, 1995). The results of the analysis aligned with the conceptual framework confirming the importance of formal and informal learning.

Applications to Professional Practice

The findings of this study support previous research and confirm the appropriateness of IT business leaders training and development strategies. IT organizations that utilize knowledge creation, knowledge transfer and knowledge management strategies throughout the organization encourage higher job performance levels (Sankowska, 2013). The sustainability of STEM-related businesses requires qualified and prepared employees in STEM occupations (Peeters & Vaidya, 2016).

Business leaders who provide effective knowledge management systems could improve business sustainability and new STEM employee performance (Peeters & Vaidya, 2016). Organizational sustainability and effective employee development in a technology organization require that business leaders evolve with technology to maintain effective use of knowledge creation, knowledge sharing, and knowledge management systems (Charlebois, Palmour, & Knoppers, 2016). Business leaders are a vital link between organizational knowledge and rigorous job-related training offering critical experience to STEM workers (Schumann et al., 2015). IT leaders who obtain, share, circulate, and apply existing knowledge through a knowledge management system

provide support to new STEM employees (Schumann et al., 2015). These ideas provide business leaders with multiple ways to increase productivity.

Study results indicated that business leaders who provide effective employee training and development systems could potentially reduce the gap between STEM employee supply and demand (Lindlöf et al., 2013). Furthermore, these results provide business leaders with comprehensive ways to increase productivity and maintain organizational effectiveness. This study is important to understanding the leadership strategies some IT business leaders need to improve new STEM employees for business sustainability. Findings from the study and recommendations might serve as the basis for the development of leadership strategies IT business leaders can use to improve employee performance and business sustainability. The results could provide strategies for IT business leaders to improve new STEM employee's skills and business performance.

If business leaders consider these findings, the gap in new STEM employee development relating to performance and business sustainability could decrease. Business leaders need to encourage new IT employees to attend professional development for completing complex tasks (Theodosiou & Amir-Aslani, 2013). Business leaders who connect internal knowledge with rigorous IT development inspire and motivate STEM workers (Schumann et al., 2015). Employers who make innovation-friendly organizations a priority increase learning and employee development (Skok et al., 2013).

Study findings identify useful strategies for IT business leaders in technology companies. In addition, the findings provide strategies for business leaders to develop and improve new IT employee performance and business sustainability. The study's

findings also add to the understanding of business development by identifying strategies that advance employee performance. The information included in the emerged themes may support business leaders in increasing productivity and employee confidence while increasing business sustainability.

Implications for Social Change

In the United States, STEM employment accounted for 46% of new jobs in 2014 and 12% of the economy (Economics & Statistics Administration, 2014). This study is important to understanding how to enhance new STEM employee performance and sustainability of IT companies. When business leaders know how to enhance employee performance, they enable the company to thrive. Transferring knowledge and, interactive professional development along with the inclusion of new technology enhances individual and social productivity (Charlebois, Palmour, & Knoppers, 2016). Transferring knowledge collaboratively could influence individuals and improve employee proficiency. Organizational knowledge creation, tacit and explicit, aligns with a continuous social interaction of knowledge involving socialization, externalization, collaboration, and internalization (Glisby & Holden, 2003; Nonaka & Takeuchi, 1995). Business leaders applying strategies that disperse tacit and explicit knowledge circulate knowledge throughout the workplace, strengthen the organization, and develop staff professionally (Charlebois, Palmour, & Knoppers, 2016).

The findings enhance and support the understanding of effective strategies used to improve employee performance in an IT company. Successful execution of professional development improvements may happen with changes to normal organizational practice (Sankowska, 2013). From a social change perspective, the research may be valuable to

society because it includes strategies to build and sustain the local IT workforce. The transfer of knowledge throughout an organization exposes continuous social interaction with others throughout the community (Sankowska, 2013). Knowledge management systems that include development tasks promote the knowledge transferring process. IT leaders of an organization need to execute knowledge transferring for the transfer process to happen (Sankowska, 2013).

Recommendations for Action

The objective of this study was to provide IT business leaders with strategies to develop the skills STEM employees need for business sustainability. The information obtained from IT business leaders may prove useful to other business leaders. Significant strategies for IT employee development include obtaining, distributing, and reusing new and existing knowledge. The implementation of knowledge creation, knowledge management, and knowledge transfer enhances employee development. The organizational decision makers determine how knowledge is effectively distributed, adding to employee performance. The concept includes tacit and explicit knowledge created through the continuous social interaction of knowledge involving socialization, externalization, collaboration, and internalization. Business leaders can use findings from this study to equip new STEM employees with resources and help them obtain higher levels of professional skills. Business leaders could distribute information through digital tools, rigorous one-to-one instruction, or professional development and training. Technical group discussions, conferences, and demonstrations are effective ways to develop IT employees. New STEM employees should participate in formal and informal collaboration for personal development that improves organizational performance. I plan

to publish the study in a trustworthy business journal and share the findings through other channels such as conferences, training guides, and Web summits.

My recommendations for business leaders include creating, transferring, and managing knowledge with organizational effectiveness. Effective employee training and development systems are vital to the advancement of STEM employees and organizational sustainability. The results of this study could help business leaders apply effective strategies using a development plan that could disclose the support new STEM employees' need for productivity in the workplace.

Recommendations for Further Research

The findings revealed strategies which were necessary for new STEM employee proficiency and organizational growth. Further studies could expand to a larger population of IT business leaders from various companies. This study included five business leaders in New York, NY. I recommend further studies with participants throughout the New York metropolitan area. Limitations are a possible disadvantage to the study (Skottun & Skoyles, 2014). A future study could include applications and strategies business leaders use to further expand development and training as technology evolves. Recommendations for further research include replicating this study to determine if the strategies are effective while implementing with other IT business leaders. All organizational decision makers require STEM employees; however, determining how their skills emerge includes significant consideration. Business leaders must identify which STEM skills are deficient and develop employees with the preferred skills (Gonzalez-Rodriguez & Kostakis, 2015).

The development of IT employees aligns with a continued planned approach because technology rapidly evolves. Business leaders could create a computer systems analyst position that focuses on staying abreast of future technology trends which could advance employee development strategies. The specialized computer systems analysts could assist the organizational decision makers with the design of computer systems, procedures, and information systems solutions to help the organization operate more efficiently and effectively. Business leaders could adapt faster to technology changes and develop IT employees according to the trends and patterns identified in advance.

Reflections

Attempting to complete this doctorate of business administration (DBA) degree by the age of 50 was my goal. I experienced self-doubt, however, giving up was never an option. Living life on purpose is important for me. I developed a program through my newly founded nonprofit organization in 2012. The program began the same year classes started at Walden University. My intent was to practice, utilize, and develop the real-world skills learned at Walden. The development of the nonprofit organization helped me put into practice the learned skills with every course taken at Walden. The achievements gained from the nonprofit encouraged me to start a for-profit business soon to become a limited liability corporation.

Prayer was the one consistent assurance that I would make it through this journey. The journey made demands of me that stretched and refined my mind, body, and spirit. I realized that this journey required a relentless drive for progress to get beyond the mountaintop. The refining moments included rewrites of various sections, scholarly writing development, weekly discussion forums, and the continued research. The

discussion forum, used to communicate and share thoughts with my classmates and chair, was supportive in pursuing my goal. The research also helped to broaden my view of IT. The intent of completing this degree was to obtain the necessary tools that would prepare me for greater opportunities.

Completing the data collection process included interviewing five business leaders of a technology company in New York. The literature shows the importance of disbursing knowledge creation and knowledge transfer throughout an organization. Business leaders focus on developing IT employee skills for business sustainability. Communication and interactions with the five business leaders were highly regarded and humbling. Each business leader shared their personal and professional experiences during the interview regarding the study topic. The findings of the research have confirmed the importance of knowledge creation, knowledge transfer, and knowledge management throughout an organization. Utilizing organizational knowledge creation and transfer strategies along with the further research recommended could improve the future of business leaders' STEM employee development throughout the United States.

Conclusion

Business leaders face the challenge of developing new technology employees to support business sustainability. The success of some IT companies is the result of business leaders who had success in developing new STEM employees. Business leaders must explore new strategies to develop new STEM employees, which may lead to more hiring for business sustainability. The development of new IT employees must include practical guidance (Baghdadi, 2013). The business leader was a factor in the exploration of new IT strategies because of their valuable knowledge and experience in STEM

training. Leadership capabilities can contribute to strategically guiding the achievement and operation of technical resources for competitive growth (Baghdadi, 2013). I concluded that this research is important to a business leader's ability to create IT employee development plans for organizational effectiveness.

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Appendix A: Semistructured Interview Questions

This section contains a list of open-ended questions I will ask during the in-depth interview. Participants in this study will participate in an interview process identifying successful strategies used to develop new STEM employees. Scheduled interviews for all parties will be according to participant availability, which will include a time, date, and location. The interviews last approximately 30-60 minutes. Participants' will receive an informed consent letter before participating in the case study. Each participant will have the opportunity to review the consent form and ask questions prior to signing. I will incorporate the results of the interview into Section 3.

Demographics Questions

1. What title do you hold in this organization?
2. What is the total number of newly hired STEM employees in your company?
3. In the last two years, how many newly hired STEM employees have successfully demonstrated growth due to the organizational training strategies practiced?
4. How many STEM employees are you responsible for within your organization?
5. How many employees are you responsible for directly leading?

Interview Questions

1. What strategies have you put into place that enhances new STEM employee proficiencies?
2. What resources does your organization provide new STEM employees to develop the skills necessary to keep your business competitive?

3. What strategies do some business leaders use to motivate and integrate workplace productivity?
4. How important is the use of technology in the development of new STEM employees in your organization?
5. How have you used collaboration with experienced peers to meet the needs of new STEM employee development?

Appendix B: Interview Protocol

Date _____ Location_____

Interviewer _____ Participant _____

Instructions:

- Explain to the participant the purpose of the study.
- Assure confidentiality and have the participant sign the release form.
- Audiotape each interview
- Record participants
- Ask questions and probe the participant to go deeper into their meanings.
- Share the findings with the participant, allowing the participant to analyze the findings and comment on them.
- Thank the participant for his/her participation.