UNDERREPRESENTATION OF FEMALE COMPUTER SCIENCE GRADUATES IN INFORMATION TECHNOLOGY: A PHENOMENOLOGICAL STUDY

by

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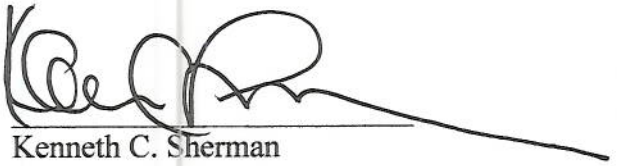

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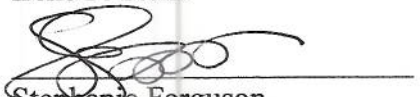

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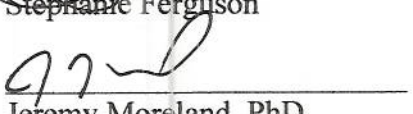

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ABSTRACT

The underrepresentation of women in information technology (IT) persists in the United States, whereas the number of positions available has increased. Despite an increase in women graduating from college with computer science degrees, little knowledge exists regarding the career decision-making experiences of these women resulting in jobs outside the IT profession. Six themes emerged from the study with a conscious reality of job economics, a desire for engaging work, and relational experiences with family and mentors emerging as dominant themes supporting the participants' decision to pursue non-IT careers after graduation. Findings revealed the meanings female computer science graduates associate with their decisions not to enter careers in the IT professions are a mixture of practical and pragmatic perspectives. From a practical perspective, participants made career decisions based on emotions in connection with a desire for engaging work and their relational experiences with family and mentors. From a pragmatic perspective, participants believed their decisions not to enter a career in the IT profession were sensible acts based on a conscious reality of economics, which directed actions toward other career opportunities. A discovery within the current study of feelings of emotion and high self-efficacy create new meanings to the experience of career choice. These findings are contradictory to their importance as component parts of traditional decision-making theory. Results from the findings include several recommendations that should strengthen strategies among stakeholders in businesses, universities, and local federal agencies to promote the recruitment of women into the technology sector.

DEDICATION

I dedicate this research to my wife Mary Jo for her patience, love, and support throughout this demanding journey. I also dedicate this research to my dad Joseph Roy and my mother-in-law and father-in-law Jo and Paul Edwards, who are no longer with us but made such a positive impact on how I conduct myself during life's journey. This research is additionally dedicated to my mother June Roy, who taught me through example and continued encouragement that there is never a challenge so big that it cannot be conquered.

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TABLE OF CONTENTS

LIST OF TABLES

Chapter 1

Introduction

Technology is a fast-growing industry segment in the United States, with a predicted rate of job prospects developing more rapidly than any other sector between 2008 and 2018 (Ashcraft & Blithe, 2009). Within the technology industry, which includes information technology (IT), computing-related jobs are growing at double the rate of all other professions (Ashcraft & Blithe, 2009). The terms technology and IT are synonymous throughout the document, both referring to computing-related professions and industries. Information technology encompasses emerging areas such as bioinformatics, next-generation web technologies, global information systems, large-scale collaborative knowledge systems, mobile technologies, and cloud computing (Kagermann, Osterle, & Jordan, 2011; Barker, 2008).

Individuals in the IT profession perform various functions ranging from application installation to the design, development, and implementation of complex systems, network architectures, and information databases (Muller, 2011). Information technology professional activities include infrastructure network development and monitoring; data management; computer hardware engineering; software and database design; and design, implementation, administration, and management of entire IT enterprises (Muller, 2011). Information technology is spreading to areas other than the conventional personal computer and network technologies, such as smartphones, handheld computing platforms, and netbook personal computers, which is increasing the demand for such jobs (Kagermann et al., 2011). Researchers at the U.S. Department of Labor estimated over 1.6 million new computing-related job openings would emerge

from 2010 through 2018 when considering growth and replacement needs (Bureau of Labor Statistics [BLS], 2010).

Predictions from a 2009 study conducted by researchers at the National Center for Women and Information Technology (NCWIT) indicated that if the current demand for talent continues, by 2018, the technology industry would fill only half of the available job openings (Ashcraft & Blithe, 2009). Unless U.S. technology industries fill specialized computing-related skills to seal the gap, competition for the same quality skills from newly formed global capitalist nations will have an adverse effect on the ability of U.S. organizations to innovate technologically (Hira, 2007; Wentling & Thomas, 2007). The inability to fill jobs challenges the future economic prosperity of the United States because the economic welfare and stability of the country depends on the ability of its skilled workforce to innovate and develop new products and services (S. P. Marshall, 2010).

Despite an increase in the number of technology-related occupations, interest by women in these careers declined between 2000 and 2008 (Ashcraft & Blithe, 2009; NCWIT, 2009). Knowledgeable and skilled women can fill the gap, but industry is failing to attract the talent, and women continue to remain underrepresented in the profession (Johns, 2008). Research to gain a broader understanding of why knowledgeable and skilled women do not enter the IT profession upon completion of undergraduate degrees in computer science is essential to understand why participation is declining and how the industry can reclaim the technical talent of women (Ashcraft & Blithe, 2009; Johnson, Stone, & Phillips, 2008; Judge & Livingston, 2008). The current qualitative phenomenological research study involved exploring the lived experiences of

15 selected women who obtained undergraduate degrees in computer science between 2001 and 2011 and chose not to pursue careers in IT. The study involved collecting verbal data to describe and interpret the phenomenon (Creswell, 2007) and provided new information to assist in understanding the underlying rationale for the continued underrepresentation of women in the IT workforce.

The chapter contains an overview of the study, which includes a review of the effects on the IT industry stemming from the retirement of baby boomers (the generation born between 1946 and 1964), a smaller Generation X cohort (those born between 1965 and the late 1970s), and the continued decline of women in the IT profession. The chapter also includes the specific problem, its purpose and significance, and an overview of how the current study provides an explanation regarding why highly knowledgeable and educated women with undergraduate degrees in computer science choose careers outside the IT profession. The chapter includes a discussion on the nature of the study, research questions, theoretical framework, definitions of terms, assumptions, scope, limitations, and delimitations of the study.

Background of the Problem

Baby boomer retirements and a gap in the Generation X cohort within the IT profession have created openings in this fast-growing area anticipated to create the most growth in raw numbers of jobs (Ashcraft & Blithe, 2009; Fowler & Wade, 2008). Despite a projected growth of IT-related opportunities between 2008 and 2018 (BLS, 2010), women still do not secure positions within the IT profession in considerable numbers (Foust-Cummings, Sabattini, & Carter, 2008). The rapid decrease of women in IT within the United States continues to receive attention and inquiry as evident in a

review of recent literature (Ashcraft & Blithe, 2009). Yet the proportion of women entering the IT field continues to decrease (Foust-Cummings et al., 2008; Hewlett et al., 2008). Statistics revealed that in 2009, men received approximately 35,000 undergraduate computer science degrees, compared to almost 8,000 women (Ellis, 2010; National Center for Education Statistics, 2009; National Science Foundation [NSF], 2010). The gender disparity in the awarding of computer science degrees is consistent with the underrepresentation of women in the IT workforce (Lacey & Wright, 2009; NSF, 2010). Fewer women in IT will surface when an appeal from industry for securing highly skilled individuals for high-demand technology jobs will increase by 22% between 2008 and 2018 (Ashcraft & Blithe, 2009). If industry cannot fill the demand for IT job openings, the United States will be unlikely remain economically competitive within a growing IT marketplace (Lips & Baker McNeill, 2009).

Researchers have addressed the rationale for the underrepresentation of women in the IT profession (Ashcraft & Blithe, 2009; Foust-Cummings et al., 2008; Hewlett et al., 2008). Several researchers have provided evidence of women respondents' perceptions of IT as a male-dominant and competitive culture, which negatively affects women's confidence, perception of ability, and interest in pursuing careers within the IT profession (Simard, Davies Henderson, Gilmartin, Schiebinger, & Whitney, 2010). Other researchers indicated broader issues, such as the perception of the nature of the work as too technical and long hours negatively affecting work–life balance as reasons women avoid the IT profession (Hill, Corbett, & St. Rose, 2010; Kaczmarczyk, 2004). Studies have included recommendations such as revised organizational culture and social structures to correct the underrepresentation (Wentling & Thomas, 2009), yet women are

not seeking undergraduate degrees in the computer sciences (Singh, Allen, Scheckler, & Darlington, 2007), and in many instances, if they do pursue a degree, they are not selecting the profession as a career.

Statement of the Problem

Researchers at the BLS expect a 45% increase in employment opportunities within IT services and products by 2018 (BLS, 2010; see also Ashcraft & Blithe, 2009). The general problem is that the IT labor force is declining because of skilled baby boomers retiring and leaving the profession and fewer Generation X workers entering the IT profession (Ellis, 2007). Unless action takes place to address staffing and workforce issues, employers in the U.S. IT market will not fill the projected 2018 IT opportunities with skilled IT professionals (Ashcraft & Blithe, 2009; Foust-Cummings et al., 2008; Hewlett et al., 2008).

The specific problem was that a substantial number of women with undergraduate degrees in computer science are not choosing to enter the IT profession, and without more women pursuing careers in IT, the industry will not be able to secure the number of skilled IT workers required to meet the IT demands of the future (Ashcraft & Blithe, 2009; NSF, 2008a). To highlight the importance of the problem and its effect on meeting technology challenges, the White House budget for fiscal year 2011 requested $3.7 billion invested in science, technology, engineering, and mathematics (STEM) education programs with a greater focus on opportunities for women and ethnic minorities (Carl, 2010). If women continue to pursue careers in professions other than IT, the government will spend taxpayer money on STEM education programs without the desired outcome, and it will be difficult for the United States to remain economically competitive within a

growing global IT marketplace (Finegold, 2007; Hilton, 2008). The general population of the study comprises women across the United States who graduated with a bachelor's degree in computer science and selected professions other than IT (NSF, 2010).

Purpose of the Study

Women have increased their use of computers for education and socialization, yet the underrepresentation of women in the IT workforce remains (Singh et al., 2007), and the need to address the causes of the phenomenon continues (L. Barker & Aspray, 2006). The purpose of the qualitative phenomenological study was to explore the essence of the decision-making experiences of women awarded an undergraduate degree in computer science who chose careers outside the IT profession. The qualitative phenomenological research study included a modified van Kaam method of analysis proposed by Moustakas (1994) and a semistructured interview format to explore the decision-making experiences of 15 women who graduated from college between 2001 and 2011. The participants had an undergraduate degree in computer science and chose careers outside the IT profession. The reason for selecting the particular population was to understand, contextualize, and make sense from lived experiences the meanings associated with career choice decisions from women who earned a computer degree but chose not to enter the IT profession. The study involved evaluating the results from the research to bring to light the beliefs or perceptions contributing to women's career choice outside of the IT profession. Early research indicated certain social and structural factors might prevent women from entering the IT profession (Foust-Cummings et al., 2008). Researching and understanding the phenomenon as experienced might help industry and educational leadership to improve approaches to increase the number of women in the profession.

Significance of the Study

The significance of the study was to clarify conditions and give meaningful insight to understand the essence of the decision-making experience among female computer science majors who upon graduation chose not to enter the IT profession (Grant, Knight, & Steinbach, 2007). The results of several studies indicated a less than hospitable environment in the IT industry as playing a part in women's choice to avoid the profession (Auer Jones, 2010; Hartman & Hartman, 2008; Johns, 2008; E. Smith, 2010). Research has indicated that women perceive the IT profession as lacking female role models and is an environment not conducive to a work–life balance (Hopkins, O'Neil, Passarelli, & Bilimoria, 2008; Jeffcoat, 2008). The current study features new information to provide a deeper understanding of what career decisions mean to female computer science graduates who choose employment outside the IT profession in the context of technology and work–life balance perspectives (Ceci & Williams, 2010; Kelan, Gratton, Mah, & Walker, 2009).

The current study included a qualitative phenomenological research design (Hein & Austin, 2001; Moustakas, 1994; Sokolowski, 2000) to discover new meanings related to the increase of well-prepared female computer science graduates who chose not to pursue IT as a profession. Past researchers explored many reasons for the decline of women in IT, such as lack of role models, family conflict, social factors, and a perception of infrequent advancement opportunities to mid-career levels and beyond (Korabik & Aryman, 2007; Simard, Davies Henderson, et al., 2010). Ceci, Williams, and Barnett (2009) completed a review of more than 400 studies in an attempt to reconcile inconsistencies and to discover which issues explain the underrepresentation. Most of the

studies included female participants who had already entered the IT profession, were approximately 10 years into their careers, or were at a stage where a number of women decide that marriage and having a family is their preference (Ashcraft & Blithe, 2009; Foust-Cummings et al., 2008; Hewlett et al., 2008; Simard, Davies Henderson, et al., 2010). The current study is different from other studies due to the analysis of a specific population of women who earned computer science degrees between 2001 and 2011 and who had the required skills and knowledge but not the desire to initiate a career as IT professionals. The study involved engaging in the experience of the participants to discover reflectively why women with undergraduate degrees in computer science are not responding to an abundance of opportunities within the IT profession. The study might help industry leaders develop strategies to increase female interest in becoming a force within the IT profession.

Significance of the Study to Leadership

Discovering new meanings why women with undergraduate degrees in computer science select careers outside the IT profession is critical to offsetting the problem of not acquiring enough skilled workers to meet the demands of filling 1.6 million job openings expected by 2018 (BLS, 2010). Discoveries from the study might benefit leadership within the IT industry in several ways. First, information derived from the lived experiences of women with an undergraduate degree in computer science who chose careers in professions other than IT might help industry leaders introduce and encourage meaningful IT work perceived differently by women making career decisions. Second, strategies might evolve in the context of the study results to help address how to recruit more women to fill the gap of a diminishing workforce of skilled IT workers brought on

by inevitable retirements of baby boomers and insufficient Generation X IT professionals within the field (Fowler & Wade, 2008). Third, results from the study might provide industry leaders with a clearer understanding of women's perceptions of a work–life balanced profession (Kaczmarczyk, 2004; Tierney, 2010).

Nature of the Study

The qualitative phenomenological research study involved gathering data using digitally recorded, transcribed, semistructured interviews of the beliefs and perceptions that influenced women with computer science degrees to make a career choice in a non-IT profession. Qualitative research permits developing an explanation or understanding of a central phenomenon (Creswell, 2009). A phenomenological design was an acceptable way to explore the lived experiences of female computer science graduates from 2001 through 2011 who selected careers outside the IT profession as the focus or central phenomenon (Creswell, 2009). The phenomenological design was appropriate for exploring the rationale associated with women's career choice because a phenomenological study includes people's lived experiences (Acker & Dillabough, 2007; van Manen, 2006). The data collected were from 15 women living in the National Capital Region (NCR) of the United States who earned an undergraduate degree in computer science between 2001 and 2011 but chose a career in a profession other than IT. The NCR is the District of Columbia and counties in Maryland and Virginia (U.S. Department of Homeland Security, 2005).

Overview of the research method. Van Manen (2006) discussed qualitative research in terms of the differences between methodology and method. Methodology is the application by which a researcher asks the right questions and seeks simpler threads

within and among complexities not otherwise readily accessible. The researcher posed a series of questions to participants during an interview to solicit their experiences, beliefs, and perceptions regarding why they made a career decision in a profession other than IT.

The method is the technique or design for conducting the research (M. Q. Patton, 2002; van Manen, 2006). A qualitative phenomenological research method was appropriate for finding meanings associated with making career choices other than IT among women who graduated with an undergraduate degree in computer science (Bogdan & Biklen, 2007). Qualitative phenomenological research can reveal an understanding of individuals' actions and reactions in not selecting a career in IT resulting from an event the participants have experienced (Moustakas, 1994; Waters, 2002; Waugh & Waugh, 2004). Analyzing lived experiences can establish a basis for determining how individuals might react in future situations.

Qualitative phenomenological research is useful for establishing understandings of an effect from the analysis of responses to semistructured interviewing techniques (Bogdan & Biklen, 2007; Moustakas, 1994). Unlike the qualitative approach, the quantitative approach includes pretests and posttests, numbers, and closed-ended questions; the qualitative approach was more suitable for the current study (Creswell, 2009). An interview approach can be useful for exploring and understanding central phenomena by asking participants questions and analyzing responses for descriptions and themes (Creswell, 2009). Understanding women's perceptions about career choice revealed the meanings underpinning their reactions to the event in which they have participated (Moustakas, 1994; Waters, 2002; Waugh & Waugh, 2004).

Overview of the design appropriateness. In qualitative research, using a qualitative method and phenomenological design is appropriate. A qualitative method is a particular approach suited for obtaining a specific type of data, and the phenomenological design involves exploring the elements of the phenomena that affect decision making (Trochim, 2006). The study included an empirical phenomenological design to collect and describe the lived experiences of the participants relative to the environment from which the experiences derived. Husserl (1970) noted the aim of phenomenology is to study human phenomena devoid of questioning their causes, unprejudiced realism, or manifestation. An empirical phenomenological research design was appropriate because the focus of the study was individuals' experiences of a shared phenomenon (Moustakas, 1994): women with computer science degrees who chose careers outside the IT profession. The phenomenological design was the proper approach for the study because the goal was to obtain an understanding of the phenomenon through using various techniques such as discussions and interviews to capture the essence or meaning of the lived experience (Creswell, 2005; Waters, 2002; Waugh & Waugh, 2004).

Central themes emerged from the participants' experiences shared through personal interviews (Lunenburg & Irby, 2008). Interviews consisted of a semistructured interview protocol with open-ended questions (Horton, Macve, & Struyven, 2004) designed to help participants share descriptions of their experiences regarding career choice. After the interviews were complete, a manual analysis of the data commenced to provide a qualitative view of the participants' thoughts, reflections, feelings, concerns, and attitudes (Cooper & Schindler, 2006; Neuman, 2006). The researcher applied NVivo 9 (di Gregorio & Davidson, 2008; QSR, 2011) software to assist as a validation tool to

verify patterns and themes of participants' experiences during career choice decisions. The method included an interview technique to provide the participants the opportunity to describe freely their personal experiences relative to career decision making. Groenewald (2004) noted the purpose for the phenomenological research method was to describe the perceptions and beliefs of the participants based on their lived experiences.

Sample Size

Qualitative designs involve studying a small sample of the population, which allows the development of emerging themes from abstract data (Bogdan & Biklen, 2007). Typical sample sizes noted in the literature range from five to 20 participants (Leedy & Ormrod, 2010). The sample size should allow theoretical saturation, which occurs when iterations among analysis, theory development, and data collection generate a view, and extended review bears no additional or minimal information that challenges or elaborates the view (Strauss & Corbin, 1998). The population investigated was women working in the NCR who earned computer science degrees between 2001 and 2011 but never entered the IT profession upon graduation. The sample consisted of 15 female participants (Strauss & Corbin, 1998).

Past research on the underrepresentation of women in IT concentrating on female populations and samples mainly concerned gender stereotyping and other barriers associated with women not selecting a career in IT (Craig, Lang, & Fisher, 2008; Margolis & Fisher, 2002; Turkle & Papert, 1990; Volman & van Eck, 2001). The selected population was relevant to the current study based on a gap in the literature that did not address why women choose not to work in the IT profession after dedicating years of study to qualify to do so.

Research Question

The present study involved exploring the lived experiences of 15 women with an undergraduate degree in computer science and linking those experiences to meanings associated with a career choice decision. The research question was as follows: What is the essence of the decision-making experience of career choice among female college graduates with computer science degrees who do not enter the IT profession? Phenomenology is a school of thought that includes a focus on participants' subjective experiences and interpretations (Creswell, 2009). The researcher gathered the participants' perceptions, beliefs, and experiences associated with career choice decision making through personal interviews to help create a deeper understanding of why women with an undergraduate degree in computer science did not enter the IT profession.

Theoretical Framework

The underrepresentation of women in the IT profession is increasing at a time when the exodus of baby boomers from the IT workforce has vast macroeconomic implications that will take decades to unravel (Fowler & Wade, 2008). The literature is rich in research relative to why fewer women choose to major in computing and why women do not pursue careers in technology or computing fields (Harris, Cushman, Kruck, & Anderson, 2009). Researchers have yet to uncover why women who have spent considerable time and equity obtaining an undergraduate degree in computer science made career choice decisions to avoid the profession. The present study involved examining career choice decision making from the perspective of the lived experiences of women who made the decision. The personal experiences and knowledge obtained from

why these women made their choice might help heighten interest in IT career-relevant activities and occupations (S. M. Smith, 2002).

In phenomenology, beliefs and perceptions are part of knowledge (Moustakas, 1994). According to Moustakas (1994), the role of research with a phenomenological approach is to arrive at the essence of the experience or to grasp an understanding of the participants' "perceptions, perspectives, and understandings of an event that occurred in their lives" (Leedy & Ormrod, 2010, p. 144). For the purpose of the research study, the theoretical area for exploration was the effect of the beliefs or perceptions of women with an undergraduate degree in computer science and their career decision-making choice relative to the IT profession.

Decision theories. Decision theory involves rational choices to predict and explain choices and to improve decision making (Peterson, 2009). The purpose of decision theory is to predict and explain choices made while understanding how to improve decision making (Peterson, 2009). The theory of individual decision making has become the renewed focus of an enormous amount of research and reconsideration from many perspectives (Herbig & Glöckner, 2009). Making choices under uncertainty represents the heart of decision-making theory concerned with difficult decisions simply because of their complexity or of the individual who has to make them (Fischer, Fischer, Weisweiler, & Frey, 2010). Individuals make decisions based on their own needs and intuition rather than in a deliberate decision mode where they tend to make their decisions by carefully weighing the advantages and disadvantages of different decision alternatives (Fischer et al., 2010). A number of decision theories were relevant to the

present study, including sense-making theory, social cognitive career theory (SCCT), and behavioral decision theory.

Sense-making theory. Sense making is a theory of cognition, communication, and behavior that seeks to explain how people understand events and how actions become self-validating (Dervin, 1998) and is the method where individuals provide meaning to experience (Reed, 2008). The concept, often presented as an interdisciplinary research program, brings collective meanings drawn from philosophy, sociology, and cognitive science (Cheuk, 2008). Sense-making theory was important to the current study because the theory provided an alternative explanation for assessing situations, such as how women with an undergraduate degree in computer science make decisions to embark on careers outside IT.

According to Olsson (2009), the focus of the theory is "more on individual making of sense than on the construction and reconstruction of cognitive order through societal negotiation processes" (p. 27). In sense-making theory, Weick, Sutcliffe, and Obstfeld (2005) noted that situations will arise in which an individual has an incomplete or blocked understanding of something. Weick et al. further noted when the internal sense runs out, individuals need to create new sense by asking questions, formulating ideas, and seeking out information, both formally and informally, that provides answers that help them to make sense.

Social cognitive career theory (SCCT). Social cognitive career theory is a by-product of social cognitive theory and is a more generalized and rigorously tested theory developed by Lent, Brown, and Hackett (1994). The theory, built on Bandura's (1986) social cognitive theory, indicates career decision behavior results in interactions among

outcome expectation, goals, and self-efficacy. Career decisions often take into account the career histories of at-risk groups such as women in IT, and SCCT presents a likely explanation of how these interactions help or dissuade these groups (Chartrand & Rose, 1996; Lent, Lopez, Lopez, & Sheu, 2008). The application of SCCT emphasizes how social and cultural differences might restrict opportunities for women interested in an IT profession because of underlying consequential decisions based on perceived barriers and self-efficacy associated with the field (Bandura, 1997). The theory served as a valuable framework for the current study to help understand how women make career choices as well as to provide a foundation that influenced approaches that support women achieving their potential in a rapidly changing IT environment (Walsh & Heppner, 2006).

Behavioral decision theory. Researchers have developed many behavioral decision-based models with the purpose of providing ways to evaluate and explain decisions. Edwards (1961) pioneered behavior decision theory to provide a systematic approach for describing how individuals incorporate values and beliefs into their decisions. Edwards's theory also includes a prescribed course of action closely reflecting the values and beliefs of decision makers. Explicit to the theoretical approach on decisions is the view that individual decision makers might express intuitive decision making based on cognitive modeling, knowledge structure, and emotional awareness, instead of collecting information (Ju, Junwen, & Chenglin, 2007). The use of intuitive decision making might support selecting a career path different from educational study. Researchers making efforts aimed at understanding, explaining, and predicting important decisions should consider approaches grounded in behavioral decision theory (Peterson, 2009).

Definition of Terms

A definition is a series of words that provides meaning to a term or phrase. Definitions clarify and provide clear operational meaning to terms used throughout a research study. The following terms were the working definitions for the current research and served as the operational terms throughout the study.

Information technology (IT): Computer technology that includes hardware and software and telecommunications technology that includes data, image, and voice networks (Wentling & Thomas, 2009).

Information technology labor workforce: IT technicians, computer programmers, and technical managers (NSF, 2008b).

Perception: The use of sensory information to attain awareness and understanding of an environment (Foust-Cummings et al., 2008).

STEM: Science, technology, engineering, and mathematics occupations (Ashcraft & Blithe, 2009).

Underrepresented: Inadequate representation of women in science-related careers in relation to men (Ahmed, 2007).

Work–life balance: Opportunities for flextime, part-time work, and telecommuting that improve the quality of personal life (Leiter, Jackson, & Shaughnessy, 2009).

Assumptions

Assumptions might add to the foundation of a phenomenological study related to career choices made by women. The focus of the study was the lived experiences of female graduates who pursued a science-related degree major but decided not to enter the

profession. One assumption of the study was that the underrepresentation of women in the IT profession was a problem that warranted study and advocacy to promote change. Another assumption was the general population for the study would provide new and valuable insight into the topic. Another assumption was that the sample would provide honest and open answers to the interview questions. A final assumption was that all participants graduated with computer science degrees between 2001 and 2011.

Scope and Limitations

Creswell (2005) defined limitations as "potential weaknesses or problems with the study as identified by the researcher" (p. 198). For the current phenomenological research study, two limitations existed. The first limitation was the dependence on the interviewees' willingness and ability to provide an accurate account of their lived experiences through thoughtful and meaningful responses to the interview questions. Choosing the participants through purposive sampling ensured the resulting data would contribute to the research study. The second limitation, and one that could occur in any phenomenological study, was bias (Creswell, 2005). Leedy and Ormrod (2010) noted any preconceived personal experiences "may unduly influence what the researcher 'hears' the participant saying" (p. 153). The researcher executed the concept of epoché or bracketing to mitigate bias by setting aside personal experiences and taking a fresh perspective toward the phenomenon under investigation. Keeping the interviewee focused through the interview questions provided the boundary needed to capture the most factual data.

Delimitations

Delimitations further taper a study's scope and identify areas not intended or included in the study (Leedy & Ormrod, 2010). The qualitative design and small sample size limited generalization of the results from the study. The first delimitation was the small sample size and the ability to achieve saturation. Small sample sizes are the preference in qualitative studies, but the concern is that the limited number of participants might also limit the type and amount of data captured to achieve saturation (C. Marshall & Rossman, 2006; M. Q. Patton, 2002). The focused geographic setting of the study in the NCR likely did not represent a setting inclusive of women from other sectors of the United States. Despite the delimitations, an assumption was the findings would be transferable. Transferability of findings indicates the degree to which findings "have applicability in other contexts" (D. Cohen & Crabtree, 2006, para. 1). The study was specific to career choices made by women who graduated with undergraduate degrees in computer science and might be transferable through a rich description of the method and findings. A final delimitation was that all participants graduated with computer science degrees between 2001 and 2011.

Summary

Encouraging women to pursue careers in the IT profession is essential because it reduces the reliance on outsourcing by filling the gap with native-born skilled workers (Hira, 2007). Failure to capitalize on the talent weakens productivity, innovation, and competitiveness in the United States that promote industrial leadership and growth in the economy (Pearson, 2008). To make a career in IT more appealing to women, industry leaders should seek to understand the reasons knowledgeable and skilled women with

degrees in computer science choose not to pursue careers in IT and embark on actions to bolster efforts toward filling the skilled IT worker gap (Ashcraft & Blithe, 2009).

Chapter 1 contained a discussion of the problem, which was that a substantial number of woman undergraduates with degrees in computer science are not selecting IT as a profession, and without more women pursuing careers in IT, employers will not be able to secure the number of skilled IT workers required to meet future demands. The chapter also included an overview of the design, approach, and appropriateness of the study. A discussion on why the use of a phenomenological approach to qualitative research was the appropriate method to explore the lived experiences of the participants followed. Creswell (2009) defined qualitative research as collecting data from the views of others. Chapter 1 contained the study purpose, a description of the participants, and the guiding research question. The chapter also contained the theoretical framework of the study, which included several decision theories appropriate to understand the rationale used to predict and explain choices and to improve decision making (Peterson, 2009). Chapter 2 includes a review of the literature relating to the study and contains broader implications of the gap within the literature associated with the lack of research on women with undergraduate degrees in computer science and their decisions not to pursue careers in IT after dedicating years of study to do so.

Chapter 2

Review of the Literature

The objective of the literature review is to (a) explore existing research relevant to women in IT; (b) identify gaps in the research, and (c) situate the study within the literature, in particular to focus on remedies to female underrepresentation in IT careers and leadership. The literature review for the current phenomenological study includes scholarly research crucial to understanding the background, nature, and extent of the problem of female underrepresentation in the IT profession. A review of the literature was necessary to develop a historical perspective on earlier female career decision making and to garner an understanding through further research of the meanings women with undergraduate degrees in computer science associate with non-IT career decisions.

The chapter contains an in-depth discussion of barriers that contribute to and might directly affect a woman's pursuit of a career in IT. Also included is a thematic overview of the past and current climate within the IT field. The literature review includes coverage of theories relevant to gender and germane to the research question and a discussion of the phenomenon related to meanings women attach to career choices. The review also includes identified gaps in the literature, which situates the study and supports the research question regarding female underrepresentation in IT careers.

Documentation

The sections within Chapter 2 reflect the result of a search of books, peer-reviewed articles, documents, dissertations, and the Internet. The literature review maximized University of Phoenix's Electronic Library System, including database searches in ProQuest, EBSCOhost, and Gale PowerSearch. Research on similar topics

included dissertations using the ProQuest Dissertations and Theses database. Specialized electronic databases such as SAGE Full-Text Collections expanded access to scholarly and professional article searches. To add breadth and depth to the topic, the research included electronic sources outside University of Phoenix's Electronic Library System, such as ERIC, Google Scholar, and other universities including Cambridge, Cincinnati, Massachusetts Institute of Technology, Stanford, and Walden. Government databases such as the BLS, U.S. Census Bureau, and NSF provided statistical information regarding future trends and patterns. The topics searched supported the purpose and significance of the study and the underlying reasons for an ongoing gap between the numbers of men and women in the IT profession. The literature had a significant gap related to the problem studied.

Historical Perspective of Factors Affecting Women's Choice of Careers

Women are practically absent from the historical literature on computing, although they have made noteworthy contributions in many segments of the computing industry (Misa, 2010). Studies involving the decline of women entering professional careers began to appear in select management, psychology, and career journals in the 1990s and converged to determine knowledge about the shape of 21st-century women's careers (Fouad & Singh, 2011; Hopkins et al., 2008). Researchers have concentrated on identifying reasons for the decline by focusing on barriers such as lack of computer education, a male-dominant computer culture, and other gender biases (A. Warren, 2009; Wentling & Thomas, 2009). Other researchers attributed the decline to the work–life balance associated with long hours and family conflict and the lack of female role models and mentors (Hopkins et al., 2008). A common theme in most research studies was the

gap between the number of women and the number of men employed in fields related to IT, with men dominating disproportionately (NCWIT, 2009).

Early education. In early studies, researchers analyzed the decline of women in IT by focusing on how women related to and interacted with computers (Comber, Colley, & Hargreaves, 1997; Evard, 1996; Furger, 1998). Researchers also reviewed the inadequacies of teaching computing (American Association of University Women, 2000; Holden, 1997) and the meanings women assign to the computer culture (Turkle, 1984, 2003). Differences in gender exist in experience, educational environments, and attitudes relating to computers (Margolis & Fisher, 2002; Turkle & Papert, 1990; Volman & van Eck, 2001). Wilder, Mackie, and Cooper (1985) assessed kindergarten to 12th-grade students and found both boys and girls considered computers better suited to boys. Whitley (1997) conducted gender research and analysis distinctions in computer behaviors and attitudes and indicated self-efficacy relative to computers was higher in men, or men had a strong belief in their own competence, and men had a more optimistic view toward computers than women did. The research indicates men have more computer experience than women, as reflected in the classroom, where men tended to dominate computer use and often drove women to the background.

Teacher and parental attitudes. Teachers, counselors, and parents often lack an understanding on how to use technology to construct an appealing, equitable, and innovative learning environment, so girls traditionally comprise a very small proportion of students in computer design and computer science courses (L. Barker & Aspray, 2006). Teachers counseling young women to match female job traits to presupposed job success and satisfaction never focused on the enrollment and pursuit of an IT profession.

Teachers did not encourage young women to learn about and use computers, so young men became more experienced with computers and other technologies (Margolis & Fisher, 2002; Volman & van Eck, 2001). Recognizing that declining interest among women in technical curricula begins at an early age, the importance of intervention efforts requires attention. Exposing girls to positive IT role models; counteracting IT as a male profession; keeping parents, teachers, and counselors better informed; and creating positive images of computing become themes to ensure future increases in female IT representation (Morrell, Cotten, Sparks, & Spurgas, 2004).

College education. Studies depicting why women avoid IT careers indicate that young women care less about technology and more about solving problems. Women continue to view disciplines such as psychology and education as more attractive than other disciplines because the focus within these fields is problem solving (Anker, 1997). Young women are choosing problem-solving disciplines over technology careers because typically they have limited awareness of what an IT degree and career involves (Anker, 1997; Venkatesh, Morris, & Ackerman, 2000). An important issue analyzed in the academic arena is a lack of programmatic design and curricular approaches in computer science that have been successful for recruiting and retaining women and other underrepresented populations.

Current Review of the Recruitment of Women into Computer Science

The intention of freshman women to select computer science as a major decreased from 2.8% in 1985 to 1.3% in 1995 and to 0.4% in 2006 (Harris et al., 2009). Although the current generation (Generation Y) of women uses computers in equal numbers to men, women notably differ concerning design, creation, and implementation of new IT

(Adaya, 2008; Ashcraft & Blithe, 2009). A male viewpoint contributes to the development of IT innovations, and men receive the most recognition in the industry (Klawe, Whitney, & Simard, 2009; Soe & Yakura, 2008). As the population of female high school and college computer science students dramatically reduced from 2000 through 2006 (L. Barker & Aspray, 2006; Black, 2010), the IT field remains destined as a male-dominated culture, which will severely affect the U.S. economy unless significant changes occur. Further research is necessary through continued investigation of the existing and new challenges associated with the phenomenon from multiple perspectives, especially to focus on remedies to female underrepresentation in IT careers and leadership (Agosto, Gasson, & Atwood, 2008; Nelson & Veltri, 2010).

Perceptions and Attitudes toward IT Careers among Women

The literature on the perceptions of women regarding working in an IT environment includes key factors such as parental and child care, maternity, and telecommuting. These work–life balance factors center on the cultural dynamics currently influencing a women's choice in the IT field (Trauth, Quesenberry, & Huang, 2008). Women view the IT workplace as a place in which it would be difficult to support a work–life balance, and if a temporary leave were necessary to have children, they would find returning to the workplace environment difficult because of the rate of advance of newer technology (Harris et al., 2009). Acquiring a deeper understanding of these dynamics would support theoretical knowledge of the female gender as it applied to culture and might help industry leaders concentrate on attending to the problem of female underrepresentation in the IT field (Trauth, Quesenberry, & Yeo; Whitecraft & Williams, 2010).

A woman's career-choice behavior, particularly her attitude toward considering a nontraditional female profession such as IT, leans toward negativity because of a perception of potential work–family conflict (Riemenschneider, Armstrong, Allen, & Reid, 2006). The type of work associated with a career in IT and aspirations of parenting might affect a woman's attitude toward her IT career goal (Brandel, 2007). The IT field often requires long hours, extensive travel, and continual skill upgrading. Women who values quality time with family and perceive IT as too demanding will not pursue the field as a career (Simard, Davies Henderson, et al., 2010). Women's attitudes about work and family roles affect their feelings regarding these two roles to the point that some women are deselecting themselves from positions for work–life balance reasons (Anita Borg Institute, 2009). Because most women are primarily responsible for child care and domestic activities, work and career-choice behaviors favor fields that emphasize less importance on career and more importance on flexible scheduling (Moody, 2008).

Industry culture and reputation. When considering gender and IT issues, taking into account both a cultural and a cross-cultural perspective is important (Craig & Lang, 2010). According to Wentling and Thomas (2009), gender differences embedded in IT workplace cultures, as with STEM and engineering environments, can affect negatively development of a woman's career. Women perceive the IT field as a gender-biased environment possessing characteristics described as antisocial, individualistic, competitive, oriented toward a male-dominated culture, lacking women in upper management, and lacking the potential for female advancement (Jordan, Clark, & Waldron, 2007; Simard, 2009). Women often believe the IT profession is boring,

consists of nerds and male techies, and lacks in opportunities to apply problem-solving and other employability skills.

In an IT review essay, Soe and Yakura (2008) noted that climate and culture within an organization extensively affect a woman's outcome relating to employment and participation. A higher percentage of promotions and hiring of men rather than women in IT organizations leads toward views of a culture and climate that are distant toward women (Soe & Yakura, 2008). If organizational leaders wish to appeal to and hold on to capable women in the IT workplace and leadership, they must understand how workplace culture characteristics negatively as well as positively affect the development of a woman's career in IT (Koput & Gutek, 2011).

Frieze, Hazzan, Blum, and Dias (2006) noted practitioners and researchers must identify factors such as issues concerning culture as influencers on women's options toward a career. Focusing women toward a positive cultural perception of the field and the importance of their relationship to IT are instrumental toward establishing a broader picture of the profession and the value of women within the culture. According to Trauth et al. (2010), researchers must articulate how factors such as cultural influence might portray a gender image and gender relationship with respect to IT. Far-reaching solutions intended to improve the cultural acknowledgment of women in IT might have a limited result without a comprehensive understanding of the significant factors surrounding the sociocultural context. Trauth et al. proposed a theory of individual differences whereas individual women will undergo a different range of sociocultural influences that form their inclination to either avoid the IT profession or participate in it. Trauth et al. further noted women also react to socially influencing gender in a range of ways regarding IT

work. Differences and perspectives of individuals occupy a midpoint between believers in a set of characteristics and a sociocultural understanding in explaining female underrepresentation in the IT profession.

The current IT culture rewards assertiveness, which is often uncharacteristic of women. Turkle (1984) noted, "In our culture girls are taught the characteristics of soft mastery—negotiation, compromise, give-and-take, while models of male behavior stress decisiveness and the imposition of will" (p. 109). When women become assertive, an unconscious bias associated with gender surfaces, implying that women are difficult to work with or aggressive, which results in a double standard (Haines & Kray, 2005). Leaders in the IT industry should elevate the unconscious awareness of gender bias and should investigate advancement and recruitment within the IT field for evidence of such bias (Chaiklin, 2011). Any continuing recruiting, retaining, and advancing of women in technology depends on the collective ability to make computing and high technology a more inclusive environment (Riemenschneider et al., 2006). A culture of flexibility can help women in IT meet the demands of their family and responsibilities.

Gender-role stereotyping. Early studies focusing on gender stereotyping attitudes indicated female students were less knowledgeable about IT, did not enjoy operating computers, and experienced more software problems than their male counterparts did (Janssen Reinen & Plomp, 1997). Research also indicated women did not enjoy computing because most of the accessible software was conducive to the male competitive nature of working against the computer, whereas women tended to prefer software conducive to working cooperatively and interactively with the computer (American Association of University Women, 2000). Gender disparities relating to

computer use in the workplace are highly prevalent in the literature. Turkle (2003) noted the culture associated with computers made by engineers and for engineers is primarily by men for men. Turkle further proposed broadening the definition of computer culture to include more input by women to encourage women to participate more openly within the culture. Despite research-based recommendations to minimize the gender computer gap, the percentage of computer science degrees awarded to women has declined dramatically in recent years, from 37% in 1985 to 22% in 2005 and only 0.4% of female freshman indicated intentions toward a computer science major in 2006 (Klawe et al., 2009).

Gender-role attitude. Gender-role attitude significantly contributes to a woman's career behavior, particularly in nontraditional gender career choices (Bona, Kelly, & Jung, 2010; Corrigall & Konrad, 2007). College women with traditional gender-role attitudes who majored in computer science were less likely to enter a profession related to computer science than were women without traditional gender-role attitudes (Simard, 2009). Women who believed men had greater academic abilities in computer science tended to perform worse on examinations than women who did not hold the same attitude (He & Freeman, 2010). External factors such as parents, role models, and mentors influence women's attitude toward both traditional and nontraditional gender career decision (Galinsky, Aumann, & Bond, 2009). Marks, Lam, and McHale (2009) studied family patterns of gender role attitudes and found women with parents displaying traditional gender roles, such as the mother staying home with children, were less likely to have nontraditional gender-role attitudes (Lang, Craig, Fisher, Bennetts, & Forgasz, 2010).

Lack of mentoring programs and female role models. A role model or mentor is another external factor that influences women's career choices. Buck, Clark, Leslie-Pelecky, Lu, and Cerda-Lizarraga (2008) and Quimby and DeSantis (2006) indicated women holding positive attitudes toward nontraditional fields, and who knew an individual regarded as a role model in the field, were more apt to pursue nontraditional fields than others without role models. Women must have access to mentors who will guide their career decisions. Positive mentoring programs during women's academic progress have improved their attitude toward pursuing nontraditional career fields (Trauth et al., 2010).

Recruitment and Retention Strategies for Women in IT

Researchers have also examined how retention strategies that respond to IT worker values could stabilize the gap between female and male IT professionals. Researchers have generally attributed the gradual decline in women's participation to the hostile masculine culture of the discipline (Cheryan & Plaut, 2010). Ross (2010) explored notions of the computing culture and its perceived effect on women's place and work–life existence in a computer science profession as well as its effects on the discipline. Winokur (2007) noted making value offerings to IT workers, such as additional days off on maternity leave, personal days, and health-care-related benefits, might help to attract and retain women.

Retention studies on the lack of role model influence and the effect on women in IT revealed the importance of psychosocial and career mentoring initiatives facilitating positive friendships or family-like relationships and job effectiveness (Wanberg, Kammeyer-Mueller, & Marchese, 2006). Consequences of work–life conflict within the

IT profession and the effects of burnout have become a significant research area. Documented literature on work–life conflict highlighted decreased levels of job satisfaction, increased career dissatisfaction, and increased turnover (Messersmith, 2007).

Recent Legislation and Specialized Programs

Between 2008 and 2010, fixing the broken educational pipeline became the solution for offsetting the underrepresentation of women in IT and other technological disciplines (Atkinson, 2010). Staffing the nation's schools with well-qualified math and science teachers became a prominent issue in elementary and secondary education. The America COMPETES Act passed in 2007 as a response to funding for new initiatives and various science education programs (Atkinson, 2010). The act was an important step forward to ensure the United States enacts the strategy needed to compete in a global-based economy (Atkinson, 2010). The American Recovery and Reinvestment Act of 2009 incorporated $2.5 billion in federal funds for the NSF, which included new funding for programs associated with STEM education (American Recovery and Reinvestment Act of 2009).

The use of specialized programs to address the lack of awareness and to introduce young women to IT as a rewarding and exciting career path has begun to surface (Klawe et al., 2009). Events such as Computer Mania Day hosted by the Center for Women and Information Technology at the University of Maryland gather academics and professionals to foster female students' interest in IT degrees and careers (Morrell et al., 2004). Such events provide opportunities to address the lack of awareness by introducing young women to IT through hands-on interaction and by encouraging them to go back to their schools and pursue IT as a meaningful and fulfilling career path. Despite these

efforts, the effects are negligible, with a continued decline of women in IT higher education and a dramatic underrepresentation of women in the IT profession (Nelson & Veltri, 2011).

Generational Differences

Recent research had depicted mistakes in arguments suggesting the existence of a particularly adept technology user or identifiable generation (Bennett & Maton, 2010). Researchers have indicated gender differences in computer use reduced appreciably between 2000 and 2010. Generation Y women have been immersed in and grown up with new computer technology and are defining new models of behavior and computer use more rapidly than anticipated (L. Barker & Aspray, 2006; Fedorowicz, Vilvovsky, & Golibersuch, 2010). The diversity discovered between these studies provides a useful insight into new generational familiarities with technology both outside and inside school curriculum. Researchers also recently provided insight into an initial appreciation of technology by women while highlighting some intricacies and difficulties with women and technology that require further investigation (Bennett & Maton, 2010). Women in Generation Y are as confident and ambitious as men, yet the increased use of computers by these women does not mirror their academic or employment interest within IT.

Employment Data and Trends for IT Workforce

Employment opportunities and economic prosperity within the IT marketplace are rapidly growing, as evidenced by more than 81,000 IT companies spanning 50 states and the District of Columbia (NCWIT, 2007). By 2018, the BLS predicted a 37% increase in IT job openings. A snapshot from the Puget Sound region in Washington State revealed four of the top 10 job openings are for computer science specialties, totaling 40% of the

available jobs in a growing IT industry (DeSilva, 2011). Despite the positive trends regarding the growth potential of the IT industry, the country will not meet future IT challenges because of a shortage of skilled IT workers. Predictions have indicated that by 2018, IT employers will fill only half of their available job openings (NCWIT, 2009). Data collected by researchers at the Computing Technology Industry Association indicated 21 million IT jobs would be vacant in the United States in 2012, and there could be only 17 million IT workers to fill those positions. The cause is impending baby boomer retirements, a reduced Generation X workforce, and an underrepresentation of women in the profession (Terrell, 2007).

Between 2006 and 2008, researchers began to focus more closely on female IT careers, making various peripheral attempts of inquiry into reasons women were avoiding IT careers, or why some who made the career choice and entered the field subsequently left (L. Barker & Aspray, 2006). Researchers have pointed to gender diversity, ethnicity, retention issues, lack of role models, and work–life balance factors as related to the underrepresentation of women within the IT profession and consequences on the future labor market (Johnson et al., 2008; Wentling & Thomas, 2009). Research on the lack of gender diversity within the IT workplace indicated substantial effects on women's choice of careers (Coder, Rosenbloom, Ash, & Dupont, 2009), indicating the deterrence of many would-be IT professionals from entering the career track (Gilmore, 2008) and further contributing to the underrepresentation of women in IT.

Effects from an underrepresentation of women in IT pose significant problems in organizations if the heterogeneity of workers in IT does not increase (Johnson et al., 2008). Other literature revealed the need for supportive educational environments and

more imaginative programs and curricular structure (Woszczynski & Moody, 2009). A supportive environment is often not a factor but the lack of meaning needed to attract and retain women of underrepresented populations to reinforce societal norms is a factor toward contributing to an increase in women entering the IT field (Nicholson, Hancock, & Dahlberg, 2007).

The underrepresentation of women in IT continues to have a profound effect on the ability of employers in the IT industry to fill technical positions and a direct effect on the economic prosperity and status of the United States as the leading country in the area of IT (NCWIT, 2007). In 2007, women filled only 27% of the computing-related jobs. Many talented women live in the United States but require attention to make certain a prepared IT workforce can meet future demands for filling computing-related jobs while making positive contributions toward the country's economic prosperity (Ash, Coder, Dupont, & Rosenbloom, 2009; L. Barker & Aspray, 2006). Researchers at several large women's organizations indicated reductions in current and projected shortages of highly skilled IT professionals will occur if more women would select careers in the IT profession (NCWIT, 2009).

Industry requires the contributions of women to play a heightened role in technology leadership. According to Ovide (2010), "Female technology executives increasingly are banding together to solve what they say is a problem in their own midst: a dearth of women in top positions at emerging technology firms" (para. 1). Statistics from the Dow Jones Venture Source showed that in 2009, approximately 11% of U.S. companies with backing from venture-capital companies had former and current female chief executive officers or founders (Ovide, 2010). A 2009 review of Y Combinator, a

start-up incubator, revealed it funded only 14 female-owned firms out of a total of 208 (Ovide, 2010).

As the IT market continues to gain momentum and the requirement to fill vacancies within industry increases, it becomes evident that leaders in the IT profession must develop a more appealing environment in which work is an aspect of a meaningful existence for women (L. Barker & Aspray, 2006). A Generation Y focus group summary report (Nichols Barrett, 2011) indicated women are essential in building a skilled and diverse labor force that can offset severe shortfalls, but only if they sense the work environment as fulfilling, enjoyable, meaningful, and leading to professional growth.

Theoretical Models of Career-Choice Behavior

Few decisions have as profound an effect on a woman's life as the choice she makes toward a profession of work and career, and according to researchers at Women in Technology (2009), many decisions a women makes toward a profession might stem from early childhood perceptions. Like men, women realize they will spend a considerable amount of time at work, and the choice of career will significantly affect their lifestyle (Whitmarsh, Brown, Cooper, Hawkins-Rodgers, & Wentworth, 2007). Reviewing literature involving career development models, theories, and past behavioral experiences might provide insight into the formulation of new theories directed toward an understanding of women's career-choice behavior (O'Neil, Hopkins, & Bilimoria, 2008). As the testing of such theories proceeds, the theories might expand the knowledge base and allow insight into predicting future career selection criteria (O'Neil et al., 2008). Exploring existing theories and developing alternative theories to make possible a

broader understanding of the underrepresentation of women in IT phenomenon is essential.

Reviewing the phenomenon from a practical perspective allowed an extended review of past and current investigations to gain additional insights about the variations in relationships between women and IT (Hill et al., 2010). Reviewing the phenomenon from a pragmatic perspective allowed a critical assessment of current behaviors that focus on and support innovative development and sustainable proposals to improve the involvement of women in the IT profession and support the nation's information economy (Hill et al., 2010).

Structural model of career-choice behavior. Structural theories focus on individual characteristics and occupational tasks and indicate choosing a profession depends upon knowing oneself, knowing the requirements of the job, and having the talent to tie the two together (McGinty, 2010). Reviewing structural theory and relating it to the severe decline in women choosing careers in IT shed light on the underrepresentation within the career field (O'Neil, Hopkins, & Bilimoria, 2008). Structural theories such as Parsons's (1909) trait and factor theory and Holland's (1959) person–environment fit theory indicated the applicability of measuring both individual talents and the attributes required in particular jobs. According to these theories, the process of choosing a career involves matching individuals to the right job so they can develop and advance in the profession. Structural theory is an essential element of career counseling approaches, and when linking career choice in IT to the theoretical framework, it becomes readily apparent that early education and guidance underscore

many reasons for women's underrepresentation in the field (Meszaros, Creamer, & Lee, 2009).

Career counseling in IT for young women during the 20th and into the 21st centuries was nonexistent, so the application of structural theory never factored into careers concerning women and IT (McGinty, 2010). The application of a structural theory toward a woman's career choice in IT must center on the belief that she would fully understand the IT environment. Doing so requires women to choose their career based on compatibility of interests, likes and dislikes, and skills that express values and attitudes and take on her ability to undertake challenges and positions she likes and avoid those she dislikes (McGinty, 2010). Women often received little or no information on the involvement and availability of IT careers (O'Neil et al., 2008). Buzzetto-More, Ukoha, and Rustagi (2010) revealed women attending a minority-serving institution received substantially less counseling and exposure to computing compared to men.

Although structural theory applies to both men and women, gender bias involving IT careers in the 20th and early 21st centuries is evident, and women pursued female-dominated occupations with greater interest (Shapiro, Ingols, O'Neill, & Blake-Beard, 2009). A review of the application of structural theory toward a career choice in IT indicated women generally would find more reasons to reject IT and cite other more knowledgeable occupations (Rudman & Phelan, 2010). The indifference toward women in applying structural theory toward a career in IT fueled a gender gap within the field that continues in the 21st century (Adaya, 2008). Structural theory application might become a more viable approach to resolving the underrepresentation of women in IT with the recent introduction of educational initiatives such as the America COMPETES

Reauthorization Act of 2010 focused on STEM education and gender parity (Atkinson, 2010; Stine, 2008).

Social cognitive theory model. Social cognitive theories consist of processing information and the deliberate behaviors of motivated improvement on an individual's social position, which might relate to either social status in general or one aspect of one's life, such as career advancement. Bandura (1977) introduced social cognitive and self-efficacy theories that explain the behavior of individuals from the perspective that performance is the product of interplay among personal, behavioral, and environmental influences. Applying social cognitive theory might help improve insight into the social reasons and behaviors contributing to perceived barriers woman have about the IT profession and the continuing gender gap and underrepresentation of women within the IT field (McGinty, 2010). Researchers at NCWIT (2009) noted women were often unable to proceed through the process of making a career choice in IT. The study findings included reasons such as an inability to establish clear career goals in the field and a lack of understanding performance criteria toward determining the upward mobility and direction of a woman's career in the future.

According to social cognitive theory, the knowledge learned by people can relate directly to having observed others in social situations, the experiences they have undergone over time, and outside modeling influences (Bandura, 1997). The theory places much more emphasis on the mind and the effect external factors can have on decisions and behaviors. Women contemplating the IT profession often fail to take appropriate goal-related actions that lead to performance experience because society has imposed a loss of self-efficacy resulting in a failure to arrive at the right career decision at

the right time (Quigley, Green, & Grant-Vallone, 2010). When social and cultural environments fail to support a woman's career-related endeavors in a positive manner, she can neither set her own career goals nor turn them into her own career-related actions (Shapiro et al., 2009).

According to social cognitive theory, the culmination of an individual's personality initiates with rough beliefs and habits of thought acquired through unique experience in the social environment (Bandura, 1986). Beliefs and habits might become so ingrained in an individual's subconscious that they influence the individual without the realization of such, thereby affecting how he or she learns, behaves, interacts, and lives (Betz, 2004). Research on women in IT has shown women often lack appropriate mediators to shape their IT learning experiences during the formative years, indicating a difference between men and women in self-efficacy (Ashcraft & Blithe, 2009). The effects on the ability for a woman to learn and achieve her goals might compare to the degree of self-efficacy she possesses (Betz & Fitzgerald, 1987; Betz & Hackett, 1981). If women believe they can learn new behaviors in the IT field, they will likely have a more positive attitude toward the profession (Ashcraft & Blithe, 2009).

A woman's belief about her capabilities is a significant part of self-knowledge (Lent et al., 1994). Women have not readied themselves for careers in IT, possibly due to social beliefs and perceptions of how they relate to those in the IT profession (Bona et al., 2010). A woman's perceived self-efficacy within the IT field might address her ability to exercise control over challenging demands (Davis, Oborn, Morganson, & Major, 2009). Societal beliefs portrayed at an early age depicting a male dominant culture within the field have given rise to low self-efficacy, resulting in women's belief that a desired

outcome to succeed and grow within the field is unattainable (Bandura, 1986). A woman's self-efficacy is generally lower than a man's in occupations traditionally dominated by men (Betz & Hackett, 1981). Often women cannot develop career-related interests in IT because they lack outcome expectations due to low self-efficacy, so any personal aspirations within the IT profession have little merit (Quigley et al., 2010).

Social cognitive theory also posits that experiences can alter a woman's career-choice behavior through the influence of social modeling. Social modeling can directly affect a person's thinking, perceptions, and emotions (Women in Technology, 2009). The learning process from social modeling starts with observation and passes to memory retention, observed behavior reproduction, and production of future behavior through motivation. Social modeling states individuals are more likely to model their behavior after someone with whom they can identify. The more emotional attachments and perceived commonalities between the woman and the model, the more likely the social model will have an influence on her learning (Women in Technology, 2009). Perceptions about the IT environment through social models influencing the profession as geeky and having no social skills will likely cause many women to reject careers in IT (Adaya, 2008). Women who have the talent and interest in the field become uninterested because of the negativity displayed and how society, through modeling, views those in the IT profession (Castano & Webster, 2011).

Attitudinal model of career choice behavior. Attitudinal behavior toward a profession is a factor that affects career choice and might help explain women's career-choice behaviors that eventually contribute to the underrepresentation of women in IT (Chaiklin, 2011; Gurer & Camp, 2002). Attitudes toward vocational interests generate

during the early stages of education as girls might develop a different credence from boys toward the attraction of IT occupations, resulting in a relatively smaller number of women in the IT field (Grant et al., 2007). Girls often decide educational and career pathways as early as middle school (Simard, Stephenson, & Kosaraju, 2010). Indicators of a declining female college enrollment in IT majors (NSF, 2009) reflect a need for more intensive and focused action aimed at younger students (Cohoon & Aspray, 2008; Lasen, 2010).

Reasonableness indicates that women will make decisions and take actions influencing their career based on gender role attitude (Judge & Livingston, 2008). For women to develop positive attitudes toward IT as a career, female teachers must get involved with computer education (Gurer & Camp, 2002; Wilson & Harsha, 2009). Female teachers need to work with female students early, as studies have shown that middle and high school girls with female computer professors showing sufficient skills, knowledge, and positive attitudes perform better than girls without such teachers (Gurer & Camp, 2002; Wilson & Harsha, 2009).

Factors that influence a woman's interest in IT include attitudes toward computers, which affect career choices (Ahuja, 2002; Gurer & Camp, 2002). Both men and women share a common interest in the use of computers, with women's attitudes concerning computers becoming increasingly more optimistic. For the majority of women, optimism concerning computers has not evolved into an attraction to a career in the IT field (Creamer, Burger, & Meszaros, 2004). Several indicators such as minimal exposure to career counseling and computing-related course offerings point toward gender-based use patterns and perspectives on computing in a precollege academic

environment as causes for the lack of women in science and technology fields (Buzzetto-More et al., 2010; Fedorowicz et al., 2010).

Attitudinal behavior associated with decreased self-efficacy, lack of belonging, and discrimination indicates low female interest in pursuing a career in the IT profession (Cheryan, Plaut, Davies, & Steele, 2009; Murphy, Steele, & Gross, 2007). Johnson et al. (2008) discovered self-efficacy and stereotyping correlated with some certainty to the relationship of a woman's attitude regarding IT career intentions and a career in IT. Johnson et al. also revealed IT self-efficacy gender differences, with men reporting IT self-efficacy at higher levels than women. The low self-efficacy reported in women clearly coincides with the disproportional gender ratio of IT professionals, which distorts a woman's attitude about self-efficacy in IT and reduces her enthusiasm toward pursuing a career in the IT field (Stout, Dasgupta, Hunsinger, & McManus, 2011).

Cultural model of career-choice behaviors. A literature review regarding career-choice behavior for women as applied to cultural influences indicated the need to analyze the various ways an embedded perception of a women's role in a culture affects her career choice, especially in the case of women choosing IT careers (Trauth, Quesenberry, & Huang, 2008). Frieze et al. (2006) noted cultural factors are significant influencers on the career options available to women and are issues that practitioners and researchers need to recognize. To have a better understanding of the lack of female representation within the IT profession, Trauth, Quesenberry, and Huang (2008) examined factors influencing the sociocultural environment.

Trauth, Quesenberry, and Huang (2008) also sought to reveal how cultural influence and associated factors such as political power and social relations affected the

economy due to female underrepresentation in the IT profession. Trauth, Quesenberry, and Huang described the expansive role that culture plays in unleashing and spurring societal growth. Exploring the environmental pressures affecting women in IT revealed regional culture and economy played a significant role in inhibiting or enhancing participation from women within the IT field.

Decision-making models. The review of literature on decision making included an explanation of how individuals make decisions and a dialogue of what means motivate the decision. Decision making is a common activity of humans, with every individual consistently making a choice on various subjects. Human behavioral decisions involve intuitive or rational decision making, and either will guide a woman's approach to career decision making (Ju et al., 2007).

Rational decision making encompasses a structured and sequenced approach to choices. Using such an approach can help build discipline and consistency into an individual's decision-making process. Intuitive decision making is neither sensory nor subjective judgment but linked closely with decision makers' experience, knowledge, and emotions (Ju et al., 2007). The decision-making process reveals that values and beliefs are incorporated into a woman's career decision that later guide the courses of action taken.

Phenomenological Research

The current study included a phenomenological design because the design involves a complete and complex description of the phenomenon described by the participants in their natural setting (Dahlberg, Dahlberg, & Nystrom, 2008). The approach revealed how the purpose of the research question was to explore the meaning

of the lived experiences of participants and shed light on the meanings associated with the subject in detailed, descriptive, qualitative accounts. Phenomenological research has influenced movements such as poststructuralism, existentialism, feminism, cultural critique, and postmodernism, as well as the formation of new methods and theory (van Manen, 2006).

Husserl (1970) noted, "Phenomenology is the 'science of science' since it alone investigates that which all other sciences simply take for granted (or ignore), the very essence of their own objects" (p. 23). According to Dahlberg et al. (2008), "The overall aim of life-world research is to describe and elucidate the lived world in a way that expands our understanding of human being and human experience" (p. 37). Phenomenological research begins with the intuitive experience of the phenomenon or problem identified, and the researcher tries to extract from it the essential features of the individual's lived experiences (Husserl, 1970).

The purpose of phenomenological research is to identify phenomena as perceived by individuals within a situation and to study lived experience from the perspective of individuals (Sokolowski, 2000; van Manen, 1990). Phenomenological research involves searching for an understanding of a phenomenon through the use of lived experience by applying various techniques such as discussions, interviews, and participant observation (Ostergaard, Dahlin, & Hugo, 2008). The intention was to collect abundant images of the experiences from the participants while remaining cognizant of the meanings attributed to their lived experiences (Dahlberg et al., 2008). The researcher's responsibility was to explore the participants' experience and to bracket out biases and preconceptions using a

sufficient degree of self-awareness while seeking to detect core themes from data gathered (Creswell, 2009; Nieswiadomy, 2011).

Phenomenological research is powerful in that it uses subjective experience to gain insight and understanding into an individual's actions and motivation while seamlessly avoiding assumptions and conventional wisdom (Leedy & Ormrod, 2010). According to Moustakas (1994), "The understanding of meaningful concrete relations implicit in the original description of experience in the context of a particular situation is the primary target of phenomenological knowledge" (p. 14). Husserl (1970) noted phenomenological researchers search for description rather than explanation and must start from a viewpoint unbound from supposition or preconceptions. Feminists as researchers reject the viewpoint of avoiding supposition, preconception, or bias and emphasize the researcher as an inclusive participant and not an impartial or removed observer (Plummer, 1983; Stanley & Wise 1993).

Emotions as meanings and the effect on career choice. Emotions can play an important role and have a substantial effect on an individual's career choice. Between 1993 and 2003, numerous researchers examined the relations between career indecision and indecisiveness based on personal traits (C. R. Cohen, Chartrand, & Jowdy, 1995; Kelly & Lee, 2005; Leong & Chervinko, 1996; Tokar, Withrow, Hall, & Moradi, 2003). The focus of present research was on the emotional and personality features on the difficulties of making career decisions, as the experience of career choice can be a highly complex, ongoing exercise instilled with emotion and subjective meaning (Callahan & Greenhaus, 1992; C. R. Cohen et al., 1995; Saka, Gati, & Kelly, 2008; Santos, 2000).

Social interactions and societal context can give rise to positive or negative emotions in a woman's experience of making a career decision.

Amundson, Borgen, Iaquinta, Butterfield, and Koert (2010) studied emotion and career decisions and concluded, "Fear, primarily fear of not being able to base career decisions on what was meaningful, was a powerful emotion for participants" (p. 345). The meanings associated with career-choice behavior concerning the underrepresentation of women in the IT workforce require a greater understanding between women and the broader environment regarding the effects of emotion. Brown, George-Curran, and Smith (2003) noted, "Perhaps . . . the role of emotion is worthy of consideration when attempting to understand one's self-efficacy for career decision-making tasks" (p. 386). The knowledge and understanding of a woman's emotions pertaining to subjective meanings, struggles, and interactions with her social and societal contexts, and the effect these have on career choice, require substantial consideration.

Emotion conceived as an internal process regulates and guides action and connects to the interpersonal and contextual. According to Iaquinta (2007), emotion affects career choice in three ways: (a) emotion motivates and energizes action to sustain a specific career choice, which might be difficult or boring; (b) emotions regulate and control actions, projects, and career choice through moment-to-moment decisions, and (c) emotion, being associated with needs, desires, purposes, and goals, can access, develop, and orient narratives about project and career. Emotion both regulates action in a social process and emphasizes its construction through women's actions, projects, and career choices. Emotion as a social and cultural construct is appropriately conditioned by age,

gender, ethnicity, and sexuality, with younger people and particularly women exhibiting a wider range of emotional license (Kidd, 2008).

Effort of will cannot control emotions, nor can adherence to any set of techniques make the decision process easier (Saka et al., 2008). A woman's decision toward career choice can become emotional, with feelings both positive and negative relative to her options driving the preferences and choice (Kidd, 2008). The emotion of belonging and providing a connection to a cultural society within a working environment brings to light the essence of the experiences shared by women regarding education, gender roles, and work–life balance (W. Patton & McIlveen, 2009). Belonging also plays on the emotional mind-set and affects career choice because emotions might have an effect on a woman's judgment involving career choice, particularly where gender domination is prevalent (W. Patton & McIlveen, 2009). Regarding the IT profession, if women can avoid the perceived challenges and barriers triggered by emotions, and the challenges and barriers triggered by outside factors, they might better situate themselves to formulate a meaningful IT career choice (Ashcraft & Blithe, 2009).

Problems as meanings and the impact on career choice. Meanings established from captured interviews on the lived experiences of participants might expose negativity or problems affecting career-choice behavior—hence the phenomenon. Clarification of meanings from studies involving the lived experiences of women anticipating careers in IT often reveal problems affecting their career choice. The theory of individual gender differences (Trauth et al., 2004), which views two levels of analysis, societal and individual, posits that together these concepts explain the differences women relate to the IT field and react to gender discussions about IT. The lived experiences highlighted

meanings as problems associated with a disparity of computer education, career progress, work–life balance issues, and sociocultural factors, as causes to resistance toward participation in the IT field, and influencing career choice (Trauth et al., 2010).

The effect of career choice associated with meanings as problems are frequently responses to actual or perceived disparities about the characteristics of the job (Rosenbloom, Ash, Dupont, & Coder, 2008). Meanings derived from the study reflected differences in preferences between genders and could clarify why female IT underrepresentation remains high. Rosenbloom et al. (2008) further noted much of the difference between men and women entering IT is that women have a problem with the various characteristics of the job and unsurprisingly decide on other choices regarding careers. Studies involving meaning as problems and the effect on career choice surround various differential exposures and experiences (Trauth et al., 2010).

Differential exposure refers to the quantity of gender bias that a woman faces and differs by individual factors such as age, parental status, or ethnicity, as well as the geographical area where she resides (Trauth et al., 2010). Differential experience explains a woman's consciousness of bias, which is the extent to which she notices and internalizes the bias and the meaning she derives from an influence such as a role model, mentor, and significant life experience (Carter & Silva, 2010; Trauth et al., 2010). Differential experience is also noticeable through an individual's abilities, character, and educational proficiency, as well as the economy and culture of a particular geographical area (Trauth et al., 2010). Differential response is affected by individual factors such as coping mechanisms, degree of family support received, sense of personal agency, and

institutional factors such as gender policies and equality laws of a geographical area and institutional settings (Castilla, 2008; Trauth et al., 2010).

Differentials reveal systematic and pervasive interaction with gender-based influences and might significantly affect a woman's career choice. Personal meanings might unveil meanings as problems that affect career choice when something does not meet personal expectations (Wentling & Thomas, 2009). The mental models women have of IT have a tendency to generate unappealing and inaccurate images of education and careers in IT (Rettenmayer, Berry, & Ellis, 2007). Because the IT profession alleges female gender role dissimilarities, a woman will notice less resemblance between herself and the IT profession, and meaning becomes a problem in the context of career choice (Cheryan et al., 2009).

Phenomenology and Career Choice

Phenomenology lent itself to the current study because the study involved exploring the essence of career decisions from participants through their thoughts, their feelings, and the meaning associated with the experience. Researchers of past phenomenological studies demonstrated the appropriateness of the phenomenological design relative to problems related to career choice. Lips-Wiersma (2002) conducted a phenomenological study to explore the influence of an individual's spirituality on career choice decisions, resulting in an indication that spirituality influenced the individual's career decision. Duffy and Blustein (2005) conducted a phenomenological study on religious influences and spirituality on career-choice commitment. The results from the study indicated religion and spiritual awareness modestly influenced an individual's self-confidence in making a career decision. Kerbel (2004) conducted a phenomenological

study on the topic of intuition as a valuable factor in the process of making a vocational decision. Sellers, Thomas, Batts, and Ostman (2005) used phenomenology to examine the experiences of women who reported a dual calling to motherhood and a career. The women described their decision for career choice as passionate and said they would find it difficult to change.

Conclusions

The literature review contributes to the study through a reflection of issues addressing female underrepresentation within the IT profession (Hira, 2007; Wentling & Thomas, 2007). Researchers of early studies concentrated on reasons for the underrepresentation of women in IT by focusing on barriers such as computer education, a male-dominant computer culture, and other gender biases (Margolis & Fisher, 2002; Turkle & Papert, 1990; Volman & van Eck, 2001). Researchers of later studies concentrated on work–life balance, focused on the lack of role models and mentors, and depicted women choosing problem-solving disciplines over technology careers due to a limited awareness of what an IT degree and career involves (Craig et al., 2008).

The review detailed how women are practically absent from the historical literature on computing, although they have made significant contributions in many segments of the computing industry (Misa, 2010). Studies involving the decline of women entering professional careers continued to appear in select management, psychology, and career journals beginning in the 1990s, converging to reveal knowledge about the shape of women's careers in the 21st century (Fouad & Singh, 2011; Hopkins et al., 2008). The review depicted how researchers have analyzed the decline of women in IT by focusing on how women relate to and interact with computers (Comber et al.,

1997; Evard, 1996; Furger, 1998). The researchers of some early studies reviewed the inadequacies of teaching computing (American Association of University Women, 2000; Holden, 1997) and the meanings women assign to the computer culture (Turkle, 1984, 2003). Teachers, counselors, and parents often lack an understanding on using technology to construct an appealing, equitable, and innovative learning environment, so traditionally girls comprise a very small proportion of students in computer design and computer science courses (L. Barker & Aspray, 2006).

The models of career-choice behavior showed how certain decisions affect women, particularly decisions associated with making professional and career choices and decisions. Structural theories, such as Parsons's (1909) trait and factor theory and Holland's (1959) person–environment fit theory, make it possible to understand how the process of choosing a career should work by using the essential element of career counseling to make career decisions. Lack of guidance in some instances underscored causes for the underrepresentation of women in the field (Meszaros et al., 2009). A review of literature involving career development models and theories provided some insight into the gap regarding the essence of the decision-making experience of career choice among female college graduates with computer science degrees who do not enter IT professions.

The review of literature showed how the use of subjective experience to gain insight and understanding into an individual's actions and motivation while seamlessly avoiding assumptions and conventional wisdom is paramount to a phenomenological study (Sokolowski, 2000; van Manen, 1990). The studies included discussions on the importance of understanding how emotions have meanings that effect on career choice

and how meanings as a problem might explain an obvious underrepresentation of women in IT (Tokar et al., 2003). Through phenomenological research, meanings associated with emotions surface as possible elements supporting female difficulties in making a career decision (Callahan & Greenhaus, 1992; Cohen et al., 1995; Saka et al., 2008; Santos, 2000). Phenomenology research also revealed meanings as problems associated with gender disparity of computer education, career progress, work–life balance issues, and sociocultural factors as affecting women's career choice (Rosenbloom et al., 2008).

The literature has yet to reveal why women who obtain the knowledge, education, and qualifications to pursue careers in IT decide on other career paths. The studies detailed in the review failed to address the essence of the decision-making experience of career choice among female college graduates who set aside these issues, spent years completing a computer science degree, and subsequently decided not to enter the IT profession. Of particular interest was the gap in the literature that situated the study and substantiated why women with undergraduate degrees in computer science chose not to work in the IT profession after dedicating years of study qualifying them to do so.

Summary

The chapter included a comprehensive summary of female underrepresentation in IT and its effect on the future economic prosperity of the United States. The chapter also contained a review of the past and current climate within the IT field and an overview of the underrepresentation phenomenon related to the effect of meanings women attach to career choices.

Chapter 2 included a discussion of several documented theories and theorists, with a focus on models of career-choice behavior. Structural theories such as Parsons's

(1909) trait and factor theory and Holland's (1959) person–environment fit theory operate under the premise that the possibility exists to measure both individual talents and the attributes required in particular jobs. Cultural theorists Wentling and Thomas (2009) exposed embedded gender differences in culture within the IT workplace that negatively affect the career development of women. Bandura (1977) introduced social cognitive and self-efficacy theories that explain the behavior of individuals from the perspective that performance is the product of interplay between personal, behavioral, and environmental influences. Attitudinal behaviorists Gurer and Camp (2002) and Clarke and Teague (1996) noted attitudinal behavior toward a profession is a factor that affects career choice. The literature review revealed how career development models and theories substantiate past barriers and behavioral experiences affecting women's IT career decisions. The review revealed a gap associated with women who overcame these experiences, graduated with computer science degrees, and decided not to pursue careers in IT after dedicating years of study to do so. Chapter 3 includes the details of the research design, methodology, design appropriateness, population, location, data collection, data analysis, and instrumentation of the study. The chapter also includes a discussion on the trustworthiness of the study, followed by a summary.

Chapter 3

Method

The purpose of the qualitative phenomenological study was to explore the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession. Chapter 1 contained the theoretical framework and significance of the study, and Chapter 2 contained a review of the relevant literature, revealing a significant gap in practitioners' and scholars' understanding of the reasons women with computer science degrees choose to enter professions other than IT. Meaningful scholarly contributions to the gap informed corrective actions to address the underrepresentation of women in IT professions.

Chapter 3 contains an explanation of the method of research conducted to answer the research question (Creswell, 2009). The study participants were women who graduated from college between 2001 and 2011 with an undergraduate degree in computer science but elected to pursue careers in professions other than IT. The researcher conducted 15 semistructured, digitally recorded interviews, until saturation occurred, to capture the lived experiences of the women (Moustakas, 1994). Chapter 3 contains an explanation of the appropriateness of qualitative phenomenological research. The chapter includes the following sections: (a) research method and its appropriateness, (b) research design and its appropriateness, (c) population, (d) sampling, (e) data collection, (f) instrumentation, (g) soundness of the research, and (h) data analysis. The chapter concludes with a summary of the design and the steps taken to address the purpose of the study.

Research Method and Appropriateness

A qualitative method was used to explore the decision-making process of female college graduates with undergraduate degrees in computer science who pursued non-IT professions as a career choice. According to Creswell (2009), qualitative research is the preferred method to explore and understand meanings an individual attributes to a problem. Qualitative research is exploratory in approach and interpretive in explanation (C. Marshall & Rossman, 2006; M. Q. Patton, 2002; van Manen, 2006). Researchers use qualitative research to describe, explore, explain, interpret, or build a theory bounded by personal views, and the sample size is generally small (Leedy & Ormrod, 2010). Myers (2009) noted the ultimate aim of a qualitative researcher is to offer a perspective of a situation and to provide a well-written research report that reflects the researcher's ability to illustrate or depict the corresponding phenomenon. Myers also commented that the greatest asset of a qualitative approach is in its depth and richness in exploring and describing the phenomenon.

The basis for selecting a research method and design includes the nature of the research phenomenon, the researcher's personal experience, and the participants (Creswell, 2009). Qualitative and quantitative research methods are distinctly different. Qualitative research methods have an open-ended purpose to discover a central phenomenon from the participants' perspective (Creswell, 2009), typically accomplished through a broad set of questions to glean open responses from the participants. The focus of the quantitative method is interpreting numerical data resulting from a statistical analysis of identified variables (Neuman, 2006; Trochim, 2006).

The quantitative method involves structured questions to describe trends, explore relationships, and predict results for variables to answer the research question. A quantitative method relies on deductive and linear direction (Neuman, 2006) and does not allow researchers to get close to the participants (Trochim, 2006). In quantitative research, rigor reflects conciseness and objectivity while generalizing the results (Simon, 2006). A quantitative study includes hard and measurable data that would not allow a researcher to explore the lived experiences offered by research participants in a qualitative study. The current study included a qualitative research method that involved exploration and discovery in a natural setting and permitted the interpretation of a phenomenon from the meaning it represented to the participants (Denzin & Lincoln, 2008).

Research Design and Appropriateness

Husserl (1970) developed the qualitative phenomenological design approach, explaining that the goal of phenomenological design is to describe the lived experiences while understanding the meaning the experiences hold for each participant. Byrne (2001) further explained a phenomenological design allows using research questions to explore the meaning of the lived experiences of participants. Sokolowski (2000) noted using phenomenology helps to understand lived experiences to gain knowledge of a phenomenon. The two primary approaches used in the design of a phenomenology study are empirical and hermeneutical. The core of empirical phenomenology of science is meaning designed to acquire and collect data that explicate the essences of human experience, whereas achieving meaningful understanding in hermeneutics calls for insightful interpretation of historical studies or text (Moustakas, 1994). According to

Giorgi (2010), the primary difference between the two is that the hermeneutic approach must embrace that which is known already about the phenomenon, which eliminates bracketing of the phenomenon. Unlike the empirical approach, using a hermeneutic approach requires the primary focus to be on the phenomenon rather than on the participants recalling their lived experience. The current study included an empirical phenomenological design to understand the phenomenon from the perspectives and meaning of the experiences of the participants (Kvale & Brinkman, 2008). The empirical phenomenological approach involved collecting data through interviews, interpreting the interviews, and transcribing the collected data (Kvale & Brinkman, 2008).

The focus of a research design is to structure the investigation to answer research questions (Cooper & Schindler, 2006). The researcher used a qualitative phenomenological design to explore a sample of women who graduated from college with computer science degrees between 2001 and 2011 and who selected careers other than IT. Using an empirical phenomenological design permitted a complete, complex description of the problem as experienced by the participants in their natural setting (Mortari, 2008). The qualitative phenomenological design was the most appropriate for the study.

Other qualitative research designs did receive consideration. A case study design would have been inappropriate because case studies involve using multiple sources of data collection, including documents, archived records, interviews, observations, and quantitative data (Thomas, 2011). The researcher also explored the feasibility of using a grounded theory design approach. The focus of grounded theory methodology is on the process that creates a new theory. Strauss and Corbin (1998) noted, "The grounded

theory approach is a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon" (p. 24). Because the focus of the research was not on developing theory but on exploring and understanding the study participants' perceptions, the qualitative grounded theory design would have been inappropriate for the study. The researcher also considered qualitative ethnographic research that includes interviews and observations in the data collection. Ethnographic research would have been inappropriate for the study because the researcher did not add knowledge about a culture by analyzing, describing, and interpreting the shared patterns of beliefs, behaviors, and language that develop over time within a culture-sharing group at a single site (Creswell, 2007).

Because the researcher sought a better understanding of the phenomenon from the viewpoint and meaning of the experiences of female computer science graduates and decisions they made not to enter the IT profession, phenomenology was the most appropriate design for exploring these human perceptions and experiences (Moustakas, 1994). Ratner (1991) noted a phenomenological design requires a structure that enables the researcher to reveal the meanings associated with the subject in detailed, descriptive, qualitative accounts. An empirical phenomenological study was effective for revealing individual perceptions and experiences from the participants while challenging structural and normative assumptions (Mortari, 2008). According to Christensen, Johnson, and Turner (2011), qualitative phenomenological research designs allow researchers to understand and review patterns within the core of the phenomenon, explore the conscious experience of the phenomenon, bracket preconceptions, and interpret the meaning from the lived perspective of the participants. The empirical phenomenological design enabled

the documentation of first-person accounts of the participants' lived experiences relative to career choice after graduating from college. The empirical phenomenological design also identified factors associated with the participants' decision toward not selecting the IT profession (Amundson et al., 2010; Michie & Nelson, 2006; Reid, 2007).

Karami, Rowley, and Analoui (2006) noted the phenomenological design includes the qualitative method to understand social phenomena based on human experiences. The current qualitative phenomenological study included Moustakas's (1994) modified van Kaam method of analysis to capture perceptions of college women who graduated between 2001 and 2011 using semistructured, recorded, and transcribed in-depth interviews. Using an in-person, in-depth interview allowed the researcher to control the questioning, collection, and exploration of the experiences of the participants and led to open discussions to uncover the meaning for their choice of behavior (Ajjawi & Higgs, 2007).

Research Question

The process of starting any type of research includes selecting a research question to support of the topic under study. The research question states the study's purpose and what the researcher investigated or attempted to verify (Myers, 2009; Shank, 2006). In qualitative research, the research question drives the method applied for data collection and analysis (Myers, 2009).

The primary research question that addressed the purpose of the study was as follows: What is the essence of the decision-making experience of career choice among women college graduates with computer science degrees who do not enter IT professions? By examining the question, the researcher presented discoveries of

women's lived experiences and perceptions surrounding the phenomenon of why they did not pursue a career in a profession within their educational field of study.

Population

The general population for any research study is a group of individuals having one characteristic that distinguishes them from other groups (Creswell, 2009). The general population of the study was approximately 18,000 women with a bachelor's degree in computer science who selected professions other than IT (NSF, 2010). A specific population refers to a pool of potential participants who share the specific attributes, characteristics, or experiences under study. The specific population was women with a bachelor's degree in computer science who selected a profession outside IT who resided within the National Capital Region (NCR) and who graduated between 2001 and 2011. The NCR refers to the District of Columbia and counties in Maryland and Virginia (U.S. Department of Homeland Security, 2005).

The number of female undergraduate computer science degree holders living in the NCR who graduated between 2001 and 2011 is unknown, but estimates based on data compiled from 2010 tables of the Characteristics of Recent Science and Engineering Graduates show nearly 2,400 female computer science graduates (NSF, 2010). The study was unique to this population because the study might close a gap in the literature that has not addressed why women choose not to work in the IT profession after dedicating years of study to do so.

Sampling Frame

Employees from a large professional services company with 20 offices located within the NCR participated in the study. The company had nearly 9,000 employees in

the NCR, with 782 employees holding a bachelor's degree in computer science. Of these 782 employees, women account for 15% of the bachelor degrees held in computer science. The executive vice president for human resources gave the researcher permission (see Appendix A) to recruit female computer science degree graduates within the company who share specific attributes, characteristics, or experiences to study. The researcher had approval to use the company's private résumé database to identify candidate participants who met the requirements for the study (see Appendix B).

Students earn a computer science degree after 4 years of study in computer science, with a focus on mathematics and theoretical foundations of computing (Murakami, 2011). The current study encompassed a purposive sample of 15 female participants until reaching the point at which no new information occurred to challenge or elaborate the concept further. The researcher forwarded a letter of introduction (see Appendix C) through e-mail to candidate participants who graduated from college with a computer science degree between 2001 and 2011. The letter of introduction included a request that candidates who chose to participate in the study send a return e-mail to the researcher that acknowledged their intent to do so.

The study used purposive sampling, which is a nonrandom method of selecting participants that involves nonprobability sampling based on criteria within the study (Cooper & Schindler, 2006; Creswell, 2009). According to Neuman (2006), purposive sampling is appropriate for (a) selecting unique, especially informative, cases; (b) selecting members of a specialized population; and (c) identifying particular types of cases for in-depth study. Purposive sampling allowed the researcher to identify participants capable of giving a rich description of the phenomenon and to specify the

characteristics of the participants of interest so that he could locate individuals who matched the identified characteristics (Christensen et al., 2011). The goal was to reveal meanings associated with a woman's career choice as applied to the current underrepresentation of women in the IT field.

The specific population consisted of female computer science graduates who graduated between 2001 and 2011, resided in the NCR, but did not select a career in IT. Sampling involved choosing 20 individuals from the specific population and interviewing them until saturation occurred. Saturation occurred when the researcher no longer found new information that added to the understanding of the research subject. As saturation occurred before the completion of 20 interviews, the interviews stopped because no benefit has been shown by interviewing after saturation (Seidman, 2006). If saturation had not occurred before 20 interviews, additional participants would have been drawn from the initial respondents.

Informed Consent

The study involved conducting face-to-face interviews. The researcher received approval from the Institutional Review Board at University of Phoenix prior to conducting interviews. Study participants interested in participating in the study confirmed their interest to the researcher through e-mail. The researcher selected the first 20 participants who confirmed their interest. All participants received an informed consent document (see Appendix D) through e-mail that contained a description of the research study, the purpose of the study, participant involvement, and participant consent. According to Christensen et al. (2011), informed consent is a key element in the process of informing participants what they need to do and of any risks or benefits related to

participating in the study. The researcher received a signed informed consent form before any research involving human subjects began (Cooper & Schindler, 2006; Creswell, 2009; Neuman, 2006).

The consent form provided space for the participant to sign, thereby giving consent to participate in the study, and informed the participant that individual results would be confidential and that participant identities would remain anonymous. The form contained several specific elements: (a) study purpose, (b) voluntary nature of the study, (c) withdrawal procedures, (d) any foreseeable risks and benefits, (e) confidentiality process, and (f) contact information for the researcher (Christensen et al., 2011). By signing the informed consent, individuals indicated their understanding and agreement to participate in the study. Each participant received a copy of the signed form.

Confidentiality

Researchers must protect the identities of participants and the privacy of the information collected throughout the research process (Christensen et al., 2011; Cone & Foster, 2004). The researcher signed a confidentiality statement (see Appendix E) clearly stating that anything learned about the participants would remain confidential and in the strictest confidence (Christensen et al., 2011; Salkind, 2008). The researcher advised each participant that her identity would remain anonymous (Walker, 2007). The researcher also advised participants of the pending publication of the results and reassured them that the publication would not contain personal information and that only the researcher would have access to the data.

After each interview, the researcher coded study field notes and transcripts to preserve the privacy of the participants. The code consisted of an alphanumeric system

comprised of the first and last letter of the participants' surname followed by a three digit number. An assigned code served to identify each participant in the study. The participants' names remain in a sealed envelope in a safety deposit box separate from the list of participant numbers and study data. The researcher advised participants that information provided would remain under lock and key in the researcher's home for a period of 3 years and be destroyed in the most appropriate manner available to the researcher at the end of the 3 years.

Geographic Location

The geographic location for conducting the study was the NCR of the United States, which the U.S. Department of Homeland Security defined as the District of Columbia and counties within the states of Maryland and Virginia (U.S. Department of Homeland Security, 2005). Within the area, many colleges such as the George Washington, James Madison, and George Mason Universities offer computer science programs. Over 500 large and small IT-industry businesses exist in the region.

Data Collection

Phenomenology involves an attempt to understand how individuals construct meaning, and collecting meaningful data is fundamental to developing a good understanding of the phenomenon under study. In qualitative research, the data collection process should be "transparent, systematic, and rigorous" (Shank, 2006, p. 530). Qualitative data collection should yield contextually rich data and eventually lead to "illumination, insight, and understanding" (Shank, 2006, p. 14) after reaching saturation (Creswell, 2009).

The interviewing technique in qualitative phenomenological research provides researchers a way to gather descriptions and interpret the meaning of a particular phenomenon in a specific context (Kvale & Brinkman, 2009; Seidman, 2006). The primary qualitative method of data collection used in this phenomenological research was in-depth, face-to-face interviews (Christensen et al., 2011), which have the advantage of providing researchers with nonverbal and social cues not readily available in phone or electronic interviews (Opdenakker, 2009). The cues provided researchers with opportunities to probe and ask follow-up questions that lead to a richer understanding of the research phenomenon (Kvale & Brinkman, 2009). Phenomenological interviews are unique because the process reflects a conversation that encourages the participants to discuss their experience with the phenomenon freely (Kvale & Brinkman, 2009; Seidman, 2006). A phenomenological interview requires establishing rapport with the participants in a safe environment, which creates trust between the participant and the researcher (Polkinghorne, 2005). The skills required in a phenomenological interview resemble those used in therapy, such as attentiveness, listening, and reflection, and transfer to research interviews when establishing a relationship (Polkinghorne, 2005).

Data collection in the study involved interviewing 15 women who graduated with computer science degrees between 2001 and 2011 about their decision not to choose IT as their profession. A semistructured interview was the method of inquiry, which permitted the researcher to probe deeply into the topic and to understand thoroughly the answers provided (Moustakas, 1994). Semistructured interviews take the form of an everyday conversation but focus on getting to the essence of a phenomenon by centering on certain themes to guide the conversation and by asking open-ended questions (Kvale

& Brinkman, 2009). Using a semistructured interview format allowed participants to provide richer, more descriptive explanations of their perceptions and lived experiences compared to a structured interview format (Merriam, 2009).

Moustakas (1994) noted researchers develop interview questions to elicit the lived experiences of the subjects. The researcher developed 10 interview questions to help guide the discussions. The phenomenological interview questions enabled the researcher to answer the central research question by gathering the meanings, structures, and essences of participants' lived experiences. The face-to-face interviews were audio recorded. Transcribing the recordings permitted the researcher to code and identify themes and patterns. The researcher also coded the transcripts from the interview using a unique code for each participant to ensure confidentiality.

The researcher transcribed the tape-recorded interviews and reviewed each typed transcript with its source to ensure accuracy of the written transcripts. Each transcribed interview contained the participant's unique code. The researcher electronically saved the transcripts of the audio recordings in Microsoft Word format.

Instrumentation

In qualitative studies, the instrument for collecting data can take shape in multiple forms (Leedy & Ormrod, 2010). Most qualitative research studies involve the researcher as an instrument of the study and as the main data collection instrument (Creswell, 2009). As an instrument in a phenomenological study, the researcher discloses and maintains awareness of any preconceived notions and biases that might influence the quality of the collected data and subsequent data analysis (Krauss, 2005; Polkinghorne, 2005). The study included a phenomenological interview procedure, as identified by Moustakas

(1994). The phenomenological interview involved an interactive and informal process that included open-ended questions and comments. The researcher developed a set of questions intended to evoke the participant's complete experience of the phenomenon. The questions varied, were adjusted, or were reduced if the participant shared the full story of her experience.

Qualitative researchers develop instruments aimed toward participants who can best describe the phenomenon under investigation (Leedy & Ormrod, 2010). The primary instrument for the study's data collection was a semistructured interview protocol with open-ended questions (Horton et al., 2004). An interview protocol is a script-like data collection instrument that enables interviewers to read the questions systematically, elicit stories, and audio record participant responses (Christensen et al., 2011). The interview protocol serves two purposes: first, it allows for collecting or exploring the lived experiences of the participant, and second, it typically leads to an open discussion in which the participant and interviewer search for meaning within the disclosed experiences (Ajjawi & Higgs, 2007). Face-to-face interviews could provide a higher completion rate and include more complete respondent information (Opdenakker, 2009).

When creating the interview questions for a study, van Manen (1990) recommended asking questions about the phenomenon to help gain access to the participant's life-worlds and to relive the experience as he or she speaks of it. The interview questions aligned with the primary research question: What is the essence of the decision-making experiences of career choice among women college graduates with computer science degrees who do not enter IT professions? The design of the interview

questions (see Appendix F) for the study allowed for exploring the participants' lived experiences and perceptions. Questions directly associated with feelings toward gender, educational choice, influencers, and support related to findings in the literature as reasons affecting a woman's decision not to pursue a career in IT (Fouad & Singh, 2011; Hopkins et al., 2008; A. Warren, 2009; Wentling & Thomas, 2009). Other questions such as experience in making a career choice, feelings toward a long-term career in IT, and feelings related to college experience and career choice were relevant to addressing the gap in the literature. The gap in the literature related to why women with computer science degrees chose not to work in the IT profession after dedicating years of study to do so.

The study included a pilot test of the interview protocol (Creswell, 2009; Lamb, 2005) conducted with three voluntary participants who closely resembled the population. Pilot test participants assisted by determining if there were any weaknesses, limitations, or flaws within the interview design that required necessary revisions prior to implementing the study (Cooper & Schindler, 2006; Kvale, 2007). Changes to the wording of the interview questions or interview process were not necessary based on the pilot findings. Because the questions did not change based upon the pilot study, the full study included the responses of the pilot participants (Kvale & Brinkman, 2009; Thabane et al., 2010).

Interviews took place at several of the host organization's facilities within the NCR. The participants determined the time and place for the interview and coordinated with the researcher through e-mail. Using the host organization's facilities resulted in a relaxed, stress-free, and risk-free environment where the researcher had the chance to

learn about the participants' experiences in depth (C. Warren & Karner, 2005). The relaxed, stress-free, and risk-free interview environment allowed the researcher to develop a rapport with the participants so that the researcher could ask probing or follow-up questions based on the responses to preconstructed questions (Polkinghorne, 2005).

Before each interview, the researcher read the standardized word-for-word instructions and confidentiality statement to each participant and provided each research participant an informed consent form. The researcher advised participants that information provided would remain under lock and key in the researcher's safe for a period of 3 years and destruction of the information would take place in the most appropriate manner available to the researcher at the end of the 3-year period. Each participant understood she could withdraw from participation at any time without negative consequences.

Participants could have asked to withdraw through an e-mail to the researcher at any time before, during, or after the interview. Should a participant have decided to withdraw from the study, the researcher would have sent an e-mail to the participant stating that all paper information would be shredded, audio recordings from the interview destroyed, and electronic transcription of interview tapes deleted.

Reliability and Validity

The focus of qualitative research is on "rich and complex explorations of the experiences of a small number of individuals" (Hoyt & Bhati, 2007, p. 202) rather than obtaining statistically representative samples. Researchers often use the terms credibility or trustworthiness to describe reliability and validation of the data in qualitative research (Trochim, 2006). Researchers must be aware of matters such as an unsuitable population,

incorrect descriptions, inadequate interviewing procedures, researcher bias, and transcription and coding errors as possible risks to the validity of phenomenological research (Cooper & Schindler, 2006; Creswell, 2007). The researcher used various actions to address the reliability, validity, and accuracy of the study results. The validity and reliability processes of the study included transcript reviews, epoché and bracketing, coding, and careful records management.

Reliability. The credibility or reliability of qualitative research is dependent on thorough data collection and analysis methods, researcher credibility, and a belief in qualitative research value (M. Q. Patton, 2002). The reliability of qualitative research lies in the ability to understand or describe the phenomenon from a participant's point of view because only the participant can judge the credibility and legitimacy of the results (Trochim, 2006). Reliability of data indicates confidence in the findings (D. Cohen & Crabtree, 2006). Reliability for the study increased with the inclusion of indicators as the analysis of the collected data produced stronger evidence that a particular phenomenon occurred.

For the phenomenological study, the researcher performed the analysis manually to get closer to the data. Checking and rechecking the data throughout the study enhanced the reliability of the data. To confirm the reliability in the current study, the participants had the opportunity to review the transcripts of interviews for accuracy. The step was a countermeasure against problematic transcriptions and incorrect descriptions. Each study participant received a copy of her transcript to review for accuracy and to help ensure trustworthiness of the data during analysis.

Validity. Validity provides an understandable connection for those who read a study (M. Q. Patton, 2002). Validity of a qualitative research study indicates the degree to which the results become trustworthy (D. Cohen & Crabtree, 2006; Trochim, 2006). Providing thick descriptions of participants' lived experiences and piloting the data collection instrument serve to enhance trustworthiness of a study (Giorgi, 2006).

Validity of results requires confirmation and endorsement from others (Trochim, 2006). Confirmation of data validates when the findings of a study reach a degree of neutrality and indicates the researcher obtains the data through participant shaping and not researcher interest, motivation, or bias (D. Cohen & Crabtree, 2006; Trochim, 2006). Epoché, the setting aside of any judgments (Moustakas, 1994), helped to suspend the researcher's preconceptions, biases, and assumptions about the topic, allowing the researcher to approach the study with freshness and openness. Validity included the dependability of the study through emphasizing the researcher's account for the ever-changing context within which the research occurred (Trochim, 2006). The researcher described those changes as they occurred and indicated how the changes affected the approach to the study (Trochim, 2006). Dependability occurs when the degree to which the research findings are consistent and repetitive (D. Cohen & Crabtree, 2006).

Careful records management of all taped interviews, notes from interviews, and electronic copies of transcripts served to enhance dependability. The researcher instituted careful records management of all interviews, notes from interviews, and copies of transcripts. The use of a research journal (see Appendix G) maintained document coding rules and decisions made, allowed the researcher to reflect on the research process and

the role of the interviewer, and captured any observations and insights that possibly affected the results of the study (Krysik & Finn, 2010).

Generalizability serves to describe inferences from data collected and analyzed, though findings in phenomenological research are not always generalizable to a broader population due to the research including only a small sample of a population (Babbie, 1998). The findings were generalizable and transferred to other situations because there was sufficient information to trust in the similarity (Stringer, 2007). Transferability of findings indicates the degree to which findings "have applicability in other contexts" (D. Cohen & Crabtree, 2006, para. 1). Transferability improved by basing data analysis on solid and thick descriptive data of participant experiences (Giorgi, 2006). Thick description helped in determining the transferability of the research because substantive information exists upon which to assess applicability to familiar situations (Lincoln & Guba, 1985; Seale, 1999).

Enhancing transferability of the findings in the study involved collecting in-depth information about the lived experiences of the study participants (Stringer, 2007). The researcher asked semistructured questions that led to an open discussion in which the participant and the researcher searched for meaning within the disclosed experiences. To increase transferability further, the researcher piloted the interview protocol to verify that interview questions were clear and unbiased and to ensure they would yield meaningful information (Creswell, 2007).

Data Analysis

Qualitative data analysis consists of classifying people, events, and things that characterize an experience. Moustakas (1994) described the van Kaam method of

analysis as using the complete transcription of collected data to construct both a description of the experience and the meanings and essences of the experiences. In phenomenological analysis, a researcher "seeks to grasp and elucidate the meaning, structure, and essence of lived experience of a phenomenon for a person or group of people" (M. Q. Patton, 2002, p. 482). The systematic approach to organizing, analyzing, and synthesizing the data provided by the modified van Kaam method of analysis method (Moustakas, 1994) was an appropriate technique to accomplish the research study goals. The study included the modified van Kaam method of analysis of phenomenological data described by Moustakas with taped and transcribed semistructured interviews.

The researcher manually analyzed the interview text data and listed every expression relative to the experience of career choice through the horizonalization of the data. Horizonalization refers to viewing every statement or question, or units derived from the statements, as relevant or having equal value and meaning (Moustakas, 1994). Horizonalization allowed the researcher to bring lived experiences and meanings expressed by study participants into presence within the context and purpose of the study (Giorgi, 2006). Choosing statements from the transcripts that describe the participants' experience of career choice helped to understand the participants' experience and feelings associated with their career choice decision. Through horizonalization, an initial representation and understanding of the data helped drive the coding of data in subsequent steps (Giorgi, 2006).

The researcher employed bracketing to the collected data for interpretation. Bracketing of data during analysis is different from bracketing during the interview process. Bracketing during interviews refers to the researcher's ability to bracket

personal views and preconceptions whereas bracketing during analysis refers to separating collected phenomena for interpretation (Groenewald, 2004; Moustakas, 1994). Bracketing helped the researcher remain aware of any personal biases and their influence on the interpretation of the analysis. Maintaining a conscious awareness of bias and the implicit potential of assumptions and of how they might affect data immersion were essential to achieving clarity and proceeding with the analysis (Giorgi, 2006).

The researcher constructed individual textural descriptions of the experiences from the transcribed interviews for each participant and read all transcriptions to extract statements, phrases, and sentences that directly pertained to the participants' career choice decision-making experience. The researcher edited interview transcripts to eliminate off-topic and verbal digressions and to reorganize the data to group sections belonging to the same topic together within each unit of analysis (Neuman, 2006).

Grouping data into content areas within each unit of analysis (interview) helped structure the data and enabled detailed coding (Graneheim & Lundman, 2004). The goal was to understand the meaning of an experience to a specific person and to provide a thorough account of the lived experience (Moustakas, 1994). The researcher transformed the elements of the experience, which were the collection of words, sentences, or paragraphs having features related to each other, into meaning units. Meaning units are "the constellation of words, sentences or paragraphs containing aspects related to each other through their content and context" (Graneheim & Lundman, 2004, p. 106) and were the basis for all coding and identification of themes.

The initial coding scheme consisted of rules for assigning codes (labels to meaning units), definitions of themes and subthemes, and examples (Creswell, 2009;

Moustakas, 1994; Neuman, 2006). For each participant, the researcher assimilated the structural qualities and themes captured into an individual textural description and then passed through the data several times, using constant comparison to update and refine themes and subthemes and updating the coding scheme as needed. Constant comparison was the iterative process used to compare new themes to already identified themes systematically to make differences between themes apparent. The process ended when new cases did not bring any new information to light and themes become saturated (Zhang & Wildemuth, 2009).

A textural–structural description of the essence of the meanings of the career-decision experience incorporated themes for each participant. A written narrative contained identified themes translated into a coherent picture of the whole that depicted a comprehensive, contextualized description of themes verifiable by the study participants. The researcher validated and checked the elements of the experience with each participant and made modifications as required.

Summary

Chapter 3 included a description and explanation of the empirical phenomenological research methodology used for the study (Giorgi, 2010). The aim of any phenomenological research is to "determine what an experience means for the persons who have had the experience and are able to provide a comprehensive description of it" (Moustakas, 1994, p. 13). The use of an empirical phenomenological design helped to identify factors associated with the participants' career decision toward not selecting the IT profession (Amundson et al., 2010).

The chapter contained a discussion on the study participant criteria, sampling method, data collection method, reliability, and validation process of phenomenological research and the data analysis process of the research study. The research question served to validate the choice of a qualitative phenomenological methodology to understand the career decision-making experiences of women in the study. The chapter also included a discussion on the modified van Kaam method of analysis of phenomenological data described by Moustakas (1994) with audio tape-recorded and transcribed semistructured interviews. The chapter contains a discussion on the suitability for using face-to-face interviewing techniques. Chapter 4 contains an in-depth report of the findings of the study, along with the analysis of the research data.

Chapter 4

Results

The purpose of the qualitative phenomenological study was to explore the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and who subsequently chose careers outside the IT profession. Chapter 3 contained a description of the research design and methodology. The methodology encompassed techniques to explore and record the lived experiences of 15 women for the purpose of revealing critical decision factors affecting career choice. The data-gathering process included a modified van Kaam method of analysis proposed by Moustakas (1994) as well as a semistructured interview format. The chapter details the results of data collection and analysis, including the themes that emerged from the study and the observations and accounts of the lived experiences of participants gathered during 15 semistructured interviews. The chapter contains five main sections: (a) pilot study, (b) study participants (c) data collection review, (d) data analysis process, and (e) findings. The chapter ends with a summary of the themes that emerged from the data.

Pilot Study

The characteristics of the pilot participants mirrored the characteristics of the sample in the study. The pilot study included three women who met all the participant criteria. The aim of the pilot study was to help the researcher make adjustments to the clarity of the interview questions, if needed. The researcher contacted pilot study participants directly and asked them to participate in the pilot study. Participants received a copy of the invitation to participate letter (see Appendix C), the informed consent form (see Appendix D), and a copy of the interview questions (see Appendix F).

Interviews with the pilot study participants took place in September 2012. Interviews were audio tape-recorded and participants had the opportunity to review their responses.

Participants answered 10 questions that focused on revealing the essence of female computer science graduates' career choice decisions. Pilot study participants understood their responses might become part of the study and that the feedback might lead to refinements to the interview questions if required. Pilot study participants stated that the interview questions were easy to follow and understand. Based on the results of the pilot study, the interview questions appeared to be clear, unambiguously worded, and suitable to collect participant experiences related to the phenomenon. Based on the pilot participants' feedback, no changes ensued to the original interview questions.

Study Participants

Fifteen semistructured interviews took place between September 2012 and December 2012. Prior to the interview, each participant received a copy of the invitation to participate letter (see Appendix C) and received and signed the informed consent letter (see Appendix D). Interviews lasted approximately 30 to 45 minutes. Study participants chose the time and location for the semistructured face-to-face interviews. All interviews occurred at CACI facilities. The data collection process involved recording and transcribing participant responses.

In phenomenological research, the gaps in the literature inspired the interview questions. In the current study, participants sometimes needed to elaborate to ensure a clear understanding of the phenomenon and to capture the true essence of their feelings and perceptions. The researcher recorded observation notes during the face-to-face interviews to document nonverbal cues and communications of the participants. The

study participants validated summaries of the interviews at the conclusion of the interview session. The researcher transcribed each recorded interview using Microsoft Word 2007. Participants had an opportunity to review the interview transcript. The researcher performed all phenomenological reduction as part of the analysis. The analysis of demographic characteristics entailed using Microsoft Excel. The modified van Kaam method of analysis guided the data analysis toward developing themes and patterns.

Demographic Characteristics

The study took place with a purposive sample of 15 female participants who graduated between 2001 and 2011 with computer science degrees and lived in the NCR. Demographic information included age, and year graduated (see Table 1). The age range of the 15 study participants was 24 to 53 years of age. The majority of participants in the sample ranged from age 31 to 39 (54%). Remaining participants were ages 24 to 29 years (33%), and 45 to 53 years (13%). The majority of participants graduated between 2001 and 2005 (66%), with the remaining participants graduating between 2006 and 2011 (33%).

Table 1

Demographic Breakdown

Category	*N*	%
Age		
20-29	5	33
30-39	8	54
40-59	2	13
Year graduated		
2001-2005	10	66
2006-2011	5	33

Review of Data Collection

The goal of the data collection process was to determine the answer to the research question: What is the essence of the decision-making experience of career choice among women college graduates with computer science degrees who do not enter IT professions? The research question served as the framework for the formation of 10 semistructured interview questions. The answers from the questions served to generate rich data to answer the research question. Interview questions served to assess experience, preparedness, personal abilities and values, feelings, specific events, and influencers in making a career choice.

Data Collection Process

The purpose of this qualitative phenomenological study was to understand the lived experiences of female computer science graduates who did not select IT as a career profession. The research question was designed to explore the essence of career decision making among female computer science graduates. The information received from this question provided an understanding of the details influencing the career choices of female computer science graduates who did not select IT as a career. The interview questions were as follows:

1. How would you describe your experience in making a career choice?
2. Did you feel prepared for your career choice? (If so or not) what made you feel prepared, or what made you feel like you weren't prepared?
3. How would you describe your personal abilities, values, and needs that supported your career decision?

4. Describe learning experiences and feelings that may have influenced your career choice.
5. What are your feelings toward suggestions of male dominance in the IT profession in making your career choice?
6. Can you describe any issues and feelings that may have influenced a career decision choice upon graduation from college?
7. Describe specific events and feelings related to your college experience and career choice decision.
8. Describe your experience with influencers and support which make you feel connected to your career choice.
9. How would you describe your feelings about selecting a career different from your college major?
10. Explain how you feel when you think about a long-term career in IT.

The data collection process included (a) developing pilot interview questions, (b) selecting three participants to perform the pilot study, (c) using semistructured questions to elicit the lived experiences of the participants, (d) identifying study participants using purposive sampling, (e) obtaining written consent from participants, and (f) conducting interviews until reaching saturation.

Interview Process

The researcher received signed permission from CACI International's executive vice president, chief human resource officer, and executive vice president corporate communications and congressional relations to recruit subjects through purposive sampling for participation in the study and to use the premises for conducting interviews.

Three women meeting the participant criteria participated in the pilot study to validate the interview script and the interview questions. Based on feedback from the pilot study participants that indicated the interview questions were easy to follow and understand, were clear and unambiguously worded, and would collect the lived experiences related to the phenomenon no changes to the interview questions were necessary. The researcher analyzed the data collected from the pilot study participants and used the conclusions in the study. Fifteen women meeting the criteria to participate, including the three pilot study participants, participated in the overall study.

Interviews took place at several CACI International facilities within the NCR to accommodate each participant, to place her in a comfortable setting, and to reduce loss of work time. The researcher described the purpose of the study and potential outcomes. Each participant reviewed and signed an informed consent form prior to the interview. The researcher discussed confidentiality with each participant and explained that participation was voluntary and the data collected would be for research purposes. The information provided included a reminder that they could leave the interview process at any time. The participants understood the researcher would record all interviews and they could review the recordings.

Establishing a rapport with each participant prior to beginning the interview served to place her at ease. Participants received encouragement to ask questions prior to proceeding with the interview process. The researcher discussed confidentiality and anonymity to assure participants that the information they shared would remain confidential and that the researcher would not use the participants' name or other identifying information in the final report. Participants then proceeded to describe their

lived experiences about their career decision choice. During the interviews, the researcher captured any observations and insights that could possibly affect the results of the study using a research journal (see Appendix G).

Interviews consisted of 10 semistructured questions. Participants understood the questions, which validated the pilot study. Digital audio recordings captured as much detail as possible. Participants received a code to ensure confidentiality and guarantee anonymity. The code used to identify each participant consisted of the first and last letters of her surname followed by a number. Most interviews lasted 30 to 45 minutes. The researcher manually transcribed the audio recordings to aid in the analysis process and to ensure accuracy. The researcher offered all participants a copy of the transcript.

Data Analysis Process

Qualitative data analysis consists of classifying people, events, and things that characterize an experience. Moustakas (1994) described the van Kaam method of analysis as using the complete transcription of collected data to construct both a description of the experience and the meanings and essences of the experience. Analysis for the interviews involved a modified van Kaam method of analysis. Each participant received a sequential number as a code subsequently used in all participant data, including primary data captured on audiotapes, handwritten notes, and the transcription of audiotapes. Horizonalization was the first step of the analysis. Horizonalization allowed the researcher to identify and list all relevant experiences pertaining to the phenomenon across all interview questions. The researcher manually analyzed all the interview text data and coded and categorized participant responses using an iterative process that required several reviews of the data.

Reduction and elimination further narrowed down the information gathered by eliminating phrases that overlapped or were repetitive. The researcher constructed individual textural descriptions of the experiences from the transcribed interviews for each participant and edited interview transcripts to eliminate off-topic and verbal digressions and to reorganize the data to group sections belonging to the same topic together within each unit of analysis. A composite textural descriptions list generated for the participants as a whole helped to cluster responses. The researcher performed final clustering and thematizing and applied selective coding. The selective coding served to generate themes that answered the central research question.

Bracketing during analysis assisted in separating collected phenomena for interpretation. The researcher bracketed by listening repeatedly to the audio recordings while keeping any personal views or assumptions separate. By setting aside all prior assumptions, the researcher did not draw any preconceived conclusions, which allowed a conscious awareness of any personal biases and their influence on the interpretation of the analysis. Exerting a conscious awareness of bias and of the implicit potential of assumptions and how they might affect data immersion assisted the researcher in achieving clarity and proceeding with the analysis.

Findings

This section contains a discussion of the results of the study wherein 15 female computer science graduates participated in interviews. Analysis of the data took place immediately after each interview. This section contains subsections based on the stages of analysis: (a) horizonalization, (b) reduction and elimination, (c) identification of

themes, (d) textural-structural descriptions, (e) individual textural-structural descriptions, and (f) composite descriptions.

Listing and preliminary grouping (horizonalization). The purpose of this step in the process was to identify and list all the relevant experiences and expressions (horizonalization) participants made during the interview process. The researcher reviewed the study participants' transcripts to determine which statements contributed to the understanding of the phenomenon across all interview questions. The process included a listing of the relevant expressions and phrases pertaining to the lived experience of the participants. Relevant expressions and statements expressed by the participants appear under the following major headings: conscious reality of job economics, sense of purpose, feelings of competence, desire for engaging work, consciousness of gender disparity, and relational experiences with family and mentors. Table 2 includes all the expressions associated with the lived experiences and perceptions of the career choices of female computer science graduates who did not select IT as a career.

Table 2

Horizonalization Results

Conscious reality of job economics	Sense of purpose	Feelings of competence	Desire for engaging work	Consciousness of gender disparity	Relational experiences with family and mentors
Dismay with IT job availability	Use my academic strengths	Need to succeed	Experience as co-op student	Aware of potential	Family encouragement
Anxiety toward employment	Comfortable with skills	Competent of worthiness	Experience with projects	Not concerned	Teachers/ professors inspired
Hard securing an IT job	Strong academic background	Commitment to excel	Experience with internship	Never discouraged me	Peer support
Need money not IT career	Opportunities matching skills	Prepared to make choice	Work with computers	Does not matter	Professional encouragement
Financial security				Do not have issues with it	
Angst about poor standard of living					

Reduction and elimination. Reduction and elimination was the next step of the data analysis based on the modified van Kaam method of analysis. After reviewing the initial coding of the interview data, the next step was to review each response to the interview questions to determine if the response contributed to the understanding of the phenomenon. The researcher extracted from the final grouping any responses that did not contribute to the understanding of the phenomenon and combined common expressions and phrases to determine themes across the interview questions with the responses from the female computer science graduates who did not select IT as a career choice. Common expressions and phrases appeared under major headings.

The following tables include the participants' responses and themes from interview questions associated with the research question. The information provided an

understanding of the details associated with the meanings female computer science graduates associate with making a career choice outside the IT profession.

Table 3 includes the results of the reduction and elimination process for conscious reality of job economics in which two themes emerged. Discouragement with IT job availability and angst about not having a good standard of living drove a high percentage of computer science graduates to seek professions other than IT. Uneasiness with IT job availability (eight out of 15 participants, 53%) and angst about not securing a good standard of living (seven out of 15 participants, 46%) emerged as the most cited sources for conscious reality of economics and not selecting IT as a career among female computer science graduates.

Table 3

Reduction and Elimination: Conscious Reality of Job Economics

Themes	Participants
Dismay with information technology job availability	1, 2, 4, 7, 8, 13, 14, 15
Angst about not having a good standard of living	3, 6, 8, 9, 10, 12, 15

Table 4 includes the results of the reduction and elimination process from sense of purpose. Three themes emerged from the combined common phrases. Goal to use academic strengths, comfortable with skills, and strong academic background were themes computer science graduates used to describe their sense of purpose relative to making successful, satisfying career decisions. Goal to use academic strengths (seven out of 15 participants, 46%), comfortable with my skills (six out of 15 participants, 40%), and strong academic background (five out of 15 participants, 33%) emerged as the most meaningful sources for feelings of a sense of purpose in preparing to transition to the IT workforce among female computer science graduates.

Table 4

Reduction and Elimination: Sense of Purpose

Themes	Participants
Goal to use academic strengths	1, 4, 5, 6, 7, 11, 12
Comfortable with skills	1, 2, 6, 9, 10, 14
Strong academic background	5, 6, 7, 10 15

Table 5 includes the results of the reduction and elimination process for feelings of competence supporting an IT career decision. The researcher combined common phrases into the two themes, feelings of worthiness and pride and necessity to succeed (see Table 5). Feelings of worthiness and pride and necessity to succeed surfaced as essential motives for career choice decisions. Feelings of worthiness and pride (six out of 15 participants, 40%) and necessity to succeed (five out of 15 participants, 33%) emerged as the most cited sources for essential motives for career choice decisions among female computer science graduates.

Table 5

Reduction and Elimination: Feelings of Competence

Themes	Participants
Feelings of worthiness and pride	2, 4, 5, 8, 11, 12
Necessity to succeed	1, 4, 7, 11, 15

Table 6 includes the results of the reduction and elimination process for a desire for engaging work guiding career choice. The researcher combined common phrases into three themes: love working with computers, engaging experiences in cooperative education (co-op), and enlightening experiences as an intern in IT (see Table 6). Love working with computers (nine out of 15 participants, 60%), engaging experience in cooperative education as a student (seven out of 15 participants, 46%) and enlightening

experience as an intern in IT (five out of 15 participants, 33%) emerged as the most cited sources as the most meaningful recollections the female graduates hoped to recreate with the job they chose.

Table 6

Reduction and Elimination: Desire for Engaging Work

Themes	Participants
Love working with computers	1, 2, 3, 5, 7, 8, 10, 11, 13
Engaging experiences in cooperative education	1, 3, 5, 6, 12, 13, 14
Enlightening experiences as an information technology intern	2, 4, 7, 10, 11

Table 7 includes the results of the reduction and elimination process for consciousness of gender disparity in IT and career choice. Three themes, aware of potential, not concerned, and never discouraged me, emerged from the combined common phrases (see Table 7). Aware of potential (nine out of 15 participants, 60%), not concerned (eight out of 15 participants, 53%), and never discouraged me (seven out of 15 participants, 46%) emerged as the most cited sources for conscious feelings toward gender disparity the female graduates had at the time they made career choice decisions.

Table 7

Reduction and Elimination: Consciousness of Gender Disparity

Themes	Participants
Aware of the potential	2, 3, 4, 5, 6, 8, 9, 10, 12
Not concerned	1, 2, 3, 7, 8, 12, 13, 15
Never discouraged me	1, 3, 5, 8, 9, 11, 15

Table 8 includes the results of the reduction and elimination process for relational experiences with family and mentors on IT career decision choice. The three themes in Table 8 represent a combination of common phrases. Family members' encouraged, teachers and professors inspired, and encouragement from personal network affected

participants' career choice direction. Family members supported (eight out of 15 participants, 53%), teachers and professors inspired (six out of 15 participants, 40%), and encouragement from personal network (four out of 15 participants, 26%) emerged as the most cited sources of relational experiences with family and mentors as guidance toward career choice decisions among participants.

Table 8

Reduction and Elimination: Relational Experiences With Family Members and Mentors

Themes	Participants
Family members supported	1, 3, 4, 5, 8, 11,12, 14
Teachers and professors inspired	2, 3, 6, 9, 10, 12
Personal network encouragement	8, 11, 12, 15

Clustering and Thematizing the Invariant Constituents

The next step of the modified van Kaam method of analysis was clustering and thematizing the invariant constituents. Clustered themes and meanings were used to develop the textural descriptions of the experiences. Reviewing the individual transcripts led to developing invariant constituent groupings. An invariant constituent is a statement or phrase that appears throughout the data that contributes to the development of themes (Moustakas, 1994).

From a final identification of the invariant constituents, common patterns of significance emerged about the phenomenon of the decision-making experience of career choice among women college graduates with computer science degrees who do not enter IT professions. Patterns included conscious reality of economics, sense of purpose, feelings of competence, desire for engaging work, consciousness of gender disparity, and

relational experiences with family and mentors. The researcher summarized the patterns, and clustering led to six core themes.

Theme 1 was as follows: Conscious reality with job economics became a driving emotion for many female computer science graduates as they could not find IT employment after college graduation during the dot-com bubble burst (see Table 9). Participant 001 expressed emotionally that "it was bad, everyone was getting laid off." Participant 008 felt that job shortages forced her to look at all opportunities: "Although I knew exactly what I wanted to do, other factors such as the economy and job availability were involved in deciding if this choice would be the right choice." Participant 014 expressed her surprise in the lack of IT jobs as she pursued employment: "I didn't know the job market in IT was doing badly, so I began concentrating on employment and job security." Participant 009 claimed that the need and motivation "to secure a job and support myself" were greater than pursuing any career path. Participant 015 emphatically stated, "Forget about the IT career aspect, I needed immediate employment based on job security, financial security, and other safety and security reasons."

Table 9

Codes for Consciousness Reality of Job Economics

Responses	No. of participants to offer this experience	% of participants to offer this experience
Dismay with IT job availability	7	46
Angst toward not securing a good standard of living	6	40
Anxiety toward getting employment	3	20
Hard finding a job	3	20
Need money not career	2	13

Theme 2 was as follows: Female computer science graduates expressed a sense of purpose when preparing to transition from college to the workforce (see Table 10). At the time they graduated, many of the participants felt a sense of purpose toward the IT profession as they wanted to effectively use their strengths in math, computers, and problem solving toward their career decision and ultimate professional goal. Participant 005 stated, "My goal was to articulate my strengths." Participant 004 emphasized, "I was trying to fulfill my sense of purpose by applying for positions that required my degree and education, and would allow me to earn a living doing work I excelled at and enjoyed doing." Participant 010 emphasized that she felt a sense of purpose when making a career choice, stating that she wanted to promote her value in the job market and indicated feeling "quite comfortable with my technical skills, quite solid." Participant 011 expressed a sense of purpose by stating "my personal strengths were good, values were good, and coming from a good academic background helped a lot in finding a purpose for selecting my career." Participant 012 commented, "It was not as much as a sense of purpose that influenced my decision, but opportunities. I was prepared for the best opportunities that best suited my learned skills."

Table 10

Codes for Sense of Purpose

Responses	No. of participants to offer this experience	% of participants to offer this experience
Use academic strengths	7	46
Comfortable with skills	6	40
Strong academic feelings	5	33
Opportunities matching skills	2	13

Theme 3 was as follows: Feelings of competence and the necessity to succeed were essential motives for career choice decisions among female computer science graduates (see Table 11). Whereas external factors such as the economy, unemployment trends, and companies not hiring were prevalent, female graduates addressed their competence when they were choosing a career. Participant 008 believed she was worthy of a profession in the job market that "used my qualities and was something that I would actually not dread going to work every day." Others expressed feelings of competence when discussing their goal as a necessity to succeed. Participant 015 expressed her competence and passion when stating that the "idea of working, and seeing myself in a career whether in IT or in other than IT, included a vision of myself working at their highest levels."

Table 11

Codes for Feelings of Competence

Responses	No. of participants to offer this experience	% of participants to offer this experience
Competent of worthiness to job market	6	40
Necessity to succeed	5	33
Worthy of career not job	2	13
Will excel in career	2	13

Theme 4 was as follows: A desire for engaging work helped participants play to their strengths and emerged as meaningful recollections the female graduates hoped to recreate with the job they chose (see Table 12). Participants discussed the engaging learning experiences that might have helped shape their career paths and career decision making. Some participants felt their internships, work-study, and cooperative education programs were critical to their success in the workplace beyond classroom studies.

Participant 007 explained her experience as a co-op was meaningful and encouraged her to think about a career with the government. She also felt that "getting professional experience while still in school helped a lot." Participant 006 had experience as a co-op and stated that "as an intern in my senior year, I sensed that maybe graphic design might work as a career and not just a hobby." Participant 005 emotionally described her co-op experience as a teaching assistant as "one of the smartest choices I made because it enlightened me with experiences in things I was looking to do."

Theme 5 was as follows: Consciousness of gender disparity in the IT industry did not appear to have a significant emotional influence on the career choice direction of female computer science graduates (see Table 13). Most participants expressed conscious feelings toward gender disparity and suggested the consciousness had little effect at the time on making career choice decisions. Participant 002 stated, "It didn't bother me." The statement reflected the point of view expressed by the majority of computer science graduates. Participant 006 said that "I was not pressured or discouraged about the male dominance." Participant 003 claimed she "was not emotionally concerned" with that aspect in relation to her career direction, field, or workplace realities. Participant 004 was conscious of male dominance, but acknowledged that "it didn't bother me and things are improving in the workplace, i.e., more women showing up in IT workforce and organizations in general." Others such as Participant 007 indicated feelings of awareness and noted that it still "needs to improve" and women need to "get going."

Table 12

Codes for Desire for Engaging Work

Responses	No. of participants to offer this experience	% of participants to offer this experience
Encouraging experiences in cooperative education (co-op)	7	46
Enlightening experiences as intern in information technology	5	33
Enjoyed experience working projects	2	13
Enjoyed taking courses outside major	2	13

Table 13

Codes for Conscious Reality of Gender Disparity

Responses	No. of participants to offer this experience	% of participants to offer this experience
Aware, does not bother me	9	60
Not concerned	8	53
Never discouraged me	7	46
Does not matter	2	13
Still needs to improve	2	13

Theme 6 was as follows: The relational experiences with family and mentors shaped female computer science graduates' career decisions (see Table 14). Participants discussed how they relied on consultation from family members regarding career decisions, often outside of IT. Participant 004 stated, "My family, particularly my older sister, have always been avidly supportive of my ability to do whatever I put my mind to; I would say she helped with my career thinking." Educators also inspired computer science graduates toward a career decision after graduation. Participant 011 commented that the biggest inspiration and role model was her high school teacher who often "encouraged and suggested" a career in teaching. Participant 010 stated, "My math professor's advice on educational careers made me feel that I was making a great

decision." A strong personal network of female professionals helped encourage the career paths of several computer science graduates. Participant 012 commented on her professional network and stated,

> Professional women from my country were working in different very good jobs outside of IT. They came here, started doing really good, and made me feel that I can do it. If they can do it, I can do it.

Table 14

Codes for Relational Experiences on IT Career Decision Choice

Responses	No. of participants to offer this experience	% of participants to offer this experience
Family members supported	8	53
Teachers and professors inspired	6	40
Professional female network encouraged	4	26

Textural-Structural Descriptions

Constructing a textural-structural description was the next step of the modified van Kaam method of analysis. This step consisted of developing individual textural and structural descriptions of the participants' meanings and the essence of the experience of female computer graduates living in the NCR, representing the group as a whole. The researcher highlighted textural-structural examples for each participant during multiple reviews. The tables that follow contain a summary of the textural-structural analysis for the seven themes.

The first theme concerned participants' conscious reality of job economics during a downward economy. This became a driving factor for many female computer science graduates to find safe and secure employment in professions other than IT after college graduation. Theme 1 is one of three dominant themes indicative of the essence of career

decision making for female computer science degree graduates after graduation. The theme addressed the need for female computer science graduates to search for other career opportunities that would satisfy their financial needs during career decision making. Participants felt dismayed by external factors such as IT job shortages and lack of interviews during times when more experienced job candidates were competing. Participants often expressed that after interviews an overwhelming feeling of not being good enough, not knowing enough, and not being the right fit to an IT career surfaced. Others expressed emotional discouragement when employers made it clear they were looking for experienced people. Table 15 includes textural-structural examples from the interviews.

Table 15

Textural-Structural Analysis: Conscious Reality of Economics

Participants	Textural-structural analysis
001	I couldn't find anything. I went to tons of interviews.
002	I had to look elsewhere, there were no jobs; everyone was getting laid off.
008	Economy and job availability were involved in career decision.
009	The job shortages may have influenced me to think about going elsewhere than going into my college major.
013	It was difficult finding a job; experienced individuals were being turned away.
014	With the shortage of IT jobs at the time, I began having some issues and some feelings about going into industry.
015	Not being able to find a job in IT because of how many experienced people out there looking for work.

The second theme was female computer science graduates felt a sense of purpose when transitioning from academia to the workforce. The theme describes how the participants felt a sense of purposefulness toward the IT profession based on their high self-efficacy driven by a strong academic background and learning experiences. A sense

of purpose guided their decision making, ultimately leading to their career choice. Their sense of purpose also consciously directed them toward make meaningful and life-sustaining work choices. The self-efficacy expressed by each woman supported a sense of purpose as she prepared to make career decision-making steps and choices after graduation. Table 16 contains textural-structural examples from the interviews.

Table 16

Textural-Structural Analysis: Sense of Purpose

Participants	Textural-structural analysis
001	I felt the need to find a company where I could show off my learned skills.
003	I excelled in school; I feel the need to apply what I learned.
004	I graduated with that degree, and I wanted to use the degree.
009	It is difficult to get this degree; I want to use the degree

The third theme was that feelings of competence and the necessity to succeed were essential motives for career choice decisions among female computer science graduates. A sense of proficiency in academic skills bolstered encouragement that they would obtain a profession after graduation that would fill their aspiration for job security and financial steadiness. The majority of the participants gave the impression of successfully navigating a career decision during difficult economic conditions. Table 17 contains textural-structural examples from the interviews.

Table 17

Textural-Structural Analysis: Feelings of Competence

Participants	Textural-structural analysis
002	Worthy of a profession in the job market that used my qualities.
008	I wanted to express my superior technical skills.
011	My outstanding academic background gave me confidence to go into the private sector.
012	Planned to work at highest levels possible.

The fourth theme described how a desire for engaging presented participants with meaningful recollections of learned strengths and experiences that they hoped to recreate with the job they chose. Theme 4 was one of three dominant themes indicative of the essence of career decision making for female computer science degree graduates after graduation. Many participants articulated earlier learning experiences gave them the confidence to succeed and thrive in various learning environments and situations. Table 18 shows textural-structural examples from the interviews.

Table 18

Textural-Structural Analysis: Desire for Engaging Work

Participants	Textural-structural analysis
005	Getting a co-op opportunity with a major university teaching programming to young students guided my decision.
006	Getting an internship and getting graphics design experience was extremely helpful in my decision.
007	Co-op experience provided insight into obtaining a professional path in both a management and government service.

The fifth theme was conscious feelings toward gender disparity had no relevance on female computer science graduates career choice decisions The participants were familiar with being one of the only women in math, computing, and programming classes and they appeared to have thrived in educational settings where male students were more dominant (e.g., STEM fields). The exposure to male-dominated environments might have prepared the participants for the potential realities of a male-dominated workplace. Vivid recollections of the male dominance factor were not part of the conscious realities participants detailed when they recalled the essence of the career decision-making experience. Table 19 contains textural-structural examples from the interviews.

Table 19

Textural-Structural Analysis: Consciousness of Gender Disparity

Participants	Textural-structural analysis
001	It was never really an issue for me.
002	It is less prevalent, and it is less of an issue.
004	That for some reason didn't bother me.
006	Never a problem. No one ever told me because I was girl I couldn't do something.
009	I just never really thought about male dominance affecting a choice in my career.
014	I was not worried about people looking at the IT profession as male dominant.

The sixth theme was the relational experiences with family and mentors toward the female computer science graduates' career decisions. The theme included experiences with family and mentors as the participants began preparing to move into the workplace or a career path. Theme 6 was one of three dominant themes indicative of the essence of career decision making for female computer science degree graduates after graduation. Family members, teachers, and a personal female professional network were supportive, inspirational, motivational, and encouraging for many participants as they pursued their career decisions. Individuals' mothers, fathers, and husbands often encouraged the candidates to apply their various skills and knowledge while seeking a profession. Teachers often inspired participants toward making a particular career choice. Participants' professional female networks, particularly women from their country, encouraged selecting various positions. Some female professionals knew of companies that had very good positions available, mostly outside of the IT profession, and would recruit graduates from their country to fill these openings. Table 20 contains textural-structural examples from the interviews.

Table 20

Textural-Structural Analysis: Emotional Influencers on Career Decisions

Participants	Textural-structural analysis
003	My parents were educators and encouraged me to consider jobs outside of IT.
004	My dad was supportive but I had an older sister with a similar educational background who did not take an IT career path.
010	My math professor was the main person that got me on the course that I took.
011	I had educators who completely inspired me and I considered them my role models.
012	I had a network of professional women who encouraged me to seek jobs outside of IT.

Individual Textural-Structural Description

Participant 001. Participant 001 graduated from Colorado State University in 2004 with a computer science degree and desperately sought a career in her field. Participant 001 selected computer science as a major because she "knew a couple of programmers and it sounded like a really fun, interesting, challenging field to get into." After graduation, Participant 001 felt prepared to interview for positions in the IT profession. She stated with the "effects of the dot-com crash still lingering," there were a lot of people who were out of work in the field, and companies were interested in computer science degree candidates with 5 to 10 years of experience. Extremely disappointed in her ability to locate employment in the IT field, Participant 001, who excelled in mathematics in college, returned to school and studied accounting. Later, she worked for a large financial institution as an entry-level comptroller. Regarding the lived experience for Participant 001, her conscious reality of economics compelled her to make a career decision toward an opportunity outside the IT profession.

Participant 002. Participant 002 briefly considered engineering as her college major, but selected computer science at the end of her freshman year at Colorado State University. After graduating in 2002, she reflected on feeling prepared to "land employment" within the IT profession, stating with confidence that she graduated with the skills necessary to succeed in the IT field. Participant 002 noted "reality set in" regarding the economy. "Everyone in the IT profession was getting laid off. There were tons of people out in the industry with 4, 5, and even 10 years of real experience with no jobs. It was impossible for someone just graduating." Participant 002 accepted a position in a United Parcel Service (UPS) store because "she needed a job that paid

something." Later, she found employment as a geospatial analyst for a large government contractor. Regarding the lived experience for Participant 002, a conscious reality of economics compelled her to make a career decision toward an opportunity outside the IT profession.

Participant 003. Participant 003 began thinking about majoring in computer science after taking several computer courses in high school. A high school mathematics professor noticed her strength in math and science and encouraged her to pursue these strengths. Participant 003 attended Alabama A&M University and decided to select computer science as her major, taking honors courses in math and science. During her junior year, she attended various conferences and spoke with people already working in her field, which provided a chance to have a better understanding of the advantages and disadvantages of their day-to-day environment and positions within the profession. Participant 003 had parents "who were both educators" and expressed that "something in the back of my head gave a sensation that a career in education may be the path I want to pursue." During her senior year, external encouragement and insight from family and educators bolstered consideration toward a career in education. After graduating in 2004 and obtaining a secondary education teaching certificate, Participant 003 began working at a local high school as a math teacher. Regarding the lived experience for Participant 003, relational experiences with family members and professors channeled a career decision toward an opportunity outside the IT profession.

Participant 004. Participant 004 was "very interested in math and science courses" while attending the University of Virginia and decided in her second year of college to major in computer science. During her summer break, Participant 004 engaged

in an intern program that gave insight into the IT profession. Participant 004 also had members of her family working in the IT profession. The combination of knowledge associated with the IT industry through education, family, and hands-on internship initially guided her thoughts toward a career in IT. In the beginning of her fourth year of college, she began having doubts about her computer science major but "did not want to jump into something new." Participant 004 began losing focus on a career in technology, although her father who worked in the computer industry encouraged her to continue down this path. Though it was meant to encourage, Participant 004 felt "there was so much pressure" on her from her father to do better in her courses that it became discouraging. Participant 004 confided in her older sister with a similar educational background who did not take an IT career path regarding professions outside of IT. Her sister "encouraged and made recommendations" to pursue career alternatives to IT. After graduating in 2009, Participant 004 accepted a position as an entry-level marketing analyst for a small business in Virginia. Regarding the lived experience for Participant 004, relational experiences with family members channeled a career decision toward an opportunity outside the IT profession.

Participant 005. Participant 005 thought she would be a doctor and began her college education at the University of Maryland majoring in bioengineering. Beginning her second year, a school advisor recommended majoring in computer science, commenting on how her exceptional math and programming skills "were a much better fit." Participant 005 found computer science "more interesting than the other major. That is why I stayed with it, even though it was hard and very challenging." During the summer of her third year, Participant 005 participated in a co-op program at Johns

Hopkins University providing community services to "some local schools teaching kids about programming." The experience of a mentor relationship with the students "inspired her to pursue a career in education." After graduating in 2006, Participant 005 continued her education toward a master's in education while continuing part-time work as a teaching assistant at Johns Hopkins. Regarding the lived experience for Participant 005, a desire for engaging work piloted a career decision toward an opportunity outside the IT profession.

Participant 006. Participant 006 had an interest in computers at an early age and took "basically every computer course my high school had offered." She described majoring in computer science at George Washington University as "a natural choice." She found the courses challenging but enjoyable and had not yet decided on a career path. During her second year, Participant 006 did a summer internship with a small business that "opened my eyes to the profession of graphic design." Participant 006 decided to minor in graphic design as she continued to hone her skills as a part-time freelancer. After graduating in 2004, Participant 006 decided to continue pursuit of a career in graphic design, stating, "It has been my experience that many of my friends ended up choosing careers that were not in our major in college. I never thought it was terribly unusual." Participant 005 acquired a career opportunity as a graphic designer with a large company supporting the development of proposals to capture new business. Regarding the lived experience for Participant 005, a desire for engaging work piloted a career decision toward an opportunity outside the IT profession.

Participant 007. Participant 007 attended National University and graduated with a computer science degree in 2001. She felt a desire to major in computer science

because it was a "natural progression," having spent 5 years in the U.S. Navy as a programmer. She found the coursework enjoyable but very challenging being a parent and full-time student. During her third year, Participant 007 was selected to participate in a co-op program with a government agency as part of a project management team for various non-IT projects. She considered her co-op experience "extremely valuable and informative" as it provided insight into the possibility of obtaining a dual professional path in both a management and government service. After graduation, Participant 007 accepted a non-IT position with the government, specifically the missile defense agency. She noted experienced an "intuitive sensation when making her career decision" that with her government time already served with the navy, she would soon lead a team as a program manager while expeditiously moving up the ladder within the government service management positions. Regarding the lived experience for Participant 007, a desire for engaging work piloted a career decision toward an opportunity outside the IT profession.

Participant 008. Participant 008 attended Wittenberg University and originally thought about marine biology as a major, but after taking several computer classes she decided to change her major to computer science at the beginning of her second year of college. Participant 008 enjoyed the challenging curriculum and the small class sizes with usually no more than 10 students. Participant 008 expressed closeness with her professors, "who were always available for counseling and answering questions." Completing her fourth year with an excellent background in web programming, she felt confident and prepared to make a career choice in the IT profession. Participant 008 graduated in 2008 as the economic crisis took effect and "when IT jobs were scarce for

new computer science graduates." She noted her father and boyfriend, who were experienced in data administration and programming, lost their positions in the profession. Discouraged with the lack of job interviews in the IT profession, Participant 008 "focused on jobs that would help pay college debts and offer some job security." Several months after graduation, Participant 008 gained employment as an entry-level business process manager for a large firm. Regarding the lived experience for Participant 008, a conscious reality of economics compelled a career decision toward an opportunity outside the IT profession.

Participant 009. Participant 009 graduated from George Mason University in 2002. Originally selecting biology as her major, she changed to computer science her second year because "my friends told me that computer science was a good field." Participant 009 found the curriculum challenging, particularly programming classes, and stated, "Most of the students had experience and I did not." Participant 009 excelled in math, and once she improved programming deficiencies, she began focusing on a career in IT. After graduating, Participant 009 experienced difficulty finding a job in the IT profession and she noted, "I didn't know that the job market in IT was doing so badly." Participant 009 became discouraged while looking for IT employment, recalling, "When I was going to different interviews, they were looking for experienced people." She also commented that friends forced to leave the profession because of layoffs were finding employment in non-IT professions and "I decided maybe I should do it too." Nearly 6 months after graduation and with the assistance of a friend, Participant 009 began working for a large company as an entry-level market analyst. Regarding the lived

experience for Participant 009, a conscious reality of economics compelled her to make a career decision toward an opportunity outside the IT profession.

Participant 010. Participant 010 graduated from the University of Florida in 2007. Originally deciding on majoring in math with computer science as a minor, Participant 010 switched to major in computer science and minor in mathematics, commenting, "Job opportunities at that time in IT were actually beginning to pick up." She experienced difficulties with programming and hardware courses, stating, "Everybody has their different strengths. Programming and hardware, especially circuits, were not mine. I was good at math. I'm good at problem solving." Participant 010 decided to continue down the computer science track, stating a belief that her job offers would be limited if she chose a different track. Participant 010 regarded a math professor as her mentor and felt "lucky I had him for most of my math courses. He was a really good teacher and he was always there whenever I needed help." Participant 010 reflected how "he was never convinced that switching to computing as my major was a good idea" and always considered math as her strength. Participant 010, with encouragement from her math professor, continued graduate studies in mathematics after graduation, stating her "math professor was the main person that got me on the course that I took," conveying his foresight in potential in her math aptitude stating "so I guess I kind of give the credit to him." Participant 010 found employment as a program control analyst with a small business supporting the government. Regarding the lived experience for Participant 010, relational experiences with professors channeled a career decision toward an opportunity outside the IT profession.

Participant 011. Participant 011 attended George Mason University, graduating in 2001. Participant 011 began her first year in college intending to major in engineering. During her second year, she reviewed the coursework she had already completed and compared it to other majors, stating, "To be honest, I looked at which I could graduate the earliest with." She further explained that given "my love of math and the amount of courses I had taken in math, computer science was the best fit." Participant 011 had a close relationship with math educators at both the high school and the college level that "completely inspired me" and "I considered them my role models." Participant 011 continued her major in computer science and added math as a minor. Citing concerns with the recent dot-com bubble burst and job layoffs, she sought guidance and direction from "my former high school math teacher, who urged me to become a math educator like herself." Participant 011 expressed a "determination to choose a career that was rewarding on an emotional level" and teaching math had the emotional "calling" she sought. Participant 011 made the decision to pursue a career as an educator, enrolling in a program to obtain a secondary education certificate shortly after graduation. Regarding the lived experience for Participant 011, relational experiences with teachers and professors channeled a career decision toward an opportunity outside the IT profession.

Participant 012. Participant 012 graduated from Tulane in 2001. In her first year, she became "totally involved" with taking computer classes, which guided a decision to select computer science as a major in her second year. Participant 012 expressed that her goal was to "get a degree," with little thought about a career. Shortly after graduation, she and her high-school-age son relocated, as she noted her husband's profession as a medical doctor was a priority "higher than mine" and any thought of a

career was put on hold. After settling in a neighborhood with many residents from her culture, Participant 012 discovered a network of women from "my old country" successful in professions outside of IT. Participant 012 was encouraged by "some women within the network to consider several non-IT positions." Participant 012 described the experience, stating, "Women were working in different very good non-IT jobs. They came here, they started doing really good, and they had time for family." Participant 012 further commented, "I was thinking, 'Okay, that's good. I can do it. If they can do it, I can do it.'" Through her personal network, Participant 012 met a large government contractor who offered her a position as an acquisition analyst. Regarding the lived experience for Participant 012, relational experiences with a network of professional women channeled a career decision toward an opportunity outside the IT profession.

Participant 013. Participant 013 graduated from the College of Charleston in 2003. She selected computer science as a major because "there was really cool technology that was being developed," and she realized that this technology "could be applied to anything in the real world." Participant 013 found the coursework to be very challenging but credited "my love for math and logic" as the fundamental core that allowed her to persevere. During her junior year, Participant 013 began "not feeling right," citing "serious concern with the dot-com bubble burst and the amount of technology jobs lost." After graduating, Participant 013 became "distressed at how few interviews were available for IT positions." When interviews did occur, Participant 013 reflected, "Very few were calling me back." She further stated a recruiter had interest but "he didn't want to even consider hiring me because I had no experience. My self-esteem

got shoved through the floor." Participant 013 needed "to find employment and not a career at this time" and after a few months began working for a small business as an entry-level customer relationship manager. Regarding the lived experience for Participant 013, a conscious reality of economics compelled her to make a career decision toward an opportunity outside the IT profession.

Participant 014. Participant 014 stated that when she first thought about a career in IT she was convinced that what she was taught in college would fully prepare her for an exciting career in technology. Upon graduation in 2011 from Troy University, her main concern with finding a job in IT was the state of the downward economy at the time. Although she knew that a technology career was her profession of choice, the limited availability of IT jobs helped her determine if this career choice would be the right choice. On top of becoming a "fresh" graduate with limited experience, "the economy made searching and securing jobs in IT nearly impossible." She stated that with the shortage of IT jobs at the time, "I began having some issues and some feelings about not going into the IT industry." She began researching other career opportunities and began working for a government contractor as an entry-level intelligence analyst. Regarding the lived experience of Participant 014, a conscious reality of economics compelled her to make a career decision toward an opportunity outside the IT profession.

Participant 015. Participant 015 graduated from Old Dominion University in 2002. Originally looking toward engineering as a major, she decided as a sophomore to major in computer science and minor in math. Participant 015 chose computer science as a major because "I was determined to choose a career that was challenging and rewarding on an emotional level, but the driving factor was how financially successful could I be."

Coming from a small town, Participant 015 sought to become a "huge success and figured computer science would help me do that." The need to finish the degree program was the motivator "to get out and start making money and planning my future." Participant 015 thought that after she graduated, "I would be a gem out there in the IT world." Instead, a disheartening reality set in of "not being able to find a job in IT because of how many other people out there looking for work, some with 3, 6, and 10 years' experience." Participant 015 stated, "I knew I wasn't going to get the job without getting some experience and companies were not hiring inexperienced individuals to technical positions." Participant 015 stated,

> At no point did I ever not want to be a computer scientist. I always wanted to. I just didn't feel like I could because I couldn't find anything in IT. This was the big thing that made me choose something else.

Participant 015 found full-time employment nearly 5 months after graduation with a large business as an entry-level business group operations analyst. Regarding the lived experience of Participant 015, a conscious reality of economics compelled her to make a career decision toward an opportunity outside the IT profession.

This section included individual textural descriptions of lived experiences of each participant. Participants' individual textural descriptions distinguished the fundamental meaning of the experiences as applied to the three dominant themes. The individual textural descriptions helped to formulate the composite descriptions for the group.

Composite Descriptions

The final step was to develop a composite description of the group. This step involved integrating the 15 individual participant textural-structural descriptions. The

composite description is a universal description of the experience representing the entire group of participants (Moustakas, 1994). The composite description answers in general why participants did not choose a career in IT after completing a computer science degree. The composite indicates the essence of the experience as is most common among the participants and is encapsulated within the three dominant themes: conscious reality of job economics, desire for engaging work, and relational experiences with family and mentors. The content of these dominant themes comprised the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession.

A conscious reality of job economics became a compelling reason for seven of the female computer science graduates not finding IT employment after graduation. All seven described an austere IT environment as the cause for a career decision outside the profession. Three participants qualified the career decision-making experience by stating, "Companies were only interested in candidates with 5 to 10 years of experience" (Participant 001), "Everyone in the IT profession was getting laid off" (Participant 002), and "IT jobs were scarce" (Participant 008). Three participants qualified the career decision experience: "didn't know that the job market in IT was doing so badly" (Participant 009), "how few interviews were available for IT positions" (Participant 013), "the economy made searching and securing jobs in IT nearly impossible" (Participant 014), and "I couldn't find anything in IT" (Participant 015). To describe further the recollection of the conscious reality of economics, participants used keywords such as *disappointment, reality, discouraging, concern, intense,* and *disheartening* when locating employment in the IT field after graduation.

The desire for engaging work led three of the female computer science graduates to select employment outside of the IT profession. Three participants qualified knowledge gained as student interns as a career decision-making experience: "a co-op program teaching students to program inspired me to pursue a career in education" (Participant 005), "summer internship opened my eyes to the profession of graphic design" (Participant 006), "co-op experience provided insight into obtaining a dual professional path in both a management and government service" (Participant 007). Participants used keywords such as *inspiring, eye opening, valuable,* and *informative* to describe further the recollection of a desire for engaging work toward making a career choice decision.

The relational experiences with family and mentors channeled participants to select employment outside of the IT profession. Two participants qualified family members as a stimulus toward the career decision-making experience: "my parents were both educators" (Participant 003) and "sister encouraged and made recommendations for career alternatives to IT" (Participant 004). Two participants qualified educators as the stimulus toward a career-making decision by stated, "My math professor was the main person that got me on the course that I took" (Participant 010) and "My former high school math teacher urged me to become an educator" (Participant 011). One participant qualified a professional woman as the stimulus for making a non-IT career decision by including a phrase "women were working in different, very good, non-IT jobs. They came here, they started doing really good, and they had time for family" (Participant 012). Participants used keywords such as *encouraging, insightfulness, reinforcing,* and

recommended to describe further the recollection of relational experiences toward making a career choice decision.

Conclusion

The purpose of Chapter 4 was to provide detailed results for the qualitative phenomenological study that involved exploring the meanings associated with the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession. Fifteen female computer science graduates participated in interviews to gain an understanding of the essence of the experience of career choice decision that might have related to their selection of careers outside the IT profession. Data analysis involved a modified van Kaam method of analysis. The first three steps of the analysis resulted in identifying common study themes. Individual structural descriptions developed from the invariant constituents in support of major and dominant themes. Finally, the researcher developed a composite description from the individual textural descriptions for the group. Six major themes emerged in the study, with conscious reality of job economics, desire for engaging work, and relational experiences with family and mentors emerging as dominant themes supporting the participants' decision to pursue non-IT careers after graduation.

Many of the participants expressed a conscious reality of economics relating to their career decision-making experience during changing economic times in the IT profession. Most participants felt a sense of purpose when transitioning from college to the workforce based on their academic hard work and learning experiences despite the career path chosen. Nearly all participants expressed feelings of competence as a

significant motivation factor when making career decisions and choices. The desire for engaging work acquired prior to graduation helped play to participants' strengths and supported the career choice of several participants. Conscious feelings toward gender disparity had no relevance on female computer science graduates' career choice decisions. Relational experiences with family and mentors channeled career decisions for some participants.

Summary

The purpose of this qualitative phenomenological study was to understand the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession. Fifteen female computer science graduates participated in interviews. Identification of themes led to an understanding regarding the essence of the experience of career choice decision making. Chapter 5 contains the conclusions and recommendations based on the findings presented in Chapter 4. Chapter 5 also contains study conclusions; implications of the study to theory, leadership, and practice; strengths and limitations of the study; and recommendations for future research.

Chapter 5

Conclusions and Recommendations

The purpose of the qualitative phenomenological study was to explore the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession. Understanding the reasons behind the phenomenon of career choice is fundamental to addressing the gap of a diminishing skilled IT workforce brought on by the retirements of baby boomers and an insufficient number of Generation X professionals within the IT field (Fowler & Wade, 2008). By exploring the decision-making experience of women who earned an undergraduate degree in computer science and chose careers outside the IT profession, IT industry leaders might develop strategies to meet the demands of filling 1.4 million job openings expected by 2018 (BLS, 2010).

Chapter 5 begins with a review of the research study. A discussion of the themes that emerged from the analysis of information obtained from participant interviews follows, as well as a description of how the themes relate to current scholarly literature and answer the research question. The chapter also includes a discussion of the theoretical implications of the study to scholarship, leadership, and practice, with strengths and limitations of the study examined. Chapter 5 concludes with recommendations based on the findings and recommendations for future research based on the study and conclusions.

Review of the Research Study

The researcher developed the study in response to current research detailing female decision making regarding nonelection of the IT profession as mainly concerns

for gender stereotyping and other barriers (Craig et al., 2008; Margolis & Fisher, 2002; Turkle & Papert, 1990; Volman & van Eck, 2001). Chapter 1 contained a discussion of the problem of women with computer science degrees not entering careers in the IT profession as exacerbating the inability of employers in the IT industry to secure the number of skilled IT workers required to meet future demands. A review of the literature in Chapter 2 failed to uncover why women who have spent considerable time and equity obtaining an undergraduate degree in computer science made career choice decisions to avoid the IT profession. Fischer et al. (2010) explained individuals make decisions based on their own needs and intuition rather than in a deliberate decision mode where they tend to make their decisions by carefully weighing the advantages and disadvantages of different decision alternatives. The researcher used an empirical phenomenological design in the current qualitative study to explore the perceptions, feelings, and beliefs that comprise the essence of the decision-making experience of career choice among female college graduates with computer science degrees who did not enter the IT profession (Groenewald, 2004).

Chapter 3 contained a discussion of the research methodology. Because the intent of the study was to explore the shared beliefs, lived experiences, and perceptions of female computer science graduates, a qualitative method and phenomenological design were appropriate (Groenewald, 2004; Moustakas, 1994). Because the qualitative study had an empirical phenomenological design, probing interview questions allowed a comprehensive exploration and better understanding of the phenomenon regarding the essence of female computer science graduates' career decision making (Moustakas, 1994). The pilot study consisted of three computer science graduates and indicated the

importance of using the interview questions as a guide for the interviews. As participants relayed feelings, emotions, thoughts, perceptions, and experiences, the empirical phenomenological design of the study included the flexibility needed to explore and guide participants to disclose their perceptions fully through rich qualitative data.

Fifteen female computer science graduates comprised the sample for the final study. Three participants performing the pilot study were included in the study. The researcher carefully followed a modified van Kaam seven-step method of analysis to organize, manage, and analyze the information gathered in the study. Common patterns of significance emerged from the analysis and review in Chapter 4 of the invariant constituents about the phenomenon of female computer science graduates and their career decision making. Based on references made by multiple participants during the interviews, the researcher summarized patterns and clustering led to core themes.

Final Study Conclusions

The purpose of the qualitative phenomenological study was to explore the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession. The researcher conducted interviews with 15 multigenerational participants who worked within the Washington, DC, NCR and graduated with a computer science degree between 2001 and 2011. Through analysis, six themes emerged from the interview process.

The core research question for the study was as follows: What is the essence of the decision-making experience of career choice among female college graduates with computer science degrees who do not enter the IT profession? The researcher captured significant findings in the six themes identified based on the questions posed during

participant interviews that shaped the essence of meaning participants attached to career decision making. The six themes were (a) conscious reality of job economics, (b) sense of purpose, (c) feelings of competence, (d) desire for engaging work, (e) consciousness of gender disparity, and (f) relational experiences with family and mentors. Three of the six themes emerged as the most dominant: conscious reality of job economics, desire for engaging work, and relational experiences with family and mentors. The content of these themes comprised the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession.

Conscious reality of job economics. This theme related to how participants assigned meaning to their career decision-making experiences during changing economic times. Feelings of uneasiness, dismay, and anxiety and frustration with the IT market shaped the essence of meaning toward career decision making outside the profession. Participants expressed that career choice decisions were emotional. The women interviewed were in touch with positive and negative feelings when describing the decision-making process related to the first job they chose to accept following college graduation.

As new graduates competing for openings at a time when workers were losing their jobs during the dot-com bubble burst, participants described feelings of frustration and angst toward the IT profession. Participants felt dismay with the IT job shortages and lack of interviews during times when more experienced job candidates were competing. Participants often expressed that after interviews, an overwhelming feeling of not being good enough, not knowing enough, and not being the right fit to pursue an IT career surfaced. Sensations of exclusion and being indistinct in their relationship with

the IT profession drove these feelings. Meaningful career decisions transitioned from the essence of the intended profession to opportunities that would meet immediate financial needs to support a lifestyle, which became the driving emotion that led to pursuing professions outside the field. The finding was consistent with research by Shapiro et al. (2009), who observed that when the environment fails to support a woman's career-related endeavors in a positive manner; she will often set her own career goals.

Desire for engaging work. Engaging work experienced during practicum and internships acquired prior to graduation bolstered feelings of self-efficacy and gave a sense of professional identity. Participants indicated exposure to professional learning experiences outside the classroom created consciousness and awareness that careers outside IT were meaningful. Participants also expressed learning programs gave them the feeling of being part of a professional community and of what it means to complete tasks, reach goals, competently face challenges, and make choices. The findings were consistent with research conducted by Woszczynski and Moody (2009), who revealed the need for supportive educational curriculum experiences and more imaginative work/study programs.

Relational experiences with family and mentors. Participants described feelings of support, encouragement, and insightfulness from well-intended parents, teachers, and mentors who expressed their career decision-making experience. Some participants stated encouragement from family and mentors stimulated their career choice decisions. Family members' expertise and knowledge provided a perspective toward careers outside of IT where graduates could apply their various skills and knowledge. Findings indicated external support from family members during career decision planning

reflected female computer science graduates' professional career direction (Lang et al., 2010).

Participants touched on how external encouragement from well-intentioned professors and role models often led them to change their intended career path or profession. Participants described discussions with teachers and professors as encouraging them toward professional career paths and options outside of IT. The findings pointed to research conducted by Morrell et al. (2004), who suggested an association existed between a professor's awareness of a profession and a participant's career decision.

Some participants' career decision experience extended to a personal network of professional women and role models who promoted entering career areas outside of the IT profession. In one case, the network consisted of professional women with similar ethnic backgrounds who introduced the participant to opportunities outside of IT that were available upon graduation. Participants felt privileged to receive the attention and encouragement garnered from these career women and felt they could easily become part of a non-IT professional community. This finding was consistent with a recent study conducted by Buck et al. (2008), who indicated women who knew an individual regarded as a role model in a specific field or profession were more apt to pursue a career in that profession than were others without role models.

Discussion of Additional Themes

The researcher captured and identified findings as additional themes based on the questions posed during participant interviews. The themes also shaped the essence of

meaning participants attached to career decision making. The themes were sense of purpose, feelings of competence, and consciousness of gender disparity.

Sense of purpose. Female computer science graduates expressed a sense of purpose as they transitioned from academia to the workforce. The theme supported answering the research question as the majority of the study participants exhibited a high self-efficacy that shaped their workforce career decision path after graduation. Over half of the participants expressed feelings of preparedness to enter the workforce and confidence in the explicit knowledge of their inner strengths and skills with respect to making a career choice. Lent et al. (1994) noted a significant part of a woman's self-knowledge accounts for her belief about her capabilities. Others felt prepared because they had strong backgrounds in the fields of math and science, leading them to believe they could meet any of the challenges commensurate with transitioning into the workforce after graduation. The remainder of the participants claimed they felt prepared to transition to the workforce but also felt a need to gain some footing or understanding of the workforce environment that would allow them to acquire the confidence needed to transition from college graduate to employee.

Feelings of competence. Feelings of competence appeared to be a significant factor for computer science graduates' career-making decisions. The theme supported answering the research question, as participants voiced feelings of competence associated with a sense of proficiency in academic skills that gave meaning toward making a career decision after graduation. Participants expressed feeling competent that they would find a profession, whether in IT or not, where they could leverage their full potential. The

majority of the participants gave the impression of successfully securing employment during difficult economic conditions.

Consciousness of gender disparity. Conscious feelings toward gender disparity had no relevance on female computer science graduates' career choice decisions. The theme supported answering the research question as participants made decisions to seek a career in the IT profession not based on gender disparity within the IT profession, but as a female-oriented and social profession. Participants were aware of the early perceptions indicating the predominance of men within the IT profession and gender disparities relating to computer use in the workplace (Turkle, 2003). Participants agreed that the disparity had decreased and was much less of an issue now than in years past. Most participants stated the gender disparity did not bother them and did not discourage them from selecting IT as a career choice. Participants noted gender does not matter in the IT profession because the work performed distinguishes one's abilities.

Implications

The underrepresentation of women in IT persists in the United States. Despite an increase in the number of women graduating from college with computer science degrees, little knowledge exists regarding why these women make career decisions outside of the IT profession. The IT landscape is changing rapidly and increased opportunities within the field look promising for female computer science graduates. Understanding the meanings female computer science graduates associate with selecting careers outside the IT profession should help leaders in both the public and the private sectors to develop educational initiatives and enrichment programs designed to increase interest and knowledge and to promote career interests and opportunities, particularly to

underrepresented groups such as women in IT (Lips & Baker McNeill, 2009). Implications of this study included both theoretical and research-based inferences related to leadership, as noted in the following discussion.

Theoretical implications. The interpretation of decision theories guided the study based on the notion that females' decisions to not pursue IT as a profession is an emerging social phenomenon about which researchers lack knowledge. The study confirmed that most participants made difficult career decisions under uncertainty primarily during the dot-com bust and a challenging economic crisis that began in 2008. Making decisions under uncertainty represents the central tenet of decision making theory (Fischer et al., 2010).

The study challenged the component parts of traditional decision theory, such as SCCT, which posits that females have significantly lower levels of self-efficacy with regard to selecting nontraditional professions such as IT. The theory indicates low self-efficacy among females toward a nontraditional profession may shape interests, goals, performance, and ultimate career choice toward selecting a traditional occupation (Quigley et al., 2010). The study revealed the basis of selecting non-IT professions was the emotional and high self-efficacy state of the individuals. A key point in support of this important finding indicated emotions of frustration and negativity and feelings of high self-efficacy drove most career decisions, as evidenced primarily by participants who graduated between 2001 and 2004 in the midst of the dot-com bubble burst.

Participants described making decisions centered on emotions of frustration and negativity with the IT profession as large losses of market capitalization led to considerable reductions in hiring in the IT profession. Study participants made clear that

when interviews with potential companies bore no successful outcome, emotions drove feelings of not being the right fit for their desired profession and diminished the desire to pursue a career path in the IT profession. Participants made decisions based on intuitive needs and what made sense rather than a rational structured and sequenced approach to a career decision. The study confirmed when negative emotional experiences with the IT profession destabilized participants' career decisions, they applied intuitive decisions and actions as a guide to making career decisions. Intuitive decisions and actions became self-validating (Dervin, 1998) and provided meaning to the career decision experience (Reed, 2008). As participants applied intuitive decisions and actions to their search for a career, it brought into play a discerning assessment and conscious reality of economics in the IT market, which ultimately led them to careers outside the IT profession.

Social cognitive career theory, grounded in Bandura's (1986) social cognitive theory, indicates career decision behavior results in interactions between outcome expectation, goals, and self-efficacy (Lent et al., 1994). The application of SCCT emphasized how social and cultural differences might restrict opportunities for women interested in a nontraditional profession such as IT because of underlying consequential decisions based on perceived barriers and low self-efficacy associated with the field (Bandura, 1997). In early research, researchers often indicated the IT field was a nontraditional female environment lacking the potential for female advancement (Jordan et al., 2007). Societal beliefs depicting the IT profession as nontraditional for females indicated low self-efficacy among women resulted in their belief that a desired outcome of success in the profession was unattainable (Bandura, 1986).

Contrary to this theory, the majority of the participants appeared to express feelings of a high level of self-efficacy and did not play to emotions contributing to their career behavior, particularly in a nontraditional career choice for women such as IT (Bona et al., 2010). Most participants based career decisions on the prospect of distinguishing their abilities within a profession of choice in the current job market, not on negativity displayed or societal views of the IT profession. Participants based their career decisions on a desire for engaging work built on a sense of purpose and feelings of confidence.

Participants expressed feelings of high self-efficacy through emotions of confidence and preparedness with their computer strengths, skills, and academic background. A sense of purpose driven by feelings of competence regulated and controlled actions that stimulated their desired career choice decisions. The study confirmed how the participants' emotions of purpose, competency, and a desire for engaging work turned into career decision actions, whether the acceptance of IT-related job offers or not, as long as they could apply some of their academic skills. Computing-related learning experiences garnered through cooperative education and internship programs revealed a desire for engaging work, which indicated experience garnered through a learning environment can inspire and structure interests, goals, performance, and ultimately career choice (Walsh & Heppner, 2006).

Family and mentors often supported or encouraged the candidates to apply their various skills and knowledge toward a specific career. The implicit knowledge acquired through exposure with experienced family members and mentors may have transferred to intuitive decision making by the participants. The findings from this study indicated

many participants made intuitive decisions based on relational experiences with family and mentors who were knowledgeable and experienced in various professions. The implicit knowledge available to the decision maker is the basis for intuitive decision making (Edwards, 1961). The implicit knowledge gained through these relationships that led to intuitive decision making, which is the foundation of behavior theory, was the basis for the participants' behavior decisions and may have supported selecting a career path different from their original intentions (Edwards, 1961).

Implications of the study to leadership. Should the underrepresentation of women in IT continue, by 2018, predictions indicate the industry will find it difficult to fill even half of the available job openings (Ashcraft & Blithe, 2009). Career interest by women in the profession declined between 2000 and 2008, even though the number of computing-related occupations increased (NCWIT, 2009). As the IT market gains momentum, industry leaders must develop a more appealing environment in which IT work becomes more meaningful for women (L. Barker & Aspray, 2006).

The significance of the qualitative phenomenological study is that leaders might understand the meanings women with the requisite education and knowledge base in computer science associate with career decisions outside the IT profession. The IT profession appears to be failing to attract highly qualified female computer science graduates who are well-positioned to fill future IT professional shortfall (Johns, 2008). Losing women during the hiring freezes of the dot-com bust and the 2008 economic crisis further deteriorated the female IT population. Women are essential to offset severe future shortfalls, but they will only have an interest if they sense the environment is fulfilling, enjoyable, and meaningful and will lead to professional growth and financial stability.

The findings from the study might inform IT executives responsible for the recruitment of female college graduates about the career choice importance of job economics, engaging work, and other aspects of life. Early decision-making theories often related the selection of careers outside the IT profession with gender disparity and low self-efficacy, but were remiss in discussing career decision making based on emotions and feelings of high efficacy often associated with intuitive decision making. Understanding the link between intuitive decision making and decision makers' emotions and feelings of high self-efficacy in the decision-making process might help leaders determine courses of action that introduce STEM initiatives that appeal to females and help position the IT industry to fill the gap of a diminishing skilled IT workforce.

The current study involved exploring the lived experiences and perceptions of 15 female computer science graduates to understand the meaning associated with career decision making outside the IT profession. The information shared regarding their decision to seek opportunities outside the IT profession might prompt industry leaders to develop recruitment programs that portray an exciting and evolving IT industry offering a new personal connection to women with computer science degrees.

Recommendations

Reflecting on the discussions, analysis, and results of the study several drivers emerged to form the recommendations. Leaders in both private and public sectors have a vested interest to promote and improve STEM professions such as computer science. Leaders in the private sector require highly skilled individuals for high-demand technology jobs that will increase by 22% between 2008 and 2018. Leaders in the public sector will have invested billions in STEM educational initiatives and enrichment

programs designed to increase interest and knowledge, and promote career interests and opportunities, particularly to underrepresented groups such as women in IT. For example, the 2014 U.S. budget includes $3.1 billion in programs to recruit STEM teachers, support more STEM-focused K-12 education, improve undergraduate STEM education, and invest in STEM teaching and learning.

Despite the investment of billions of dollars in STEM education programs, women continue to pursue careers in professions other than IT. If the public sector continues to spend money on STEM education programs and initiatives without the desired outcome, then the private sector needs to invest in better approaches to offset the continued underrepresentation of females in science-related careers such as IT. The recommendations founded on the findings from this study may add to and validate current practices in the field while prompting leaders in industry and academia to collectively assess their efforts and approach in portraying IT as an exciting and evolving STEM profession.

Participants felt a sense of purpose when transitioning from academia to the workforce, but the reality of economics during the dot-com bubble burst and later a declining economy left participants with feelings of discouragement with the IT job market and became a driving emotion for many female computer science graduates' career decisions. When participants could not find employment in the IT industry that met immediate financial needs to support their lifestyle, they searched for secure positions in other selected professions. A critical component of Theme 1, the conscious reality of economics, supported a strong recommendation to build partnerships among businesses, universities, and local federal agencies to develop research-based practices

offering paid IT-focused STEM research initiatives that ensure creativity and innovation continue during a period of slow economic growth. Paid IT-focused STEM research initiatives would also support critical components of Theme 2, sense of purpose, and Theme 3, feelings of competence, by infusing into the IT profession academically prepared females exhibiting high self-efficacy and considered the best and brightest in their profession.

Leaders in business and academia could invest dollars to develop STEM education initiatives and programs that produce a clearer association and pathway between computer science and the expanding IT profession. The focus of the strategy could be on how the varied IT career possibilities are not one-size-fits-all but suit a variety of different personalities and computing ambitions. Leaders in both industry and academia must work together to present these distinctions to future female computer science graduates to ensure a steady flow of talent, fresh perspectives, and college-prepared employees.

Theme 4's critical component, desire for engaging work, supports a strong recommendation for the IT industry leaders to continue funding STEM IT academic programs such as college internships, cooperative education, computer clubs and camps for women, and support networks for female computer science majors. Industry leaders working directly with leaders in organizations such as the National Association of Professional Women and NCWIT could develop enrichment programs that enhance the desire for engaging work within the wide array of IT professions requiring computer science disciplines. The recommendation also supports a critical component of Theme 6: relational experiences with family and mentors. Exposing family members and mentors

who often support, encourage, and provide insight toward the career decisions of female computer science graduates to the wide array of IT professions and enrichment programs might enhance their knowledge of IT and the advantages of a career in the profession.

A critical component of Theme 5, consciousness of gender disparity in the IT profession, supports the recommendation for leaders in the IT industry to emphasize the success and achievements of women currently in the profession to those considering the profession. Working with organizations such as the Anita Borg Institute for Women and Technology to expose, recognize, and reward women with a computer science college degree as leaders in the industry can clear any misconceptions that women are undervalued in the profession.

Strengths and Limitations of the Study

Limitations of the current study included a scope narrowly focused on female computer science graduates within one company with offices in various locations in the NCR. To obtain a comprehensive perspective, future research should include other large companies not only in the NCR but also across the country. The face-to-face interviews required the researcher to travel to various locations in Virginia, Washington, DC, and Maryland, which often caused the researcher to have conflicts in scheduling and work priorities. Conflicts in scheduling also occurred for some participants who worked under contract and required permission from their customer to do the interviews at the agreed upon time and place. The scheduling conflicts also caused some time constraints during interviews, as some participants' employers gave them a small window of opportunity to attend the interviews. Time constraints sometimes limited the researcher's plan to use field notes to supplement the audio-recorded interviews.

A limitation was the timing of the participants' graduations. As participants searched for IT employment, jobs were scarce, although earlier predictions indicated there would be a shortage of workers. Performing this research on graduates beyond 2011 may produce different results or may disclose other issues relative to why women are choosing other jobs.

The current study had several strengths. The researcher received permission to use the resources of a large company to enlist the support of participants. The participants identified with the topic of the study and were excited to participate, as indicated by the immediate responses received to the letter requesting participation. Participants were available when requested, despite having to reschedule interview times around their workday. All participants were open and willing to respond to the interview questions.

The qualitative empirical phenomenological design was an appropriate design for the scope of the study, which was to understand and interpret the lived experiences of female computer science graduates who chose to pursue career choices outside the IT profession. The modified van Kaam method of analysis was the most appropriate method to organize and analyze the large amount of data collected during the study. The modified van Kaam method of analysis helped to identify common themes that emerged from interviews with the participants and their lived experience making a career decision outside the IT profession. The core patterns developed into themes derived from the data were (a) conscious reality of economics, (b) sense of purpose, (c) feelings of competence, (d) desire for engaging work, (e) consciousness of gender disparity, and (f) relational experiences with family and mentors.

The in-depth interviews in the current qualitative phenomenological study led to an understanding of the meaning participants attached to career decision making to professions outside IT. Understanding this achievement should be useful to industry IT leaders in supporting STEM educational initiatives that establish and improve industry best practices in marketing, recruitment, retention, and enrichment programs that will draw female computer science graduates toward the IT profession. Because the focus of the study was on the antecedent meanings and experience of career choice, the researcher did not determine the post decision and workforce entry experiences of those who chose not to pursue IT careers. Changing the scope of the study to focus on how computer science and the wide array of fast-paced and evolving IT computer disciplines interrelate could lead to improvements applicable in future research.

Recommendations for Future Research

Given the narrow scope of the qualitative phenomenological study, additional research with a broader scope is necessary to validate key themes that emerged through interviews with the 15 participants who selected professions outside the IT profession at one company within the NCR. The first recommendation is to conduct a case study using graduates from different types of academic institutions across the United States. The findings of this study indicated relational interactions with mentors are part of the essence of the career decision-making experience. The purpose of such a case study would be to go beyond mentors and explore the influence of organizational culture and values between different types of postsecondary educational institutions on STEM career making decisions of students.

The generational cohorts comprising the sample for this study were 13% baby boomer, 54% Generation X, and 33% millennial. The focus of the case study would be extensively on members of the millennial generation who are digital natives and the primary investment concerns for current STEM-focused initiatives. The study results might reveal different findings for the 80 million millennial cohorts. Different findings could materially alter some of the practitioner recommendations of the current study in making them more focused toward the needs of today's college students.

Researchers could conduct further studies to develop a richer picture of the career decision-making experience, including a longitudinal study. The proposed study would track freshman female computer science candidates through the process of developmental trends associated with career choice over a span of 14 years from college entry through the first 10 years of workplace entry upon graduation. The study would be instrumental in determining if current STEM critical investments have an effect in increasing computer science graduates' selection of careers in IT. The study would also allow researchers to determine whether the essence of the career decision-making experience for IT-related jobs as detailed in the current study is of a short- or long-term nature.

Researchers could also focus on findings from the current study associated with social cognitive behavior of career satisfaction. Based upon the 25% of participants who discussed the road they did not take, more research is necessary to see how generalizable these feelings are. If the experiences and feelings reported in this study are prevalent in larger target populations of women not entering the IT profession, there may be potential for follow-up STEM career recruitment campaigns among these women. Based upon the NSF's science and engineering data from 2008, the return of every 10% of women lost to

STEM careers will result in approximately 42,000 positions filled each year (NSF, 2013). Researchers could also examine components of SCCT and the relationship between environmental influences and the emotions and high self-efficacy of female graduates considering technology professions and the impact on IT career decisions.

Summary

The purpose of the study was to explore the essence of the decision-making experiences of women who earned an undergraduate degree in computer science and chose careers outside the IT profession. Chapter 5 contained a review of the research questions, methodology, and limitations of by the study. The summary and interpretation of the findings from Chapter 4 provided the main results of the qualitative data, their explanations, and integration with established theory. Discussions included theoretical implications of the study, recommendations to leaders, and recommendations for further study based on the study limitations and research findings.

Conscious reality of economics, desire for engaging work, and relational experiences with family and mentors were the dominant three of the six major themes that supported the essence of the decision-making experience to choose a career outside the IT profession. Implications from the study provided a perspective on dominant factors contributing to the underrepresentation of females in the IT profession and to the ways these factors can affect future female computer science graduates' decision making regarding IT as a profession. The results from the semistructured method were consistent with some findings associated with the theoretical framework on decision theory outlined in Chapter 1.

Findings from the study supported a recommendation for building partnerships between businesses, universities, and local federal agencies to develop research-based practices offering paid IT-focused STEM research initiatives ensuring creativity and innovation continues during a period of slow economic growth. Another recommendation was for leaders in the IT industry to continue funding support for aggressive STEM IT programs in academia such as college internships, cooperative education, computer clubs and camps for women, and support networks for female computer science majors.

The findings from the current study included new insight to the issues associated with female computer science graduates' career decision making. The findings also included the participants' conscious reality of economics, desire for engaging work, and relational experiences with family and mentors and the ways each supported the essence of the decision-making experience of female computer science graduates. The findings indicated critical investments in STEM education for women in computer science may be a promising practice to offset why these women make career decisions outside the IT profession.

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Appendix A

Premises, Recruitment and Name (PRN) Use Permission

University of Phoenix®

PREMISES, RECRUITMENT AND NAME (PRN) USE PERMISSION

CACI International

Name of Facility, Organization, University, Institution, or Association

☑ I hereby authorize James M. Roy, a student of University of Phoenix, to use the premises (facility identified below) to conduct a study entitled Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study.

☑ I hereby authorize James M. Roy, a student of University of Phoenix, to recruit subjects for participation in a study entitled Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study.

☑ I hereby authorize James M. Roy, a student of University of Phoenix, to use the name of the facility, organization, university, institution, or association identified above when publishing results from the study entitled Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study. .

Signature 06/01/2012

Date 6/4/12

Mary Good

Name

Executive Vice President, Chief Human Resources Officer

Title

Signature 06/01/2012

Date 6/4/2012

Jody Brown

Name

Executive Vice President, Corporate Communications and Congressional Relations

Title

1100 North Glebe Road

Arlington, VA. 22201 USA

1

Appendix B

Data Access and Use Permission

DATA ACCESS AND USE PERMISSION

CACI International

Name of Facility, Organization, University, Institution, or Association

Please check mark any of the following statements that you approve regarding the study and data described below:

☑ I hereby authorize James M Roy, a student of University of Phoenix who is conducting a research study titled or described as follows: Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study access to, and use of, the non-identifiable archival data described as follows: The access and use of the CACI International resume database to identify candidate subjects for participation in the aforementioned research study. In granting this permission, I understand the following (please check mark each of the following as applicable):

☑ The data will be maintained in a secure and confidential manner.

☑ The data may be used in the publication of results from this study.

☑ This research study must have IRB approval at the University of Phoenix before access to the data identified here is provided to James M Roy.

☑ Access to, and use of, this data will not be transferred to any other person without my/our express written consent.

☑ The source of the data may be identified in the publication of the results of this study.

☑ Relevant information associated with this data will be available to the dissertation chair, dissertation committee, school as may be needed for educational purposes.

Mary Good

Signature

Executive Vice President

Chief Resources Officer

1100 North Glebe Road

Arlington, VA. 22201 USA

06/06/2012

Researcher Signature/Acknowledgement

06/06/2012

Current version 032012

Appendix C

Letter of Introduction

My name is James Roy and I am an employee of CACI International and a student at the University of Phoenix working on a Doctorate degree specializing in Information Systems Technology. I am conducting a research study entitled *Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study*. Despite the growing need for information technology (IT) workers, women are not stepping forward in significant numbers to take advantage of the career opportunities presented in the IT field. The purpose of the qualitative phenomenological research is to explore and understand the lived experiences of female Computer Science graduates to bring to light the beliefs or perceptions contributing to a woman's career decision outside of the IT profession.

I am looking for volunteers to participate in individual audio-recorded interviews that focus on obtaining your experiences and perceptions of why you chose not to work in the IT profession after obtaining a degree in computer science. The interview is expected to last no more than 90 minutes and will be hosted at a CACI International facility. The interview will be scheduled at your convenience. Your participation in the study is strictly voluntary. If you choose not to participate or wish to withdraw from the study at any time, you can do so without any consequences. The results of the research study may be published, but your identity will remain confidential and your name will not be disclosed to any outside party. Participation poses no foreseeable risks to you.

If the study peaks your interest and you would like to participate, or would like more information please contact me at (703) 628-7131, or send me an email at roysrus@email.phoenix.edu.

Sincerely,
James Roy

Appendix D

Study Participant Consent Form

Informed Consent: Participants 18 years of age and older

Dear,
My name is James Roy and I am a student at the University of Phoenix working on a Doctorate degree. I am doing a research study entitled Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study. The purpose of the research study is to explore and understand the lived experiences of female Computer Science graduates to bring to light the beliefs or perceptions contributing to a woman's career decision outside of the IT profession.

Your participation will involve responding to an audio recorded interview expected to last approximately 90 minutes. You can decide to be a part of this study or not. Once you start, you can withdraw from the study at any time without any penalty or loss of benefits. The results of the research study may be published but your identity will remain confidential and your name will not be made known to any outside party.

In this research, there are no foreseeable risks to you. Although there may be no direct benefit to you, a possible benefit from your being part of this study is that industry leaders may develop strategies toward encouraging female interest in becoming a force within the IT profession. With more women in the IT profession, society benefits because the ability to fill IT jobs with technically qualified women helps the future economic prosperity of the United States. The economic welfare and stability of the country depends on the ability of its skilled workforce to innovate and develop new products and services.

If you have any questions about the research study, contact me at (703) 628-7131 or roysrus@mail.phoenix.edu. For questions about your rights as a study participant, or any concerns or complaints, please contact the University of Phoenix Institutional Review Board via email at IRB@phoenix.edu.

As a participant in this study, you should understand the following:

1. You may decide not to be part of this study or you may want to withdraw from the study at any time. If you want to withdraw, you can do so without any problems.

2. Your identity will be kept confidential.

3. James Roy the researcher has fully explained the nature of the research study and has answered all of your questions and concerns.

4. You understand that the interview will be recorded, and by signing this form you grant permission for the researcher, James Roy, to record the interview. You understand that the information from the recorded interviews may be transcribed. The researcher will develop a way to code the data to assure that your name is protected.

5. Data will be kept in a secure and locked area. The data will be kept for three years, and then destroyed.

6. The results of this study may be published.

"By signing this form, you agree that you understand the nature of the study, the possible risks to you as a participant, and how your identity will be kept confidential. When you sign this form, this means that you are 18 years old or older and that you give your permission to volunteer as a participant in the study that is described here."

(☐) I accept the above terms. (☐) I do not accept the above terms. (CHECK ONE)

Signature of the interviewee _____ Date _____

Signature of the researcher _____ Date _____

Appendix E

Confidentiality Statement

University of Phoenix®

Underrepresentation of Female Computer Science Graduates in Information Technology: A Phenomenological Study.

James M. Roy

CONFIDENTIALITY STATEMENT

As a researcher working on the above research study at the University of Phoenix, I understand that I must maintain the confidentiality of all information concerning all research participants as required by law. Only the University of Phoenix Institutional Review Board may have access to this information. "Confidential Information" of participants includes but is not limited to: names, characteristics, or other identifying information, questionnaire scores, ratings, incidental comments, other information accrued either directly or indirectly through contact with any participant, and/or any other information that by its nature would be considered confidential. In order to maintain the confidentiality of the information, I hereby agree to refrain from discussing or disclosing any Confidential Information regarding research participants, to any individual who is not part of the above research study or in need of the information for the expressed purposes on the research program. This includes having a conversation regarding the research project or its participants in a place where such a discussion might be overheard; or discussing any Confidential Information in a way that would allow an unauthorized person to associate (either correctly or incorrectly) an identity with such information. I further agree to store research records whether paper, electronic or otherwise in a secure locked location under my direct control or with appropriate safe guards. I hereby further agree that if I have to use the services of a third party to assist in the research study, who will potentially have access to any Confidential Information of participants, that I will enter into an agreement with said third party prior to using any of the services, which shall provide at a minimum the confidential obligations set forth herein. I agree that I will immediately report any known or suspected breach of this confidentiality statement regarding the above research project to the University of Phoenix, Institutional Review Board.

James M Roy	JAMES M. ROY	06/05/2012
Signature of Researcher	Printed Name	Date
Raquel V. Alsruhe	Raquel V. Alsruhe	6/5/2012
Signature of Witness	Printed Name	Date

Appendix F

Draft Interview Protocol

Thank you for participating in the study. The results of the interview may help researchers understand why women are underrepresented in the information technology profession and offers a foundation for further inquiry.

Time of interview:

Date:

Place:

Interview Code:

The purpose of the research study is to explore and understand the lived experiences of female Computer Science graduates to bring to light the beliefs or perceptions contributing to a woman's career decision outside of the IT profession.

Draft interview questions

1. How would you describe your experience in making a career choice?
2. How prepared did you feel for your career choice? (If so or not) what made you feel prepared, or what made you feel like you weren't prepared?
3. How would you describe your personal abilities, values, and needs that supported your career decision?
4. Describe learning experiences and feelings that may have influenced your career choice?
5. What are your feelings toward suggestions of male dominance in the IT profession in making your career choice?

6. Describe any issues and feelings that may have influenced your career decision choice upon graduation from college?
7. Describe specific events and feelings related to your college experience and career choice decision.
8. Describe your experience with influencers and supporters who make you feel connected to your career choice.
9. How would you describe your feelings about selecting a career different from your college major?
10. Explain how you feel when you think about a long term career in IT.

Thank you for your participation. The information you shared with me today will remain confidential. I will not use your name or other identifying information in the dissertation coming from this study. Finally, do you have any questions?

Appendix G

Research Journal Template

RESEARCH JOURNAL TEMPLATE

Date of entry:	
Event:	
Descriptive notes	Reflective notes