Women chief technology officers in community colleges

by

Monica D. Wiggins

B.A., Wayne State University, 1992
M.S., University of Phoenix, 2005

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF EDUCATION

Department of Educational Leadership
College of Education

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Abstract

This study used a qualitative phenomenological method to investigate the experiences of women chief technology officers in community colleges and their experiences that led to attainment of leadership roles in technology.

Throughout the history of the United States, citizens have witnessed gender inequality in the workforce. The gender inequality faced by women in the workforce, specifically technology fields, is a concern that promotes an absence of diversity, inclusion, female role models, and varied perspectives; which further supports inequality in salaries and leadership attainment. Without a balance, barriers that women face in the workforce will continue to prevail.

The purpose of this study was to describe the experiences of women chief technology officers in community colleges. The study sought to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. In addition, the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. The intent of the study was to discover and define their experiences in the workforce (specifically the technology sector), education, and organizational structures.

This study goes beyond the barriers and deterrents that current literature highlights about bias and stereotype threats, and informs the technology field by providing practical methods through the use of positive mindsets that project an invincible determination to persist in technology. Those with high self–efficacy levels may view barriers as tasks to master and conquer (Zimmerman, Schunk, & DiBenedetto, 2015). The women of this study viewed barriers as temporary nuisances that they either had to go through, over, or around to master or conquer, but never did they view barriers as permanent obstacles keeping them from reaching their goals.

Positive mindsets allowed the women to reverse negative barriers into opportunities. The women took intimidating settings, such as meetings filled with men, and used such situations as platforms to promote women in technology among the men. When the women were tasked with completing degrading work with no extra pay, they accepted the tasks and completed them as if they were high priority tasks, and volunteered to complete additional projects that others refused, thus displaying unintentional leadership qualities to executive management. In addition, during leadership development, the women used common daily practices, such as staying organized, documenting processes, and showing respect to all levels. These are simple methods that women aspiring technology can apply immediately in the workplace.

This study discovered that, although the participants understood the negative aspects of being in the technology field, the passion they have for helping people through the use of technology, the community college, and growing women in technology to leverage equity in the future of technology for women, far outweighed any deterrents or barriers to persistence.

A deeper understanding of the lessons learned from the women chief technology officers in community colleges in this study contributes to knowledge of how more women may persist and attain technology leadership success through the recommendation of possessing positive mindsets.

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Dedication

I would like to dedicate this dissertation to the entire Sanders family, my late aunt Teressa, and my mother JoAnn, who listened amiably to my constant discussions about the study every day. Most of all, I dedicate this study to my daughters Alaris and Auriell. They have encouraged and supported me throughout the entire journey through all the missed movie nights and family outings. My daughters gifted me with a journal to use for notetaking during the writing process, with the inscription stating that the dissertation was only 1000 pages and that I could do it. To continue family time over three years, the three of us would sit at the table on our laptops silently writing and completing school assignments together. I thank them for their love, patience, inspiration, and for taking the climb with me.

Chapter 1 - Introduction

Introduction

Technology has dominated the twenty–first century. It is used daily to conduct business with co–workers, formal education and training, communicate with family and friends, collaborate with classmates, and to solve world problems. People use multiple technology software programs and hardware devices daily, from smart phones, tablets, and interactive gaming systems to smart televisions with voice–activated remote controls. Specifically, as smartphones and tablets continue to become multipurpose devices, it is no surprise that the ownership of such devices has continued to increase (Anderson, 2015). With technology being so prevalent in today's society, the workforce often requires understanding of the use of technology and the need to obtain technology related skills to compete in the workforce and on a global stage as a nation (U.S. Department of Education, n.d.).

As a global leader, the United States' workforce will need to have the skills to solve complex issues of today's world and "these are the types of skills that students learn by studying science, technology, engineering, and math—subjects collectively known as STEM" (U.S. Department of Education, n.d.). Federal reports highlight STEM related goals that include "…national security, cybersecurity, artificial intelligence, quantum information science, and advance manufacturing" (Committee on STEM Education [CoSTEM], 2018).

An example of the importance of STEM skills is provided by the late 2019 and 2020 response to the emergence of the virus that caused the Coronavirus Disease 2019, also known as COVID-19 (Centers for Disease Control [CDC], 2020). This COVID-19 pandemic is critical and requires the knowledge of skilled STEM professionals to address this world problem. The outbreak was first identified in Wuhan, China and has spread around the world, including the

United States. Current symptoms “include mild to severe respiratory illness with fever, cough, and difficulty breathing” (CDC, 2020), and severe cases have led to death of millions of Americans. Executive orders by state governments ordered the closing of many states around the nation in an attempt to curtail the spread of the virus. Organizations, such as the National Basketball Association, suspended their season due to the COVID-19 outbreak. In addition, many educational institutions, such as Michigan State, Los Angeles Community College District, University of Michigan, Yale, Harvard, Princeton, and Georgetown Universities suspended face–to–face classes to offer online courses to mitigate the outbreak (Agrawal & Kohli, 2020; Levenson, Boyette, & Mack, 2020). Soon afterward, educational institutions throughout the nation in every state, such as Kansas State University, and K–12 education systems followed suit. Technology provides a means to sustain the current state of education through virtual learning environments, where many education institutions were able to switch to online courses during this unforeseen health concern.

In addition, scientists have been researching this new virus to find treatments, and to discover and create a possible vaccine, for instance (CDC, 2020). The Bill and Melinda Gates Foundation, along with the National Institutes of Health, provided funding for scientists to research innovative vaccines to address the concern of the COVID-19 virus (Begley, 2020; Gates, 2020). It is hopeful that engineering a synthetic version will decrease the time to manufacture a vaccine to distribute to billions (Begley, 2020). With the use of computer technology, synthetic biologists can create antigens that will be the base of what promises to be more potent vaccines. Begley (2020) made the following observation:

> Using a computational protein-design algorithm, scientists might determine that, for instance, a nanoparticle 25 nanometers across and made of 60 identical pieces is ideal for

presenting the antigens, so their most immunity–inducing side faces outward, where the immune system can most easily "see" it (p. 4).

Using computer technology allows scientists to be able to try a million variants to find the right protein composition (Begley, 2020). Computers allow scientists to research for vaccines in a more efficient and timely manner. Currently, two vaccines are authorized and recommended to prevent COVID–19: Pfizer–BioNTech COVID–19 vaccines, and the Moderna COVID–19 vaccines. Multiple other vaccines are under development (CDC, 2020). As stated, this COVID-19 pandemic is critical and requires the knowledge of skilled STEM professionals to address this world problem. This issue requires individuals, regardless of gender, who can perform the necessary high skilled technology tasks to address such pressing world concerns. A Black woman, Dr. Kizzmekia Corbett of North Carolina, was one of the leading scientists behind the Moderna COVID–19 vaccines (Bryant, 2020).

The need for STEM skills is not specific to new technology, but also affects old manufacturing jobs (Radu, 2018), such as those associated with the automotive industry. Twenty–first century global automotive companies in the United States, such as General Motors (GM) headquartered in Detroit, MI., design cars with technology that makes phone calls, assists drivers with navigation and media features. New vehicles will provide the options of having integrated Amazon Alexa equipment, which is interactive artificial intelligence technology (General Motors, 2019) that is common today. Skilled technology workers will be required to continue to design, troubleshoot, repair, and maintain devices with advanced technology. America continues to face the challenge of producing future scientists and engineers (Moakler & Kim, 2014). Consequently, there is a shortage of technology workers and large technology

companies, such as Google and Apple, consider hiring individuals without degree credentials if they can perform the high–skilled technology tasks (Radu, 2018).

America needs to expand its pool of technology professionals and increase STEM education to fulfill the economic and workforce needs of today, and to maintain its status as a global leader in education. The need for more technology professionals requires a national initiative for all Americans to have access to high–quality STEM education. The goals of this initiative reported by the Committee on STEM Education (2018) include the need for Americans to increase diversity, equity, and inclusion for STEM, along with an increase in STEM literacy, while preparing the workforce for the future ensuring sustainability of America's ecosystem (CoSTEM, 2018). Despite the criticality of STEM, there are still underrepresented groups of people who may not have equal access to STEM education or to work in STEM fields. In the United States, one group that is underrepresented in STEM is women; although "women make up half the population, they comprise less than 30% of the STEM workforce" (CoSTEM, 2018). Accordingly, it is imperative for America to expand its pool of technology professionals to include women.

Consequently, gender disparities exist in STEM. It is vital to break the barriers to success and expand knowledge to increase the number of women in technology to help meet the nation's requirements. Expanding the talent among women may produce the next technology icons with world-changing ideas. It may increase the chances of growing skilled professionals who are leaders, innovators, educators, and researchers who can contribute to solving the complex issues of today's world, as so desperately needed (Jackson, Hillard, & Schneider, 2014).

The underrepresentation of women in technology is a "social and economic justice issue" (Zheng, Stapleton, Henneberger, & Woolley, 2016). Without an adequate balance of women in

the technology workforce, there will be a lack of diversity, inclusion, role models, and ideas from varied perspectives.

Problem Statement

Throughout the history of the United States, citizens have witnessed gender inequality in the workforce (Bailey & DiPrete, 2016; Wang & Degol, 2017), specifically in STEM fields (Wang & Degol, 2017). Women make up a large percentage of the population in the United States, but only account for a small percentage of technology professionals comprising 30% of the STEM workforce (CoSTEM, 2018). The percentage of men to women in STEM jobs is a distant 76% for men versus 24% for women (Ritzdorf, 2015, p. 18). However, more women attend postsecondary institutions and outperform men in education attainment, specifically at community colleges, but women only earn 92 cents for every dollar earned by men (Community College Daily, 2018). Studies show that women leaders with an increased number of female employees run more productive companies and provide competitive salaries of 10 percentage points more, showing an upsurge in wages and production with women CEOs (Soyars, 2017). Furthermore, STEM occupations earned nearly 70% more than the national average of occupations in 2005 (Terrell, 2007). For instance, the average wage and salary earnings for engineers were $74,670 and technology earnings were $67,010. The average STEM wage and salary earnings for all occupations were $64,560; while all other occupations averaged earnings of $37,870 in 2005 (Terrell, 2007). STEM related jobs continue to pay more than other occupations. The total median annual wage in 2018 for all occupations was $38,640; that for STEM fields was $84,880, and non-STEM fields was $37,020 (U.S. Department of Labor, 2019).

The gender inequality faced by women in the workforce, specifically in technology fields, is a concern that promotes an absence of diversity, inclusion, female role models, and varied perspectives, which further supports inequality in salaries and leadership attainment. Without a balance, barriers that women face in the workforce today will continue to prevail.

This study investigated the experiences of women chief technology officers in community colleges. Women are underrepresented in STEM, specifically leadership, and earn less than men; although women comprise half of the U.S. population, dominate the number of students enrolled in higher education, and represent a large percentage of employees in the workforce.

Purpose of Study

The purpose of this study was to describe the experiences of women chief technology officers in community colleges. The study sought to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. In addition, the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. The intent of the study was to discover and define their experiences in the workforce (specifically the technology sector), education, and organizational structures.

Methodology

The methodology is qualitative, using a phenomenological method with in–depth interviews. Data sources included interviews with open–ended questions. A copy of the interview questions is located in Appendix A. There were no archival records, physical artifacts or documents shared by the participants. Through triangulation, the collection of evidence from numerous forms of data, credibility of the procedures was increased (Creswell & Poth, 2018). In

this study, data was collected from video conference calls, audio recordings, notetaking, and electronic mail documentation.

A semi–structured interview protocol was used to be able to have participants elaborate on responses or to provide examples. There were 24 open–ended interview questions, which allowed opportunity for follow–up questions. The open–ended questions focused on the individuals related to the phenomenon, as well as the contexts wherein the participants experienced the phenomenon (Lochmiller & Lester, 2017).

Prior to administering interviews with participants, I underwent a bracketing interview by a colleague, as an attempt to identify any biases I may have had with the phenomenon of the study (Lochmiller & Lester, 2017), as a gesture of transparency and building trust (Roberts & Hyatt, 2019). Bracketing is "a concept common to phenomenology that refers to suspending judgment about the phenomenon of interest in order that you might know how the object of study really is [in actuality]" (Lochmiller & Lester, 2017, p. 289). I prepared a bracketing statement prior to collecting data. A copy of the bracketing statement is located in Appendix C.

The sample comprised 13 women chief technology officers in community colleges from various regions and community college structures. Building on the sample of 13 women chief technology officers in community colleges, only gender characteristics were considered in the sampling, regardless of age, race, ethnicity, socio–economic background, or religion. After receiving approval from the Institutional Review Board (IRB) to conduct the interviews, permission was sought from prospective participants to interview.

Research Questions

The research questions of the study were designed to gain a deeper understanding of the women chief technology officers' experiences that led to attainment of leadership roles in technology.

1) How do women chief technology officers in community colleges describe their experiences that shaped their careers?
2) What do they perceive as factors that shaped their careers? How do they perceive self–efficacy as a factor that shaped their careers?
3) How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership?

Theoretical Framework

The purpose of this study was to describe the experiences of women chief technology officers in the community college to identify the lessons learned during their journeys to discover a deeper understanding of their experiences that led to attainment of leadership roles in technology.

The primary theoretical framework for this study was Bandura's (1977) Self–Efficacy Theory. Through the lens of Bandura's theory of self–efficacy, the dimensions of the four sources of information for efficacy expectations deepened the understanding of the participants' experiences. Appreciative Inquiry Approach was a secondary concept used to strengthen the structure of the study through the use of its four tenets, as it sought to inquire what worked for the participants during their journeys.

Self–Efficacy Framework

In 1977, Albert Bandura created a framework to predict and explain the psychological changes associated with behavior. It is noted that cognitive processes play a key role in shaping behavior, and in his study, behavior responses were observed by participants through modeling (Bandura, 1977), so that he may study any behavioral changes before, during, and after testing. In other words, models of behavior were displayed by others, and participants who viewed the modeling had cognitive responses based on how they perceived the sources of information observed from the modeling.

This theory was chosen because in Bandura's social learning analysis, he states that efficacy expectations are derived from four main sources of information: Performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1977, p. 195). The more successes participants have the higher their mastery expectations will appear, making performance source the most influential, because it is based on personal mastery experiences (Bandura, 1977; Bandura & Adams, 1977). In the vicarious source, participants observed others succeed through adverse situations (Bandura & Adams, 1977). By observing others overcome threatening activities, they developed a sense of expectations that they, too, may overcome adverse situations and improve if they "intensify and persist in their efforts" (Bandura, 1977, p. 197). Having successful coping strategies falls under verbal persuasion (Bandura & Adams, 1977), and according to Bandura (1977), although verbal persuasions are greatly used to "influence human behavior" due to accessibility, they are a weak source for efficacy expectations. Telling people what to expect will rarely produce expected outcomes compared to one's own experiences. The fourth source of expectancy was physiological arousal where anxiety and vulnerability to adverse situations were observed. This arousal may affect "perceived

self–efficacy in coping" with stress (Bandura, 1977). Through the lens of Bandura's self–efficacy theory, a deeper understanding of the participants' experiences, perceived personal efficacy, social factors, persistence and attainment was obtained. Bandura's lens was useful for this study because, through the dimensions of the four sources of information for efficacy expectations, this lens assisted me with obtaining meaning of data and themes pertaining to the experiences of the participants as they relate to persistence, overcoming barriers, and how they perceived efficacy during their pursuit of technology leadership roles.

Appreciative Inquiry Approach

Aligned with the purpose of the study, I utilized appreciative inquiry, as a secondary conceptual framework, to acquire knowledge concerning positive factors that supported the participants to attain leadership roles in technology. The appreciative inquiry (positive strength-based) approach supported identifying what "worked" or what was "right" during their journeys (Egan & Feyerherm, 2005). There are four basic tenets of appreciative inquiry beginning with discovery: appreciating what is or what worked well, dream: envisioning or imagining what could be, design: determining what should be, and destiny: creating or executing what will be (Egan & Feyerherm, 2005; Priest, Kaufman, Brunton, & Seibel, 2013; Somerville & Farner, 2012).

The discovery process of the appreciative inquiry approach allowed me to identify and share positive attributes from the journeys to use in the future. The dream process helped shape an optimistic vision of how one imagines a better institution or STEM industry. During the design process, a blueprint for change was created that integrates the past, future, and positive desires that are relevant to today's reality (Egan & Feyerherm, 2005). Last, the destiny process executed transforming the design into reality (Egan & Feyerherm, 2005).

I sought to obtain data using appreciative inquiry processes in the interviews that would lend to the knowledge of the field, as the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. “During the discovery process of inquiry ... best experiences are collected…” (Somerville & Farner, 2012, p. 10). The four appreciative inquiry processes were embedded in the research questions. In addition, interview questions structured with positive appreciative inquiry processes in mind provided positive support information that institutions and aspiring women in technology may use to increase diversity, success in technology leadership, and skilled technology professionals.

Significance of the Study

The findings of the study may help women practitioners better understand how to succeed in the field because; through identifying lessons learned, other women may adopt the lessons and persist in technology and leadership roles; thus increasing the representation of women in technology.

The findings of the study may also inform practice and policy concerning disparities in the STEM workforce faced by underrepresented groups, specifically women; which may position the nation and local communities to increase its talented technology workforce and leadership pool. Increasing the talent and leadership in technology through the representation of women may not only benefit women, but also may contribute to the shortage of skilled technology professionals to support the local business economy and workforce, thus positioning the United States to continue to be a global competitor with skilled individuals who can solve complex world issues of today. The findings of this study may provide data that can be used by technology practitioners to improve practice in the field of technology, where women leaders are concerned, and will inform women aspiring technology leadership roles. In addition, this study

may provide information that can be used to strengthen the vantage point for equality in salaries and leadership attainment.

In other words, a deeper understanding of the lessons learned from the women chief technology officers in community colleges in this study may contribute to knowledge of how more women may persist and attain technology leadership success and identify the stance of community colleges during the journeys of the participants. With large technology companies, such as Google and Apple, willing to employ individuals with high–tech skills, whether or not they have formal training credentials (Radu, 2018), speaks to the criticality of the need to expand the talent pool in technology and leadership roles to include underrepresented women. The findings of the study may help address the concern of underrepresented women, because more women attend postsecondary institutions and outperform men in education attainment, specifically at community colleges, where underrepresented groups tend to earn additional skills or formal training credentials (Community College Daily, 2018).

Delimitations

The delimitations of the study derived from the selected criteria of the study. Clarifying the boundaries of the study indicated how I narrowed the scope of my study (Roberts & Hyatt, 2019). This is a qualitative interactive phenomenological study of women chief technology officers in community colleges, which posed limits that only incorporate women and community colleges.

Assumptions

An assumption considered in this study was that the interview questions were truthfully answered by participants in an open and honest manner (Roberts & Hyatt, 2019). It is further assumed that participants accurately recollected their experiences. Moreover, assumptions

include that this study would contribute knowledge to increase diversity and equity in the technology workforce and lend to a decrease in the gender gap. Also, it was assumed that strategies experienced by participants would be identified, despite challenges and barriers, so women aspiring STEM careers may employ them.

Limitations

While there are limitations with all studies with which I, as the scholar researcher, may have little or no control (Roberts & Hyatt, 2019), the limitations of this study proposed difficulty obtaining 12–15 women chief technology officers in community colleges, since women are underrepresented in technology, especially in leadership roles. In addition, regional differences were a limitation because, if the population is not large in size it limits the possibility of narrowing the criteria of participants from specific community college structures, such as from large urban multi–campus community colleges or from small single–site rural community colleges. The study was limited to a population of participants from various community college structures.

Another limitation may be reflexivity as described by Watt (2007), as "the process of intentionally accounting for your assumptions, biases, experiences, and identities that may impact any aspect of your research study." As a woman in a technology leadership role at a community college, it was necessary to be able to intentionally display reflexivity to support internal credibility of the study.

Definition of Terms

For the purpose of this study, it is necessary to describe the operational definitions of the following key terms used:

Bracketing: "A concept common to phenomenology that refers to suspending judgment about the phenomenon of interest in order that you might know how the object of study really is [in actuality]" (Lochmiller & Lester, 2017, p. 289).

Chief Technology Officers: For the purpose of this study, the operational definition of chief technology officers refers to a senior technology leadership role in the STEM or Information Technology industry for business and education sectors, including chief information officers (CIOs), vice chancellors, vice provosts, directors, vice presidents, and may be interchanged with other titles referring to senior technology leadership roles as defined by the institution. A Chief Technology Officer (CTO) is the executive in charge of an organization's technological needs, as well as its research and development (Frankenfield, 2019).

Community Colleges: Community colleges are defined as "any not–for–profit institution regionally accredited to award the associate in arts or the associate in science as its predominant degree. That definition includes the comprehensive two-year college, as well as many technical institutes, both public and private" (Cohen, Brawer, & Kisker, 2014, p. 5). In addition, the definition includes community colleges that collaborate with universities to offer baccalaureate degrees (Cohen et al., 2014, p. 5) and those that confer their own.

Professions: Careers or jobs that require formal training or college education. Law, medicine (Klass, 1961), and professors at universities, for example.

Reflexivity: The process of intentionally accounting for one's assumptions, biases, experiences, and identities that may impact any aspect of one's research study (Watt, 2007).

Self–efficacy: Refers to a person's belief or confidence in the ability to display control of one's behavior, motivation, or social environment (Bandura, 1977). Efficacy expectations are derived from four main sources of information: Performance accomplishments, vicarious

experience, verbal persuasion, and emotional arousal (Bandura, 1977, p. 195), with performance source being the most influential because it is based on personal mastery experiences (Bandura, 1977; Bandura & Adams, 1977).

STEM: Acronym for science, technology, engineering, and mathematics. Subjects collectively known as STEM. Skills to solve complex issues of today's world (U.S. Department of Education, n.d.).

STEM, Engineering, Technology: For the purpose of this study, these terms are used interchangeably. Technology includes computer information science and/or engineering science technologies. Computer information technology science includes computer programming, logic, algorithms, and systems administration, but does not include courses that instruct students in using software (e.g., processing). Engineering science technology refer to technical tasks used in engineering and science occupations, such as instrumentation or equipment maintenance (Cunningham, Hoyer, Sparks, & Ralph, 2015).

Stereotype Threats: Coined by Claude M. Steele, Department of Psychology at Stanford University, and Joshua Aronson, School of Education at the University of Texas, Austin, "Stereotype threat is being at risk of confirming, as self–characteristic, a negative stereotype about one's group" (Steele & Aronson, 1995, p. 797). Moreover, stereotype threats are negative stereotypes concerning a specific social group, such as women, that produces suboptimal performance by that particular group because of a cognitive awareness of the negative stereotypes (Beilock, Rydell, & McConnell, 2007).

Triangulation: Described by Creswell and Poth (2018) as a validity procedure wherein a practitioner scholar seeks to establish evidence across multiple lines of data for accuracy.

Organization of the Study

Chapter 1 served as the theoretical foundation for the research study. In Chapter 1, the issues were stated followed by the problems that were created by the issues. The purpose of the study followed and were based on the problems identified. This chapter identified the guiding research questions that helped to explore the problems stated. The methodology of the study used to examine the phenomenon was identified, as well as the theoretical framework.

Chapter 2 provided the literature review related to women in the workforce, leadership, technology, higher education, and factors contributing to underrepresentation. Chapter 3 described the methodology and the research design of the study. Chapter 4 explained the results and findings of the research, and Chapter 5 summarized the study in discussion and provided an analysis of the data findings and how it related to the current literature, implications, offered recommendations for future research and concluded, as based on general formats of qualitative studies (Roberts & Hyatt, 2019).

Chapter 2 - Review of the Literature

Literature Review Process

This chapter discussed the literature review related to women in the workforce, leadership, technology (STEM/engineering), and higher education. It discussed the United States workforce history, women in leadership, and the United States STEM quest. In addition, the chapter discussed factors contributing to underrepresentation, the need for STEM education, and the relevance of the literature review.

For the purpose of this literature review, education databases were used to search and identify the majority of prominent peer reviewed resources related to the topic or the problem of practice, and all resources were documented. The topic aligned with a problem of practice to study in more detail. After collecting the literature, an argument was developed that justifies a need for the study, and the literature was surveyed to identify specific resources that supported the argument. Then the literature was analyzed, synthesized, and summarized. This approach endorsed the process of critiquing the literature to identify any gaps for the study to address (Creswell & Poth, 2018; Lochmiller & Lester, 2017; Roberts & Hyatt, 2019). The literature was critiqued based on theoretical grounds of Bandura's Self–Efficacy Theoretical Framework. The following key words were used to research the resources: United States workforce, higher education, history, leadership, women, success, bias, barriers, STEM, technology, careers, underrepresentation, attainment, and community college. The overarching research question was: How do women chief technology officers in community colleges describe their experiences that shaped their careers?

Overview of Literature Review

The purpose of this study was to describe the experiences of women chief technology officers in community colleges. The study sought to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. In addition, the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. The intent of the study was to discover and define their experiences in the workforce (specifically the technology sector), education, and organizational structures.

The relevance of this review highlighted the gender gaps in STEM technology careers and leadership in today's society, specifically in the community college. Furthermore, the review discussed deficient diversity, the absence of role models and varied perspectives, and barriers, as they relate to the aforementioned technology leadership gender gaps. Significant to this study, the literature review added to the knowledge of the field by revealing gaps in the literature; and supporting the argument for the need to identify lessons learned to increase the representation of women in technology and leadership, and to produce skilled professionals who can solve complex world issues of the 21st century, reshaping the workforce.

For the theoretical framework, Role Congruity Theory of Prejudice Toward Female Leaders was considered, but not preferred. This theory discussed how gender roles and leader roles produce two forms of prejudice: The perception that women are less favorable as leaders; and "evaluating behavior that fulfills the prescriptions of a leader role less favorably when it is enacted by a woman" (Eagly & Karau, 2002, p. 2). Therefore, this theory was not chosen as the grounded theory for this study because it is understood that prejudice exists. Bandura's Self–Efficacy Theory was chosen as a primary theory because the study sought to discover how

women chief technology officers in community colleges persisted through prejudices, among other barriers and deterrents, to technology leadership roles. Appreciative Inquiry Approach was chosen as a secondary concept used to strengthen the structure of the study through the use of its four tenets, as it seeks to inquire what worked for the participants during their journeys; specifically, because literature is inundated with what is "wrong" (barriers).

Grounding the study in Bandura's Self–Efficacy Theoretical Framework allowed for a deeper understanding of the lessons learned to apply as a model for aspiring women in technology and leadership through the four principles of efficacy expectations. This theory was chosen because in Bandura's social learning analysis, he states that efficacy expectations are derived from four main sources of information: Performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1977, p. 195). The more successes participants have the higher their mastery expectations will appear, making performance source the most influential because it is based on personal mastery experiences (Bandura, 1977; Bandura & Adams, 1977). In the vicarious source, participants observed others succeed through adverse situations (Bandura & Adams, 1977). By observing others overcome threatening activities a sense of expectations that they too may overcome adverse situations and improve if they "intensify and persist in their efforts" (Bandura, 1977, p. 197). Having successful coping strategies falls under verbal persuasion (Bandura & Adams, 1977), and according to Bandura (1977), although verbal persuasions are greatly used to "influence human behavior" due to accessibility, it is a weak source for efficacy expectations. Telling people what to expect will rarely produce expected outcomes compared to one's own experiences. The fourth source of expectancy was physiological arousal where anxiety and vulnerability to adverse situations were observed. This arousal may affect "perceived self-efficacy in coping" with stress (Bandura,

1977). Through the lens of Bandura's self–efficacy theory, a deeper understanding of the participants' experiences, perceived personal efficacy, social factors, persistence, and attainment was obtained.

Introduction

Current literature on technology fields informs that the United States has a history of gender inequality in the workforce, academia, and leadership. Today, although the number of women in the workforce, leadership, and education has increased, there exists a gender disparity in technology leadership. Technology dominates today's society and as a global leader, the United States will need to have the skills to solve complex issues of today's world, which are the skills learned in science, technology, engineering, and math, referred to as STEM (U.S. Department of Education, n.d.).

This literature review discussed the history of the United States workforce, higher education, leadership, and technology, as well as the status of women in technology leadership roles in the community college and existing gaps and barriers. Considerable history of the United States workforce intertwines with higher education and the sustainability of the economy. Consequently, this history described a past that identifies with gender inequality and patriarchal structures in the workforce and academia.

Today, technology has infiltrated the world and how it functions. Daily, technology is rampant in the workplace, business, personal, social, and educational lives of individuals of all ages throughout society; and it demands in some form, familiarity with its use, maintenance, or innovation. In addition, there has been considerable change in the national demographics of students and employees with improved levels of women working and attending higher learning institutions. However, literature describes a present scene that continues to display gender

inequality and male–dominant structures in critical career fields, specifically in technology leadership (Community College Daily, 2018; CoSTEM, 2018; Ritzdorf, 2015).

United States Workforce History

Historically, there has been an inherent gender bias in the United States workforce. Although the number of women working and attending college has increased, they have not always had access or privilege to do so in the past. In addition, the increase in women working and attending college was not a privilege extended to women of all races, ethnicities, and socio-economic status (Grogan, 2010).

During the early decades of the 20th century, professional careers were male-dominated in the United States and the start of women obtaining professional work was limited to White women of middle-class status and above (Grogan, 2010). A college education was necessary to gain professional status and this was a time when educational institutions and academe did not welcome women, so access was denied. Without access to higher learning, women did not qualify to enter the professions and this norm did not start to change until later decades in the 20th century (Grogan, 2010). Although women of the dominant middle– to high–class socio–economic status began working as leaders in education, inequality still existed for these women in most countries. This situation did not include all women, which makes the lens of inclusiveness constricted with continued gender disparity (Grogan, 2010), in addition to status and race discrimination.

During the later decade of the 20th century, the number of women chief executive officers and administrators working in public community colleges climbed to 126 by 1990 (Giannini, 2001, p. 201). This was a growth of approximately 17% in the workforce where it was projected that from 1985 to 2000 there would be a growth of 135,000,000 workers. Nearly 47%

of this workforce was projected to be women, which was a jump from the 43% in 1980 (Giannini, 2001; U.S. Department of Labor, 1990).

Simultaneously, jobs for unskilled laborers dominated the workforce in the 20th century, but such jobs will constantly decline (Stephenson, 2001), especially in the 21st century where technology demands more skilled employees and learning institutions. With the prevalence of today's technology, the business community looks toward colleges to provide knowledge skills (McClenney & Mathis, 2011) to fulfill the workforce requirements.

Consequently, post–secondary institutions, especially "learning" colleges (colleges with a focus on student learning) of the 21st century, will require reform (O'Banion, 1997) for sustainability and to meet the needs of the community. This will require innovative duties to move forward in a constantly evolving technology–driven world, and leadership will be crucial.

United States STEM Quest and Underrepresentation

Data shows that students in the United States are not well prepared in STEM and this will put the nation in jeopardy (McGlynn, 2009). With many nations facing a shortage of skilled technology professionals, while opportunities in STEM fields are abundant, Washburn (2007) states that there are still fewer women pursuing fields of STEM and conducted a pilot study on women in positive media related programming roles to attract women to STEM. Alarmingly, a shortage of women in STEM related careers continues to exist. Tracey Welson-Rossman, the founder of TechGirlz concurs that there is a shortage of women in STEM related careers, stating that in information technology, there is a gender disparity with many more men than women (Welson-Rossman, 2019). "Women make up over 51 percent of the laborers in the U.S., but

account for less than 24 percent of the technology employees, with less than 18 percent of women being software engineers," stated Welson-Rossman (as cited in Radu, 2018, p. 3).

With technology being so prevalent in today's society, the workforce often requires some acquaintance with technology and the need to obtain skills to continue to be able to compete on a global stage (U.S. Department of Education, n.d.). Expanding the talent pool among women may produce productive benefits and identify the next technology prodigy with world-changing ideas and innovations (Jackson et al., 2014) to meet today's technology requirements.

It is vital to break the barriers of success to increase the number of women in technology and decrease the gender disparity to help meet the nation's requirements. There are several known factors associated with the underrepresentation of women in technology and the following section discusses notable factors.

Factors that Contribute to Underrepresentation

The current literature discusses factors that are associated with underrepresentation of women in technology. This section discusses several of the factors and their contribution to underrepresentation. The following factors are not an exhaustive list, but include social coping, diversity and men's implicit relations, risk aspects, stereotype threat effects, family and social ties, mentorships, religion, biases, microaggressions, and a lack of interest.

Social Coping

Morganson, Jones, and Major (2010), conducted a study to provide guidance for career development professionals by explaining the state of how women are underrepresented in STEM and how coping is a suggested framework to explain the gender gap, because women use coping significantly more than men. Analyses revealed that social coping was a stronger predictor for

women to commit to majors than for men. In other words, women benefit more from social coping than do men (Morganson, Jones, & Major, 2010). Interestingly, school and career counselors are a resource for social coping. Counselors' awareness of the career barriers women encounter in STEM fields may better position them to empathize with women and guide them. Consequently, administrators, faculty, and counselors may benefit by collaborating to promote social coping in their policies and programs. Along the same lines, according to Howard (2016), African American women overcome barriers to successful STEM careers through their family and social ties, mentoring relationships, as well as their religious practices.

Diversity and Men's Implicit Relations

Furthermore, Jackson, Hillard, and Schneider (2014) highlight how stereotypes may affect women in STEM. They examined the impact that gender diversity training would have on university faculty through studying changes in implicit associations and explicit attitudes toward women faculty in STEM. In this study, 234 STEM faculty participants from four Midwestern universities were sampled. Not surprisingly, men were more likely than women to explicitly approve of stereotypes, and their attitudes did not change as a result of the gender diversity training. However, participation in diversity training increased implicit associations among men. Findings revealed that diversity training had a positive effect on men's personal implicit associations toward women in STEM (Jackson et al., 2014).

Risk Aspects

On the other hand, Kincaid (2015) examined factors that may have contributed to women being underrepresented in STEM fields by examining aspects that contribute to success, and barriers that obstruct achievement, then addressed such knowledge gaps. Findings from Kincaid's study indicate that high resilience is positively associated to high grade-point averages

for women enrolled in STEM. Additional findings suggest that the stereotype threat effect was a risk factor for low-scoring women and was not a risk factor for high–scoring women, although findings show that both sets of women were affected by the stereotype threat. “Stereotype threat is being at risk of confirming, as self-characteristic, a negative stereotype about one’s group” (Steele & Aronson, 1995, p. 797). Results of Kincaid’s study found four factors that influence the success of women in STEM fields, as follows: elimination of stereotype threat, the enhancement of resilience of female students, expansion of female gender representation on community college campuses, and development of positive instructor–student and advisor–student relationships (Kincaid, 2015).

Gender Bias

The Society of Women Engineers and the Center for WorkLife Law at the University of California, Hastings College of the Law (WLL), conducted a study on men and women engineers’ experiences of bias in India that was built upon their 2015 study of Engineers’ bias experiences in the United States (Williams, Korn, Rincon, & Finn, 2018). The workplace biases were significant because they accompanied an engineer’s sense of belonging and helped engineers to make decisions to whether or not leave the company. Although the study revealed that there were significant forms of workplace bias for both men and women, gender bias was higher for women (Williams et al., 2018). Essentially, businesses may want to address workplace biases, especially for those companies and institutions seeking to provide equal opportunity for growth and retention of women (Williams et al., 2018).

The study identified four biases, two of which held preeminent bias levels. The two preeminent biases were the Tightrope and the Prove–It–Again biases. Seventy–seven percent of engineers reported experiencing the Tightrope bias, which was associated with all of the

workplace processes, including hiring and performance evaluations (Williams et al., 2018). This bias limited the range of behaviors that some engineers could display as being suitable. For example, if women behaved too feminine they may not be respected, or if they behaved too masculine, they may receive pushback for displaying the assertiveness as men (Williams et al., 2018). In the Prove–It–Again bias, 76% of engineers stated that they had to continually prove themselves in order to gain similar respect as other colleagues (Williams et al., 2018). The remaining two biases were the Maternal Wall and the Tug of War biases (Williams et al., 2018). The Maternal Wall was bias against mothers, and the Tug of War bias pitted women engineers against one another for limited positions designated for women (Williams et al., 2018). The study revealed that high levels of bias accompanied "feelings of exclusion, belonging, and lower intent to stay with one's employer" (Williams et al., 2018, p. 5).

In a subsequent study, the Society of Women Engineers and the WLL compared the workplace experiences of engineers in India to those of the United States. Over 3,000 U.S. engineers and 700 engineers from India were surveyed on their experiences in the workplace concerning gender and racial bias, in addition to the business processes. Among the engineers, white men reported the lowest levels of bias concerning gender and race (Williams et al., 2018). Although women were likely to report bias on gender, the men in India reported bias based on their region of origin or location. Awareness and training strategies to overcome workplace biases may support diversity in the engineering workplace (Corbett & Hill, 2015; Williams et al., 2018).

Nonetheless, women are encouraged, especially in the United States, to study technology/engineering, but workplace bias may pose as a barrier to retention (Williams et al., 2018). Twenty-one percent of 4-year engineering degrees are earned by women (Yoder, 2018),

but more women drop out of the field within the first five years (Corbett & Hill, 2015). Hill, Corbett, and Rose (2010), states that part of the attrition rate is because of the bias that women face in STEM.

Gender Microaggressions

Correspondingly, Yang and Carroll (2018) discusses various types of gendered microaggressions faced by women faculty in STEM disciplines. This literature talks about gendered microaggressions from elusive gestures to deliberate acts of discrimination against women that may cause discomfort, whether vocally or non-vocally displayed (Capodilupo, Nadal, Corman, Hamit, Lyons, & Weinberg, 2010; Yang & Carroll, 2018). Microaggressions in the workplace may discourage women from continuing or pursuing professional careers in industries or workplaces known for such behavior. This may be especially true in a male-dominant STEM workplace. A growing body of literature shows studies that examined women in STEM education and careers and found that women, especially women of color, experienced gendered microaggressions. Specifically, these microaggressions accompanied feelings of being excluded or unwelcomed in STEM (Faulkner, 2009; Thomas et al., 2016).

Such microaggressions aligned with the preeminent biases found in the Society of Women Engineers' and WLL's study, such as the aforementioned Tightrope bias, in which there were a limited range of behaviors that some engineers could display as being suitable. For example, if women behaved too feminine, they may not be respected, or if they behaved too masculine, they may receive pushback for displaying the assertiveness as men (Williams et al., 2018). Concurring microaggressions included the Strong Woman microaggressions type, where women may have been told that they were too assertive (Yang & Carroll, 2018), which is a trait

often associated with men. Other microaggressions included, but were not limited to, being silenced and marginalized (Yang & Carroll, 2018).

Stereotype Threat

Stereotype threats continue to represent factors contributing to underrepresentation of women in STEM. Coined by Claude M. Steele, Department of Psychology at Stanford University, and Joshua Aronson, School of Education at the University of Texas, Austin, "Stereotype threat is being at risk of confirming, as self-characteristic, a negative stereotype about one's group" (Steele & Aronson, 1995, p. 797). Stereotype threats exist when negative stereotypes concerning a specific social group, such as women, produces suboptimal performance by that particular group (Beilock et al., 2007).

The literature discusses how stereotyping a social group of people in a negative manner may impact their performance. Unfortunately, there are pervasive social stereotypes that suggest that men are more suited for specific careers, such as in STEM, where math and science subjects are prevalent. These are subjects where societal stereotypes suggest that men are better at math, for example, than women. When women are exposed to such stereotypes, it may become a belief and cause underperformance in math (Beilock et al., 2007). These stereotype threats can result in impaired performance because they may cause women to psychologically, as well as physiologically, believe the stereotypes (Hill, Corbett, & Rose, 2010).

The literature discusses how being exposed to negative stereotypes may cause individuals to underperform (Beilock et al., 2007) or doubt themselves, consequently, increasing the likelihood of removing themselves from the particular circumstance(s) associated with the stereotype threats. Subsequent to existing societal stereotype threats, barriers and deterrents also exist in academia and the workplace, especially for women (Beilock et al., 2007).

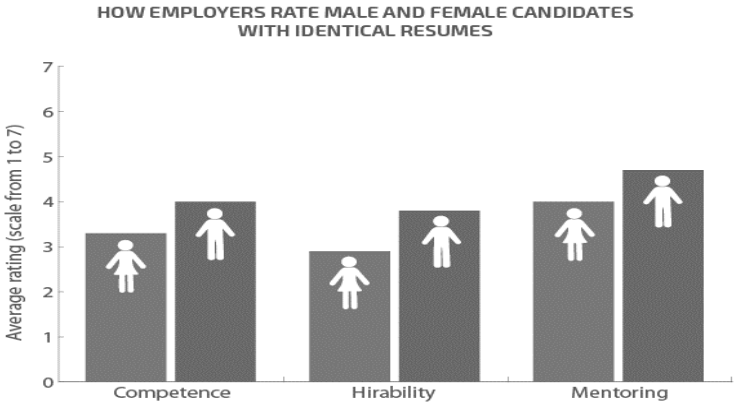
In addition, societal stereotypes have been embedded in individuals, which suggest that men should be agentic (decisive and independent), while women are expected to behave in a communal manner, displaying traits of being dependent, emotional, and supportive (Isaac, Kaatz, Lee, & Carnes, 2012). This type of assumption provides a false reality "that men are intrinsically more competent than women to achieve career success…" (Isaac et al., 2012).

Unfortunately, women make up the largest marginalized social group (Beilock et al., 2007), and negative stereotyping that discourages women in the workplace poses a disservice to the workforce by missing opportunities to possibly employ the most fit or qualified candidate for positions where women are not included or discriminated against. Society holds stereotypes that culturally shape how social groups are viewed. Reports discuss how stereotypes and biases mistreat women in engineering and computing (Hill et al., 2010) by not hiring an equally qualified or advanced candidate due to gender.

Figure 1. Displays how science faculty rated women lower than men with identical resumes in areas of competence, hire–ability, and mentoring for a hypothetical lab position.

Figure 1

How Employers Rate Male and Female Candidates with Identical Resumes



Source: Corbett, C., & Hill, C. (2015, March). Solving the equation: The variables for women's success in engineering and computing.

Other barriers may include career advancement and fewer institutional resources, such as mentorship, “research opportunities, administrative support, and equivalent compensation” (Isaac et al., 2012, p. 307).

Contrary to the aforementioned literature, Meiksins et al. (2019) discuss a study reporting that “interest” in engineering was a gender difference and may be associated with the “leaky pipeline” (Meiksins et al., 2019). The report states that women identified less with engineering and had a lower level of interest, partly due to viewing themselves as less competent. This may, in turn, be a factor as to why some women drop out or leave engineering technology for other majors or careers producing a “leak in the pipeline” (Meiksins et al., 2019).

The beliefs of one’s competence and how they view their “capabilities affect[s] their motivation and will to act, it consequently affects their performance” (Peguero & Shaffer, 2015, p. 48). Aligning with Bandura’s self-efficacy theoretical framework, where perceived efficacy impacts academic achievement, as well as impacting aspirational and psychosocial factors that affect performance (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996); literature supports the fact that barriers and deterrents for women in STEM exist.

Systemic Barriers and Opportunities

Additional factors that may contribute to underrepresentation in STEM fields are systemic barriers (National Academies of Sciences, Engineering, & Medicine [NASEM], 2016). Educational leaders and external stakeholders may unintentionally support structural obstacles that pose as systemic barriers and deterrents. Thus far, this study has discussed literature focused on underrepresented groups from a social, societal, or workplace perspective. However, there are systemic barriers in education for STEM students (NASEM, 2016) that leaders are urged to recognize in order to effectively address STEM education reform opportunities. Forward–

thinking reform opportunities may lead to sustainability and student success, but reform factors are scarcely studied (NASEM, 2016). The advancement and sustainability of STEM education, in a 21st century global economy, calls for collaborative leadership and STEM education reform (NASEM, 2016), among internal and external stakeholders, especially when ushered by increased dynamic technology, changing demographics and student populations.

Accordingly, the National Academies of Sciences, Engineering, and Medicine (2016) appointed a Committee (the Committee on Barriers and Opportunities in Completing 2–Year and 4–Year STEM Degrees) to address why some undergraduate STEM students lose interest before completing and how to improve the STEM education experiences for students (NASEM, 2016). The Committee discussed systemic barriers for students, STEM in particular, at 2–year and 4–year institutions. In addition to barriers, "opportunities to promote completion of undergraduate STEM degrees" (NASEM, 2016, p. 1) were discussed. Included are opportunities in which leaders may invest to increase student success in a systemic manner, where noticeable reform may occur in education institutions. It is vital for leaders of various entities and institutions, including local, state, and federal policymakers, funding organizations, accreditors, and educational department heads that may restructure STEM education, to look at reform in a broader manner (NASEM, 2016); and forming collaborative partnerships among these leaders may aid in the advancement of systemic STEM education reform.

Changing Demographics

Focusing on STEM students, factors that may cause diverse students to choose, stay, or leave the STEM spectrum include "race, ethnicity, gender, and socioeconomic factors" (NASEM, 2016), but factors most associated with attrition among underrepresented groups, include the "level of mathematics preparation and proficiency, departmental and classroom

culture, course sequencing, and cost" (NASEM, 2016). Many students of various majors, including STEM majors, may not complete their degrees. With this information in mind, it is important for community leaders and educational institutions to know and understand the multicultural students they serve (Cuyjet, Linder, Howard-Hamilton, & Cooper, 2016). Leaders are to, not only be aware of the trajectories and encounters of students, but also position the institution to systemically provide the necessary programs and tools for student success (NASEM, 2016). With changing demographics, many of today's students are from minority groups and are working parents (NASEM, 2016), much different from what were known as the "typical" students, who were first-time, full-time students (NASEM, 2016), so it is vital for leaders to know and understand the diverse student population and community they serve.

Different ways of learning and seeking degrees accompany the changing demographics and student population of today. There were 7.5 million students in 2–year colleges in 2011, representing 42% of all undergraduates (National Center for Education Statistics [NCES], 2014). Thirty–three percent of all undergraduate degrees awarded in 2008–2009 were Associate degrees (National Center for Education Statistics [NCES], 2013). Significantly, most of the students who attended community colleges were minorities. Fifty–seven percent of students were Black, 60% were Hispanic, and 41% were White and Asian/Pacific Islanders (NASEM, 2016; Witham, Malcom-Piqueux, Dowd, & Bensimon, 2015). Many of the minorities were low-income and first-generation students (NASEM, 2016). Along with a more multicultural student population, women make up the larger majority of enrollment, an increase from 54% over two decades ago to 57% today (NASEM, 2016). Although the number of women is STEM majors has increased, they still comprise the minority in engineering at 21%, computer science at 25%, and math at 25% (NASEM, 2016).

Complex STEM Pathways and Inadequate Data Tracking

Correspondingly, literature revealed that the pathways of aspirant STEM students are complex and national data systems are inadequate. In addition, the very nature of the STEM culture, which is "the shared patterns of norms, behaviors, and values of STEM disciplines that manifest themselves in the way courses are taught and the classroom is experienced" (NASEM, 2016, pp. 59-60), may be a barrier. In addition, STEM fields can be costly compared to other fields (NASEM, 2016). Such findings may deter students from seeking STEM degrees.

A growing proportion of undergraduate students attend part-time and transfer between institutions. They may transfer from various pathways, including reverse transfer, where they transfer from 4-year to 2–year institutions. These students are difficult to track because national data, such as the Integrated Postsecondary Education Data Systems (IPEDS), track first-time, full-time students and not necessarily the growing number of students attending community colleges (NASEM, 2016). Such students may have atypical trajectories, which may have been to earn a certificate, increase skills for a job, or transfer to 4–year or other institutions to complete (NASEM, 2016). Adequate data systems are important considering the growth in the level of part-time undergraduate students and students who transfer between institutions. Hence, it is imperative for state, federal, and other funding entities to be aware of data strategies that best analyze student data to make informed policy decisions (NASEM, 2016).

Culture of Institution

Furthermore, the culture that an institution displays often defines how students connect to academia and how they identify or understand the expectations as a student (NASEM, 2016). For example, women in engineering may need to overcome inherent stereotypes that suggest that engineering is a profession suitable only for men (NASEM, 2016). Therefore, the beliefs that

students hold concerning their academic domain and where they fit in the domain may work in support of or against their performance and persistence in STEM fields (NASEM, 2016).

Cost

Finally, cost may be another deterrent for STEM students to stop-out or switch majors. Generally, STEM graduates have more debt than other majors and the complicated transfer pathways can extend the cost for students to earn a degree (NASEM, 2016). Students with more cost may be inclined not to complete. However, underrepresented students may have less cost compared to other students, perhaps due to having greater tuition assistance or other financial needs (NASEM, 2016). Underrepresented students are also likely to attend community colleges, colleges with lower costs, and less-selective 4-year institutions (NASEM, 2016); and they represent 44% of students who earn degrees at public research institutions (NASEM, 2016).

Leadership Reform Opportunities

Although reform studies are scarcely researched, literature states that leadership is key to scale systemic STEM education reform (NASEM, 2016). Opportunities may call for college department chairs to encourage students to seek faculty positions in STEM through support from the departmental level (NASEM, 2016). Internal and external leaders, such as deans, presidents, trustees, and accreditors can be key to supporting STEM reform through policy changes that align with students' needs concerning tuition, transfers, articulation, and course credit (NASEM, 2016). Business leaders and legislators are vital to systemic reform, as well (NASEM, 2016), and building partnerships that support collaboration, engage conversation, and ignite action in support of STEM education reform should be encouraged among leadership (internal and external) of various levels on a larger scale (NASEM, 2016).

There is an extensive body of literature available concerning factors that may deter women from seeking or continuing careers in the STEM workforce and academia. Consequently, there is a gap in the literature concerning how women chief technology officers (senior technology leaders) persisted to technology leadership roles in community colleges despite barriers. This section discussed the more notable factors that may discourage women in STEM or those aspiring to a STEM career.

Interventions as Factors to Success

A synopsis of the literature discusses the success of women in STEM from viewpoints of decreasing the barriers and stereotypes, whether in STEM workforce, leadership, or education, in anticipation of decreasing the gaps that underrepresented groups, such as women, face in STEM. In other words, literature notes interventions and approaches that suggest success may be increased through narrowing the barrier gaps (Armstrong & Jovanovic, 2017; Inkelas, 2011; McGee & Bentley, 2017; Stanich, Pelch, Theobald, & Freeman, 2018). There are limited studies with a focus on the successes of women in STEM leadership roles and, although women have made advancement in the workforce, education, and leadership roles, there is still a need for approaches and models that map a path to success in STEM roles for aspiring women to follow.

Consequently, researchers have developed interventions to increase student success by addressing ways to decrease the barriers that underrepresented students face. There are several explanations of why underrepresented students are at greater disadvantages than other students, such as being first–generation students from low–income families, single parents, working while attending school, or women being exposed to stereotypes concerning low performance expectations in STEM fields, like mathematics (Stanich et al., 2018).

To intervene and increase success, one study addressed the need to implement highly structured courses that promote intentional practices of exams, active learning, and a sense of community. This study also suggested mentoring, financial aid support, research opportunities, and supplemental instruction (Stanich et al., 2018). In addition, to increase a positive sense of belonging and decrease achievement gaps associated with stereotype threats, structured group discussions were suggested (Stanich et al., 2018). Inkelas (2011) discusses living–learning programs where students living in dormitories are matched to an academic theme or topic. Consequently, the study states that living-learning programs, although not created specifically for women, may be successful with promoting success for women in STEM, as they seek to foster friendly learning environments (Inkelas, 2011). Another study discussed how experiences of high-achieving women in STEM, who displayed resilience or persistence through biases, may be a source of information for institutions to offer support for those who faced multiple risks, including biases related to structural racism and race-gender bias, for example (McGee & Bentley, 2017).

Alternatively, intervention to increase success, empowerment, and support of women focused on intersectional underrepresented women; those who held multiple minority identities, such as being Black and a woman (Armstrong & Jovanovic, 2017). The study sought to understand patterns and themes of intersectional underrepresented women in technology at the institutional level to highlight strategies that may be beneficial for support programs (Armstrong & Jovanovic, 2017).

Although literature discusses the many barriers that women face in STEM workforce, leadership, and education; literature also discusses possible interventions and how women have advanced in many of these areas, but salient disparities still exist. Prior research explains that

only 30% of women comprise technology professionals in the STEM workforce (CoSTEM, 2018), and STEM jobs comprise only 24% of women compared to the large number of men at 76% (Ritzdorf, 2015). There are more women in STEM majors, but not in engineering, computer science, and math (NASEM, 2016).

Women in Leadership

Today, leadership skills will require entrepreneurial and collaborative mindsets intertwined with critical thinking, networking, and innovative ideas, which are leadership qualities associated with or found in women (Giannini, 2001; Stephenson, 2001). Women represent over half of the number of white–collar workers in the United States, but when it comes to the number of women leading or holding executive positions, the number is despairingly disproportionate. Only 4.6% of white–collar executives are represented by women (Soyars, 2017). Studies show that women leaders with an increased number of female employees run more productive companies and provide competitive salaries of 10 percentage points more, showing an upsurge in wages and production with women CEOs (Soyars, 2017).

Gender characteristics may play a role in the accomplishments of increased wages and productivity (Soyars, 2017). It will be essential for leaders to be flexible to change as demographics continue to shift to effectively support and educate a diverse student population that demands inclusiveness and equity (Grogan, 2010). Flexibility will entail being open to variant perspectives and ideas, and these too, are the type of characteristics that are prevalent in women leaders (Stephenson, 2001). Many of the leadership qualities valued today entail leaders who are approachable, open to communication and possess social acumen; and these qualities are not dominated by male leaders (Rosin, 2010). The aforementioned qualities display that women

may not lead the same as men have led in the past and may bring innovative leadership approaches and perspectives to the workplace.

Conversely, there are some very remarkable tendencies apparent that nations may benefit from when women lead. Remunerations are present among communities with educated citizens, because such citizens advance the economy and communities in general and, there are propensities showing that when women and young girls are educated, the nation benefits greatly, whereby the gross domestic product grows (Dychtwald & Larson, 2010). Similar tendencies are present among corporations when they increase the number of women employed in senior leadership positions. Apparently, the company's financial bottom–line shows improved performance when compared to when only men are in the senior head positions. Such trends posed from educated women in leadership and the workforce are making their presence known (Dychtwald & Larson, 2010).

More than half of the professional jobs in the United States today are held by women at 51.4%, including managerial positions, compared to 26.1% held decades ago, but there are still salary gaps when compared to the male counterparts (Grogan, 2010). More degrees in higher education are earned by women and may lead to more professional roles, which may position women to be able to redesign and reform the workplace and its inequalities among the genders by improving working conditions (Grogan, 2010). However, though this is an advancement for women, it may not necessarily include the top leadership positions, such as CEO of Fortune 500 companies, President of the United States, or of U.S. school districts. A disparity still exists among such leadership roles and is deemed newsworthy when a woman is appointed to such prestigious positions; nonetheless, trends show that women bring different leadership approaches to business and education (Grogan, 2010).

Studies of women leading, as the heads of school districts in the United States, identified five recurring qualities and each of them required selfless leadership for the common good. The leadership qualities included leading for learning, social justice, relational, spiritual, and a work-life balance mode (Grogan & Shakeshaft, 2011). Literature displays that leadership by women bring different approaches from the styles of the past that include qualities encompassing selfless leadership for the common good (Grogan & Shakeshaft, 2011).

In a patriarchal society, women have endured climates of hostility and unwanted conditions. Women have been able to adapt to changing environments, communicate, collaborate, and persevere in business and academe settings; and have the capacity to reshape the meaning of work and leadership, especially for the women to follow (Grogan, 2010). As they move into top leadership roles, women may be positioned to change the inequalities of past leadership values and characteristics (Grogan, 2010). Innovative leadership may be required for such change, especially today, where evolving technology is prevalent.

Need for STEM Education

It is predicted that many future jobs will be in STEM areas and the majority of them will require higher learning degrees, specifically associate degrees, more so than baccalaureate (Blakely, 2016). Hagedorn and Purnamasari (2012) set out to identify how community colleges can be part of the solution to the nation's STEM shortage issue and uncovered gaps in STEM based on gender, geographic locations, and ethnic groups; and suggested that gaps exist in part due to a lack of quality STEM instructors and a lack of equal access to STEM degree programs.

Although specific to minority women, Wilson (2016) added that educational institutional strategies, culture, and activities contribute to the persistence of Black women in STEM, as well as strong identities. In support of the prediction of future jobs being in STEM areas and requiring

higher learning degrees, Blakely (2016) asserts that many underrepresented student populations attend community colleges, and their leaders must be innovative in addressing the STEM gap. The United States is not prepared (McGlynn, 2009) and needs to increase STEM careers and training to include underrepresented populations, specifically women, through skillful training.

In 2009, former President Barack Obama challenged all Americans to further their education beyond a high school diploma and challenged higher education institutions to improve the completion rates by 10 million by the year 2020 (Mullin, 2010). President Obama was aware of the importance of technology and its criticality to the sustainability of the United States to compete on a global platform. Where the United States once ranked first in degree attainment in 1990, by 2013 the United States ranked 12th (Obama, n.d.). President Obama's guiding principles were to ensure that "America has 21st century digital infrastructure—such as high–speed broadband Internet access, fourth-generation (4G) wireless networks, new health care information technology and a modernized electrical grid—is critical to our long–term prosperity and competitiveness" (Obama, 2011, p. 1). Obama created initiatives that supported technology education, such as Computer Science for All (Smith, 2016) and Every Student Succeeds Act of 2015.

Since community colleges are able to provide quality short–term training to individuals through certificates or Associate degrees to meet the needs of the workforce, the business communities and policymakers often turn to the colleges to quickly produce skilled workers (Obama & Biden, 2010). The Obama Administration stood behind the concept that America would not be able to lead in today's world of technology without the best educated citizens to compete in the workforce on a global stage (Kanter, 2011). Simultaneous to the challenge to increase completion rates, educational institutions had to deal with state disinvestments and new

federal financial aid requirements. The mandates brought along unforeseen changes for higher education institutions and increased financial difficulties, calling for leaders to be innovative fundraisers with entrepreneurial mindsets, in other words, new leadership perspectives were required.

New perspectives may be found in underrepresented groups, such as women. Higher learning institutions, specifically community colleges, continue to be looked upon to provide such training to address the economic concerns of the local business communities throughout the nation in general. With the high enrollment of women in community colleges, 6–year overall graduation rates at 63% for females and 57% for males at both public and private institutions (National Center for Education Statistics [NCES], 2019), these colleges have vast access to an underrepresented group of women. Conversely, the quality of education provided in underserved communities has a significant impact on their pathways into STEM careers (Hayden, Ouyang, Scinski, Olszewski, & Bielefeldt, 2011), so the ties that community colleges build with local K-12 institutions will be a key factor to attracting and guiding females to STEM early.

Community colleges continue to be rightly positioned to train and educate the nation's STEM students with their open–door philosophies and affordable tuition. In 2010, President Obama convened the first White House Summit on community colleges highlighting the important role of the community college institutions and focusing on initiatives, such as technical training for middle-class jobs (Obama, n.d.). Many students who may not have otherwise attended a higher learning institution are afforded access to higher learning through these institutions that help students "make a good living and live a good life," (O'Banion, 2019, p. 3).

These institutions have welcomed women into their halls of academe since their inception (Stephenson, 2001).

With the aforementioned challenges faced by community colleges today, such as finding new funding structures behind the states' disinvestments, low enrollment, and completion pressures from external stakeholders; the inclusion of women and their leadership perspectives may be the answer to these challenges, but not without reform and openness to change (Stephenson, 2001). Global efforts must be supported by educators and leaders must have courage to lead differently in schools and the business realm (Grogan, 2010).

Chapter Summary

This chapter discussed gender disparities in STEM, specifically leadership, and highlighted existing barriers and deterrents women face. This chapter discussed literature on possible interventions to decrease gender disparities. While the literature highlighted gender disparities in STEM, there were gaps in the literature concerning studies of the experiences of women chief technology officers (senior technology leaders) that led to attainment of senior technology leadership roles in community colleges. Gaps in the literature supported the argument for the need to identify lessons learned during the participants' journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. There is an apparent need to increase the representation of women in technology and leadership, and to produce skilled professionals who can solve complex world issues of the 21st century.

Although women have made advances in workforce, education, and leadership roles, there is still a need for approaches and models that map a path to success in STEM roles for aspiring women to follow.

Expanding the talent among women may produce benefits for productivity and identify technology professionals with world–changing ideas and innovations (Jackson et al., 2014). It increases the chances of growing skilled professionals who are leaders, innovators, educators, and researchers who can contribute to solving the complex issues of today's world, that is so desperately needed. Without an adequate balance of women in technology there will be a lack of diversity, inclusion, role models, and ideas from varied perspectives.

Chapter 3 - Research Methodology

Introduction

The purpose of this chapter was to describe the research methodology of the study. The methodology is a qualitative phenomenology study describing the experiences of women chief technology officers in community colleges. This method allowed me, as the scholar researcher, to collect direct quotes and in–depth information from interviews that described the participants' experiences from their perspectives (Lochmiller & Lester, 2017). This design also allowed participants to elaborate on their responses.

Context and Problem

This study investigated the experiences of women chief technology officers in community colleges and their experiences that led to attainment of leadership roles in technology. Throughout the history of the United States, citizens have witnessed gender inequality in the workforce. Women make up a large percentage of the population in the United States, but only account for a small percentage of technology professionals comprising 30% of the STEM workforce (CoSTEM, 2018). The percentage of men to women in STEM jobs is a distant 76% for men versus 24% for women (Ritzdorf, 2015, p. 18).

Similarly, more women attend postsecondary institutions and outperform men in education attainment, specifically at community colleges, but women earn only 92 cents for every dollar earned by men (Community College Daily, 2018). The gender inequality faced by women in the workforce, specifically technology fields, is a concern that promotes an absence of diversity, inclusion, female role models, and varied perspectives; which further supports inequality in salaries and leadership attainment. Without a balance, barriers that women face in

the workforce will continue to prevail. In summation, women are underrepresented in technology and earn less than men, although women comprise of half of the U.S. population, dominate the number of students enrolled in higher education, and represent a large percentage of employees in the workforce.

Chapter Organization

This chapter describes, in–depth, the purpose and research questions of the study, the research design, the rationale for the design, research ethics, population and sample, instrumentation, data collection procedures, data analysis, trustworthiness, and limitations (Roberts & Hyatt, 2019).

Purpose of Study

The purpose of this study was to describe the experiences of women chief technology officers in community colleges. The study sought to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. In addition, the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. The intent of the study was to discover and define their experiences in the workforce (specifically the technology sector), education, and organizational structures.

Research Questions

The research questions of the study were designed to gain a deeper understanding of the women chief technology officers' experiences that led to attainment of leadership roles in technology.

1) How do women chief technology officers in community colleges describe their experiences that shaped their careers?
2) What do they perceive as factors that shaped their careers? How do they perceive self–efficacy as a factor that shaped their careers?
3) How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership?

Research Design

The methodology is qualitative using a phenomenological method with in–depth open–ended interview questions to obtain a rich description of the participants' experiences of the phenomenon (Lochmiller & Lester, 2017). The qualitative approach allowed the participants to elaborate on their experiences from their viewpoints centered on the methodology research procedures, axiology (values), epistemology (by what means researcher obtained knowledge), ontology (the nature of reality), and rhetoric concepts (Creswell, 2007; Roberts & Hyatt, 2019).

A phenomenology study allows the recounts of a theoretical viewpoint to the study of human experiences. This methodology is best in this study for understanding the individuals' shared experiences (Lochmiller & Lester, 2017).

Prior to administering interviews with participants, I underwent a bracketing interview by a colleague, as an attempt to identify any biases I may have had with the phenomenon of the study (Lochmiller & Lester, 2017), as a gesture of transparency and building trust (Roberts & Hyatt, 2019). Bracketing is "a concept common to phenomenology that refers to suspending judgment about the phenomenon of interest in order that you might know how the object of study

really is [in actuality]" (Lochmiller & Lester, 2017, p. 289). I prepared a bracketing statement prior to collecting data. A copy of the bracketing statement is located in Appendix C.

I used a qualitative phenomenological method with in–depth open–ended interview questions for this study, because this design allowed me to obtain rich descriptions of the participants' experiences of the phenomenon. Participants described, in detail, the experiences they encountered during their journeys to technology leadership in community colleges. The participants shared elaborate stories about their experiences and recounted how they felt in many of the situations they encountered. This design accounted for a deeper understanding of their experiences as women and people in general.

Ethical Considerations

Educational organizations have Institutional Review Boards (IRB) to ensure that their scholar researchers' studies abide by the Code of Federal Regulations for the Protection of Human Subjects. In addition, the IRB assures that the research is conducted using ethical principles (Lochmiller & Lester, 2017). There are three main principles to which the IRB must correspond to, as specified in the Belmont Reports of 1978 (Roberts & Hyatt, 2019). The first principle is respect for persons, which concerns voluntary and informed consent, confidentiality, and the right to withdraw. The second principle is beneficence, which concerns risks and conflicts. The third principle is justice, which assures that participation is borne equally by society, and that the study doesn't exploit vulnerable persons or exclude those who may benefit from the study (Roberts & Hyatt, 2019; U.S. Department of Health and Human Services, 2018).

After receiving approval from the Institutional Review Board (IRB) on May 15, 2020 to conduct the study, networking and snowballing techniques were enacted in search of women CTOs, as deemed necessary. I contacted colleagues in my personal network, in addition to

educational and technology organizations, such as Educause, the American Association of Community Colleges, the American Council on Education Women's Network, the Michigan Council of Women in Technology, and the Michigan Association of Community Colleges, in pursuit of directories or access to women CTOs in community colleges. Multiple avenues of communication were made as necessary, such as the use of computer and telecommunication services to request qualifying women to participate. An invitation to participate in the study was sent to prospective participants through email communication. The invitation to participate in the study is located in Appendix D.

The purpose and nature of the study was explained to prospective participants. Once prospective participants expressed interest in the study, the IRB consent forms requesting return signatures were sent to the prospective participants, along with an invitation to access the Zoom interview link, and interview questions. An explanation of the study and its purpose was explained to prospective participants on the consent form. A copy of the consent form is located in Appendix E.

After reiterating the purpose and explaining the process of the study to the prospective participants, the signed consent forms were collected prior to administering interviews or soliciting data (Lochmiller & Lester, 2017). Participants were made aware that their data, feelings, or views would be securely held in confidentiality. Therefore, pseudonyms were used for anonymity and confidentiality of the participants. "Anonymizing data involves removing any identifiable characteristics from the dataset that could potentially (if the data were disclosed publicly) identify the participants in your study" (Lochmiller & Lester, 2017, p. 83). Pseudonyms were provided for participants and for the colleges where they performed as the senior technology leader. The pseudonyms were assembled based on names of my preceding

family members. The names of relatives were randomly assigned to participants and to the colleges where they performed as senior technology leaders. This naming convention was chosen to easily recollect the names of the participants and colleges, and as a means to have my family accompany me during my dissertation journey.

In addition, the states that the colleges were located in were referred to by region for further anonymity of the dataset. Furthermore, comments or thoughts from other participants were shared or discussed (Lochmiller & Lester, 2017). The prospective participants were directly contacted without the need to confer with a gatekeeper of the college. Anonymizing the data was a means to assure participants of confidentiality and that their data would not be disclosed in a manner that would identify them (Lochmiller & Lester, 2017).

Population and Sample

The population of participants consists of women in technology in community colleges in the United States. Community colleges are defined as "any not–for–profit institution regionally accredited to award the associate in arts or the associate in science as its predominant degree. That definition includes the comprehensive 2–year college, as well as many technical institutes, both public and private" (Cohen et al., 2014, p. 5). In addition, the definition includes community colleges that collaborate with universities to offer baccalaureate degrees (Cohen et al., 2014, p. 5) and those that confer their own.

The community colleges were in various regions, such as the Midwest, Northeast, Southeast, Southwest, and West regions. The colleges were located in rural or urban settings within the United States. The colleges consist of various physical structures, such as single–site or multiple–site colleges, and colleges with one or multiple campus locations.

A characteristic of qualitative studies is that they are known to have small samples (Lochmiller & Lester, 2017, p. 110; Roberts & Hyatt, 2019, p. 143); therefore, the sample was 13 from a proposed 12–15 participants. According to Lochmiller and Lester (2017), "A purposeful sample is when the researcher selects individuals or sites on the basis of specific criteria" (p. 141). A purposeful sample was used in this study based on the specific criteria required of participants, such as being a woman in a senior role in technology in a community college. The participants were 13 women chief technology officers: senior level executives in charge of an organization's technological needs, as well as its research and development (Frankenfield, 2019). The senior level executives were referenced by assorted work titles, such as chief information officers, vice chancellors, vice provosts, directors, vice presidents, and may be interchanged with other titles referring to senior technology leadership roles, as defined by the institution. Other than gender, there were no constraints on personal characteristics of age, race, religion, nationality, socioeconomic background, or ethnicity.

Instrumentation

The instrument administered was an interview tool conducted digitally and virtually. An original interview instrument was developed and used. The instrument comprised 24 open–ended in–depth interview questions that emerged from the research questions. The instrument closely aligned with the study's research questions embedded in the theoretical framework to "ensure that all research concepts…are adequately covered in [the] instrument" (Roberts & Hyatt, 2019, p. 150). An instrument alignment matrix was created that displays the corresponding research questions adjacent to the corresponding interview questions affirming alignment (Roberts & Hyatt, 2019). As in qualitative studies, I was also an instrument, whereby I collected and

analyzed the data (Lochmiller & Lester, 2017). The instrument alignment matrix is located in Appendix F.

A pilot test or review of the interview instrument by an individual colleague was administered to test credibility and dependability. A colleague who met the same criteria as the prospective participants completed the interview process. The individual of the pilot test looked for "understandable instructions, clear wording, adequate answers, sufficient information, length, and convenience" of the instrument (Roberts & Hyatt, 2019, p. 152). After the pilot test, there were no necessary revisions administered to the instrument. This form of credibility ensures the interview instrument provides the data that will inform the research questions and increases dependability by providing support for the conclusion of ascertaining what it was designed to ascertain (Roberts & Hyatt, 2019). Subsequently, dependability increases trustworthiness.

Trustworthiness

Trustworthiness was sought through, but not limited to, participant and data triangulation, member–checking, and peer–debriefing (Lochmiller & Lester, 2017). Accordingly, quality and trustworthiness were identified by eight tenets: 1) worthy topic – the topic of the research was relevant, timely, significant, and interesting; 2) rich rigor – the study used sufficient data and time in the field, samples, theoretical constructs, contexts, and data collection and analysis processes; 3) sincerity – the study was characterize by self–reflexivity about the subjective values and biases; 4) credibility – the research was marked by member–checking, triangulation, multivocality, and thick descriptions; 5) resonance – the research may influence, affect, or move particular readers or a variety of audiences through evocative representation, naturalistic generalizations, and transferable findings; 6) significant contribution – the research provided a significant contribution theoretically, practically, morally, methodologically, and heuristically; 7)

ethics – the research considered human subjects, situational and culturally specific ethics, relational ethics, and exiting ethics; and 8) meaningful coherence – the study achieved what it purported to be about, used methods and procedures that fitted its stated goals, and meaningfully interconnected literature, research questions, findings, and interpretations (Lochmiller & Lester, 2017; Tracy, 2010).

Consequently, to increase the credibility of the procedures through the collection of evidence across time and space from numerous forms of data; such as interviews, notetaking, memo–journaling, verbal conversations, and emails data triangulation was administered (Creswell & Poth, 2018; Lochmiller & Lester, 2017). According to Lochmiller and Lester (2017), "Participant triangulation ensues when a pattern or theme is corroborated across multiple participants" (p. 106). Therefore, based on multiple themes and patterns being documented among multiple participants, participant triangulation was addressed through this means (Lochmiller & Lester, 2017). Through data and participant triangulation, the collection of evidence from numerous forms of data, themes and patterns, credibility of the procedures were increased (Creswell & Poth, 2018; Lochmiller & Lester, 2017).

Data Collection Procedures

Data sources included interviews with open–ended questions and any follow–up questions, notetaking, memo journaling, reflection responses, verbal, and email communication. Interviews were administered virtually using Zoom videoconferencing program. Zoom was used because of its simple and user–friendly interface. Due to the pandemic of COVID–19, there were no in–person interviews conducted in accordance with the social distancing recommendations from the CDC. Social distancing is described as keeping a distance of 6–feet or 2 meters from others, as an attempt to mitigate the spread of the COVID–19 viruses (CDC, 2020).

Interview Protocol

A semi–structured interview protocol was used to be able to have participants elaborate on responses or to provide examples. This protocol provided me with more flexibility during the interview process to be able to prompt an in–depth understanding of the phenomenon and to conduct the interview in a conversational style, as desired (Lochmiller & Lester, 2017). The interview questions were closely aligned with the research questions and theoretical framework, which was the basis of the instrument design. There were two forms of interview questions. The first type of question was focused on the individuals related to the phenomenon, for example, some questions focused on the participants' responses concerning their recollections of feelings, or experiences as it relates to the phenomenon. The second type of question focused on the contexts wherein the participants have experienced the phenomenon (Lochmiller & Lester, 2017); for example, the questions focused on the setting, type of work or college structure, organization, or environment the phenomenon occurred in during the participants' experiences.

Interviews were scheduled based on availability and convenience of the participants. Interviews were conducted using the Zoom videoconferencing program due to the pandemic of COVID–19. There was one complete and in–depth interview conducted with each participant. The 24 interview questions were closely aligned with the overarching research questions and purpose of the study. Therefore, one setting obtained meaningful data based on strategically created open–ended questions in a semi–structured interview protocol. This protocol allowed for flexibility and opportunity for participants to ask additional qualifying questions, as necessary (Lochmiller & Lester, 2017). Additional time was allotted for participants who elaborated or provided lengthy or additional qualified data. The interview times were scheduled in 60–minute

intervals during a time and place that was convenient, private, and safe for the participants using Zoom technology.

Professionally administered interviews were conducted and participants were content knowing that I would be transparent concerning the focus of the research, and by being open and responsive to their needs (Lochmiller & Lester, 2017). Participants were allowed to review their transcripts and provide feedback for accuracy, increased credibility, and additional meaning through member–checking (Creswell & Poth, 2018; Lochmiller & Lester, 2017), as well as any clarification requested during and immediately following the interview sessions. Participants were provided a summary of the transcripts, along with an interview reflection form to review the interview responses provided for added trust, accuracy, transparency, and affirmation of data. The interview reflection form is located in Appendix G.

Prior to administering interviews with participants, I underwent a bracketing interview by a colleague, as an attempt to identify any biases I may have had with the phenomenon of the study (Lochmiller & Lester, 2017), as a gesture of transparency and building trust (Roberts & Hyatt, 2019). Bracketing is "a concept common to phenomenology that refers to suspending judgment about the phenomenon of interest in order that you might know how the object of study really is [in actuality]" (Lochmiller & Lester, 2017, p. 289).

Consequently, the bracketing process required that I partake in the same interview to be given to the participants to identify biases that I may have held. The bracketing interview allowed me, not only to identify biases but, the opportunity to set aside identified biases to allow an objective viewpoint of the experiences (object of the study) of the participants as they were. I prepared a bracketing statement prior to collecting data. A copy of the bracketing statement, with my stance on bias for this matter, is located in Appendix C.

Accordingly, audio recordings on a secured password protected high–tech smartphone technology, using a voice response recording application, was utilized as a second recording of the interviews. However, the recording mechanisms of the digital video conferencing programs were utilized as the primary source of data collection, utilizing both video and audio features. In addition, hand–written and typed notetaking, memo journaling, emails, and typed notations using Microsoft Word processing program during the data collection process was utilized. A Microsoft Windows laptop computer was the device used to access all technology related programs and systems.

Charging cables and portable charging devices, pens, and paper were available on standby, as well as additional consent forms, during the interviews.

Data Storage and Management

All digital and electronic data is stored on a secured password protected local hard drive. Physical data collected is securely locked away. Digital analysis information is kept confidential and is hosted on cloud technology with two–factor security authentication for access.

The data will be deleted three years after the study is completed, and the data housed on the hard–drive will be irretrievable after securely overwriting the data on the hard–drive based on current security processes.

Data Analysis

I used a thematic data analysis, which allowed integration of data from various data points. Therefore, I was able to pull information from different responses (data points) that aligned or made sense with the categories and themes. In addition, I used an inductive coding analysis process to analyze the data. An inductive approach allowed themes to develop from the data. This approach aided in making sense and meaning of the data and allowed me to develop

initial categories and themes from the raw data (Thomas, 2003). There were five steps conducted during the analysis process.

1. Raw Data

Initially, I organized the raw data of each participant into identical formats on separate documents. Each transcript of raw data contained a page heading that included: name and title, college, interview date and duration, and data collection resources. The body of the documents contained each of the 24 interview questions and the 24 participants' responses. This format was in sequential order with question 1 followed by response 1, question 2 followed by response 2, and this format continued to number 24 for both the questions and responses.

2. Text Readings and Audio Reviews

After I organized the data, I closely read the data and listed to audio sources of the data for a deeper understanding to become closer and more familiar with the data and the participant.

3. Transcription

The data were transcribed using the HyperTRANSCRIBE software program by Researchware. HyperTRANSCRIBE was used to conduct a mixture of computer assisted and manually administered transcriptions, while using the program. The program provided a platform to transcribe the data, which simultaneously allowed viewing of the participants' videos, and audible sound of the interviews, while manually transcribing the data on one cohesive platform. This method provided greater review of the data, adding a sense of connection and deeper understanding of the data, as it were being courted. Memo journaling and notetaking was also conducted, adding to deeper reviews of the data, as the initial phases of coding were conducted during reviews of the memos and notes.

4. Data Segments

The transcribed data was organized into various segments of information to gain greater control over the complex and large amount of data. This process made it easier for me to keep clarity and focus of the data; it also allowed preparation for coding of the information.

5. Creation of Categories

I coded the data segments and was able to form categories to identify similarities or differences in the data. This allowed me to review whether there was any remaining redundancy of categories that existed. This process allowed me to retain relevant data and interpret the data into themes.

Coding

Coding is considered a cyclical process versus a linear one where the coding of the data gets recoded through a cycle of data refinement (Saldana, 2009). There are two main cycles of coding sections referred to as the First Cycle Coding Method and the Second Cycle Coding Method (Saldana, 2009). The processes that occur during the initial coding of the data are considered the first cycle methods. The second cycle method is considered more thought–provoking, because it requires "such analytic skills as classifying, prioritizing, integrating, synthesizing, abstracting, conceptualizing, and theory building" (Saldana, 2009, p. 45).

In Vivo Coding

In Vivo coding was conducted as a form of analysis and interpretation during the first cycle coding method for the interview transcripts. This coding type allowed me to capture and retain the data rooted in the "language, perceptions, and worldviews" of the participants (Saldana, 2009, p. 48). In Vivo allowed me to use excerpts from inherent terms and words that may be jargon, for instance, used as forms of communication among specific groups to capture the essence of the transcript (Saldana, 2009). For example, if a participant repetitively used the

term “you know” or maybe the term “front–end” during the interview and it was revealed during examination of the transcript, the discovery may lend to meaning and theming. Front–end often refers to simple technologies with which the end–users interact; whereby the backend is considered more technical in nature, so salient use of this term is worthy of coding for meaning and theming. Although, In Vivo coding allows flexibility with the use of rhetoric terms, gestures, or words, such as repetitively saying “you know, whatever, or uhm,” were not used in the display of data findings for they did not add meaning to the purpose of this study. Accordingly, such salient wording allowed me to condense meaning (Saldana, 2009), while keeping the overarching research questions and theoretical framework of the study in mind.

Pattern Coding

The second cycle coding method was pattern coding to organize and manage categorization (Saldana, 2009), theming, and theory of the initial coded data. Coding was applied line–by–line in the data to identify any evocative or repetitive words and phrases the participants may have used in order to capture what may be significant to the participant. Therefore, during organization of the data, the terms and words used in the transcript was examined and used to extract themes and theories of the data, as well as meaning (Saldana, 2009).

Coding allowed me to attribute a symbolic word or phrase to the data in a comprehensive manner. A comprehensive observation and review of key terms linked to the research questions and theoretical framework was conducted to attribute symbolic words or phrases to the data to discover a deeper understanding of the participants’ experiences, perceived personal efficacy, social factors, persistence, and attainment. The coding ranged from a single word to multiple phrases (Saldana, 2009).

Analytic Memoing

Analytic Memoing in journal form was kept to reflect on my perception of the participants and the phenomenon (Saldana, 2009). Memoing and coding took place throughout the analysis process (Lochmiller & Lester, 2017). Also, the quotation feature of ATLAS.ti was used during the transcribing of the data to keep record of data that was of interest during the later stages of data analysis. The quotations were kept directly on the digital video and audio program files. In addition, member checking was conducted as a way to validate the findings (Saldana, 2009), verifying the facts of the data with the participants for accuracy.

A computer–assisted qualitative data analysis software (CAQDAS) program called ATLAS.ti was used to assist with the analysis of the data after the initial manual analysis and transcriptions were completed. After preparing and securing the data for analysis it was reviewed for familiarity (Lochmiller & Lester, 2017). The software program allowed greater ease of organizing and pulling themes from the data. The relevant data from various data points were identified and organized into themes using this ATLAS.ti program.

Alignment Confirmation

After the data analysis, careful consideration as to how to go about conducting the study was made. It was necessary to ensure that the data aligned with the purpose of the study and with the research questions. Questions of whether or not the data drew accurate conclusions in alignment with the existing literature reviews, and whether or not it informed the study and any decision–making processes, were deeply pondered (Roberts & Hyatt, 2019).

Limitations

While there are limitations with all studies with which the scholar researcher may have little or no control (Roberts & Hyatt, 2019), the limitations of this study proposed difficulty obtaining 12–15 women chief technology officers in community colleges, since women are

underrepresented in technology, especially in leadership roles. In addition, regional differences were a limitation because if the population was not large in size, it limits the possibility of narrowing the criteria of participants from specific community college structures, such as from large urban multi–campus community colleges or from small single–site rural community colleges. The study was limited to a population of participants from various community college structures.

Additionally, the COVID–19 pandemic posed as a limitation. The pandemic outbreak was first identified in Wuhan, China and has spread around the world, including the United States. Current symptoms "include mild to severe respiratory illness with fever, cough, and difficulty breathing" (CDC, 2020), and severe cases have led to death of millions of Americans. Executive orders by state governments ordered the closing of many states around the nation in an attempt to curtail the spread of the virus. Due to the pandemic of COVID–19, there were no in–person interviews conducted in accordance with the social distancing recommendations from the CDC. Social distancing is described as keeping a distance of 6–feet or 2 meters from others, as an attempt to mitigate the spread of the COVID–19 viruses (CDC, 2020).

Another limitation was reflexivity as described by Watt (2007), as "the process of intentionally accounting for your assumptions, biases, experiences, and identities that may impact any aspect of your research study." As a woman in a technology leadership role at a community college, it was necessary to be able to intentionally display reflexivity to support internal credibility of the study.

Delimitations

The delimitations of the study derived from the selected criteria of the study. Clarifying the boundaries of the study indicated how I narrowed the scope of my study (Roberts & Hyatt,

2019). This is a qualitative interactive phenomenological study of women chief technology officers in community colleges, which posed limits that only incorporate women and community colleges.

Positionality of Scholar Researcher

As a woman in a technology leadership role at a community college, I began working in technology in the late 1990s, and have worked in environments as the only woman on a data engineering team. I identify with high self–efficacy beliefs. When first introduced to a team of engineers dominated by White men, many with military backgrounds, I viewed it as an opportunity to learn and earn a good living, where I have witnessed women before me succumb to the stereotypes and barriers that contribute to disappointment. Those with high self–efficacy levels may view barriers as tasks to master and conquer (Zimmerman, Schunk, & DiBenedetto, 2015).

Contrariwise, being a woman in technology at a community college lent an advantage to a deeper level of responsiveness and understanding of the experiences of the participants that men or someone who has not worked in technology would not possess. My positionality also gave to knowledge structuring and data analyzation, as I reflected on one's own experiences and those of the participants. I personally related to many similar circumstances that were described by the participants.

Therefore, with my positionality, it is important to reiterate strategies to ensure credibility and trustworthiness of the study through, but not limited to, participant and data triangulation, reflexivity, member–checking, and peer–debriefing (Lochmiller & Lester, 2017). In addition, it was key for me to utilize connoisseurship due to having insight to the phenomenon as a woman in technology at a community college. Through the art of appreciation, connoisseurship was

aligned with the appreciative inquiry theory of what worked or what was appreciated for participants to persist to success. Through my experiences and positionality, this technique lent to increasing understanding and interpretation of data, as an insider (Eisner, 1998). Also, I participated in a bracketing interview that was conducted by a colleague prior to administering interviews with participants, as an attempt to identify any biases I held with the phenomenon of the study (Lochmiller & Lester, 2017).

Through data and participant triangulation, the collection of evidence from numerous forms of data, patterns and themes, credibility of the procedures was increased (Creswell & Poth, 2018; Lochmiller & Lester, 2017). I was able to intentionally display reflexivity to support internal credibility of the study. Reflexivity described by Lochmiller and Lester (2017), as "the process of intentionally accounting for your assumptions, biases, experiences, and identities that may impact any aspect of your research study" (p. 95) was utilized. Maintaining a memo journal and conducting reflective writing assisted me with a deeper understanding of the benefits of reflexivity, as well as the methodology (Watt, 2007). Utilizing member–checking, participants were allowed to review and reflect on their transcripts to provide feedback for accuracy, increased credibility, and additional meaning (Creswell & Poth, 2018; Lochmiller & Lester, 2017).

Nevertheless, it was beneficial that I recognized that this positionality permitted

insight to the intelligence of the data, as I was required to be transparent and honest with thyself concerning distinctive biases.

Summary

This chapter described the research methodology of the study in detail. This chapter described the context and problem, purpose and research questions of the study, the research

design, the rationale for the design, research ethics, population and sample, instrumentation, data collection procedures, data analysis, trustworthiness, and limitations.

Chapter 4 - Findings

Chapter Organization

Chapter 4 presents the findings of the research. It is organized by an introduction, the participant profiles, presentation of findings by research questions, emerging themes, and a chapter summary leading into chapter 5.

Introduction

Chapter 4 reports the findings which displays the data of women chief technology officers in community colleges. This chapter identifies the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. In addition, the chapter describes factors that support persistence through potential social and systemic barriers and deterrents.

Participants' Profiles

The participants were 13 women chief technology officers in community colleges. Data was collected from interviews conducted with each participant using the Zoom video conferencing tool and audio recording equipment.

The participants shared stories of their experiences that shaped their careers, contributed factors, and the strategies that they believe helped them to persist through potential obstacles to technology leadership, as aligned with the research questions and the embedded theoretical frameworks.

This section introduces the participants and allows greater insight into who they are, their roles, and years of experience.

Table 1

Profiles of the Participants

Alberta	
Title and leadership role	Alberta is a director of network and telecommunications for the information technology department. She directs a team of systems and network administrators responsible for on–premises infrastructures, including intranet, internet, telecommunications, and programming across all campuses.
Name and location of college	Smith Community College; Rocky Mountain region
Years in technology field	25 years in technology
Years in leadership roles	10 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Married
Dependents/children	None
Race/ethnicity	White/Caucasian
Siblings	None
First generation student	Yes

Year former technology leader left position	Current leader
Beatrice	
Title and leadership role	Beatrice is the former chief information officer for the information technology department. She oversaw the teams responsible for maintaining the institution's administrative and academic computing, which included support for telecommunications, networking, voice, data operations, and all functional areas; such as student services and finance.
Name and location of college	Roosevelt College; Southeast region
Years in technology field	45 years in technology
Years in leadership roles	30 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Married
Dependents/children	Adult children
Race/ethnicity	Caucasian/Eastern European
Siblings	One sibling

First generation student	Yes
Year former technology leader left position	Year 2015
Chimere	
Title and leadership role	Chimere is the vice president and chief information officer for information technology services. She is responsible for strategic planning and setting direction for the teams that maintain the network, VoIP system, security, vendor and in–house application development programs.
Name and location of college	Bunk Community College; Midwest region
Years in technology field	24 years in technology
Years in leadership roles	13 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	42–52 years
Marital status	Married
Dependents/children	8–year old daughter
Race/ethnicity	Bi–racial/Black–White
Siblings	None

First generation student	No
Year former technology leader left position	Current leader
Dora	
Title and leadership role	Dora is the vice president of information technology and the chief information officer. She oversees strategic planning for the enterprise level of the technology infrastructure, and ensures that the institution has appropriate up–to–date technology resources.
Name and location of college	Willie Community College; South Central region
Years in technology field	25 years in technology
Years in leadership roles	15 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Not married
Dependents/children	No children
Race/ethnicity	Hispanic/Latina

Siblings	5 siblings
First generation student	Yes
Year former technology leader left position	Current leader
Dorothy	
Title and leadership role	Dorothy is the vice president for information technology and chief digital officer. She is responsible for overseeing academic and administrative computing, telephony, and institutional effectiveness. In addition, Dorothy is responsible for various college services, such as student workers, media, video production, lab and helpdesk support, bookstore, and college–wide construction.
Name and location of college	Reginald County Community College; Northeastern–Middle Atlantic region
Years in technology field	50 years in technology
Years in leadership roles	43 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Married

Dependents/children	Yes
Race/ethnicity	White
Siblings	Yes
First generation student	Yes
Year former technology leader left position	Current leader
Edna	
Title and leadership role	Edna is a former chief information officer. She was the first CIO at the college and was responsible for producing the first 5–year master technology plan, and merging telecommunications under the umbrella of IT operations.
Name and location of college	Joseph College; Southeastern region
Years in technology field	23 years in technology
Years in leadership roles	11 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Married

Dependents/children	Son
Race/ethnicity	White/Anglo American
Siblings	3 sisters; 1 brother
First generation student	Yes
Year former technology leader left position	Year 1997
Frances	
Title and leadership role	Frances is a former chief information officer of information technology. She was responsible for overseeing districtwide technology operations; including the enterprise resource planning (ERP) systems, security, hardware and software requirements, and technical support of campus classrooms for instruction and the business functional areas.
Name and location of college	Paul Community College District; Midwest region
Years in technology field	30 years in technology
Years in leadership roles	7 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years

Marital status	Married
Dependents/children	Two adult children
Race/ethnicity	Indian
Siblings	2 siblings
First generation student	No
Year former technology leader left position	Year 2015
Mary–Elizabeth	
Title and leadership role	Mary–Elizabeth is a former vice president for information technology. Her team was responsible for technology maintenance and support of all software programs, hardware, website, internet, telecommunications, helpdesk, desktop support, and the distance–learning platform.
Name and location of college	Gunzella College; Southeast region
Years in technology field	37 years in technology
Years in leadership roles	12–14 years in technology leadership

Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Married
Dependents/children	2 children, no longer dependents
Race/ethnicity	White/Non–Hispanic
Siblings	3 siblings
First generation student	Yes
Year former technology leader left position	Year 2018
Melodie	
Title and leadership role	Melodie is the vice president for information and instructional technology. She is responsible for the technology infrastructure, student information systems, web applications, helpdesk, and audiovisual support for campus events. In addition, she oversees the center for creative instruction and technology, which is a group that works with faculty to design and develop educational technology for distance education and the learning management system.
Name and location of college	Dougnell Technical Community College; Mid–Atlantic region

Years in technology field	21 years in technology
Years in leadership roles	9 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	42–52 years
Marital status	Divorced
Dependents/children	2 adult daughters
Race/ethnicity	White
Siblings	2 sisters; 2 brothers
First generation student	No
Year former technology leader left position	Current leader
Mia	
Title and leadership role	Mia is the vice provost for information technology and chief information officer. She oversees the central IT operations, policies and procedures, information security, enterprise services and applications, such as networking and telecommunications. Mia is also the liaison for state and local entities for the college.

Name and location of college	Charles Community College; Southeast region
Years in technology field	35 years in technology
Years in leadership roles	25 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	*
Marital status	*
Dependents/children	*
Race/ethnicity	*
Siblings	*
First generation student	*
Year former technology leader left position	Current leader
Rhonda	
Title and leadership role	Rhonda is former district director of information technology. She was responsible for overseeing the team that maintained and supported networking, IT operations, and enterprise systems. The college successfully

	implemented a new $5M ERP system under her leadership.
Name and location of college	Newman County Community College District; Midwest region
Years in technology field	14 years in technology
Years in leadership roles	3 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	42–52 years
Marital status	Married
Dependents/children	Two young children
Race/ethnicity	Black/Ethiopian
Siblings	8 siblings
First generation student	No
Year former technology leader left position	Year 2017
Tameco	
Title and leadership role	Tameco is vice chancellor and chief information officer. She is responsible for teams comprising 167 persons that

	maintain and support the network, six functional areas, telecommunications, systems and service delivery management, and academic and administrative support areas.
Name and location of college	Gilbert Community College District; Pacific region
Years in technology field	19 years in technology
Years in leadership roles	10 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	42–52 years
Marital status	Married
Dependents/children	None
Race/ethnicity	Mixed
Siblings	2 siblings
First generation student	No
Year former technology leader left position	Current leader
Veronica	

Title and leadership role	Veronica is a chief technology officer. She is responsible for the teams that maintain and support the enterprise systems, networking, telephony, helpdesk, and media services.
Name and location of college	Aplaw Community College; Midwest region
Years in technology field	30 years in technology
Years in leadership roles	11 years in technology leadership
Age range: 21–41; 42–52; or 53+ years	53+ years
Marital status	Married
Dependents/children	3 adult children; 1 grandson
Race/ethnicity	White/Caucasian
Siblings	2 siblings
First generation student	No
Year former technology leader left position	Current leader

Note. * = Participant requested non–disclosure of personal information.

The participant narratives, as described within emerging themes and patterns, report the experiences of the participants as they described lessons learned, and lend to a deeper understanding of experiences that led to attainment of leadership roles in technology for women chief technology officers in community colleges.

Presentation of Findings by Research Questions

Research Questions

There were three research questions guiding the study:

1) How do women chief technology officers in community colleges describe their experiences that shaped their careers?
2) What do they perceive as factors that shaped their careers? How do they perceive self-efficacy as a factor that shaped their careers?
3) How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership?

Table 2 displays the research questions, corresponding interview questions, and findings.

Table 2

Findings by Research Questions

Research Questions	Corresponding Interview Questions	Findings Quotations
RQ1: How do women Chief Technology Officers in community colleges describe their experiences that shaped their careers?	**Q1**–Please share a little about your work. **Q2**–Explain what a typical workday is like for you. **Q3**–How did you decide on a career in technology? **Q4**–Was technology always an area of interest? **Q8**–Were there any women in technology who inspired you? **Q15**–How would you describe a career in technology? **Q16**–Describe your view on inclusion and the level of equity in your workplace. **Q17**–Describe the structure of the information technology department at your institution. **Q18**–Describe the organizational leadership at your institution from your viewpoint. **Q20**–How would you describe your overall experience of becoming a leader in technology?	**Alberta:** I messed around with word processors; and I worked a little bit on those. I found that I was good at it; figuring out what they do. **Dora:** I was very fortunate that my boss, at that time, just put me out there forefront working with technology. That's how I became involved; teleconferencing. We got a humongous grant in the '90s, and my job was to develop the distance ed network, and that's how I got involved with technology. After that I became the associate vice president of instructional technology.
RQ2: What do they perceive as factors that shaped their careers? How do they perceive self-efficacy as a factor that shaped their careers?	**Q5**–What factors would you say helped to shape your career in technology leadership at a community college? **Q7**–Please explain your experience with role models. **Q8**–Were there any women in technology who inspired you? **Q9**–How do you view the gender roles in Information Technology? **Q10**–Please discuss your thoughts concerning gender wage and salary in technology related fields. **Q11**–Please explain any situations where you may have felt that your gender affected how you were treated. **Q12**–What would you say stood as main barriers or deterrents during your climb to leadership in technology? **Q15**–How would you describe a career in technology? **Q16**–Describe your view on inclusion and the level of equity in your workplace. **Q19**–How would you describe the climb for women to advance to technology leadership positions? **Q20**–How would you describe your overall experience of becoming a leader in technology? **Q21**–Please share any techniques that you may have drawn upon or used to help you succeed.	**Mary–Elizabeth:** I was changing flat tires, and installing dishwashers, and putting in sprinklers … I never felt like I couldn't try something. I wasn't into personal computers, but all of a sudden, I was responsible for all personal computing in the college. I was started as a computer programmer, so I just—incrementally over time—I acquired more responsibility. I think that self–efficacy, that ability to say, "I can do this," and have support from my family and my team, helped me. Those were two big factors.
RQ3: How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership?	**Q6**–How might have self-efficacy influenced these factors? **Q7**– explain your experience with role models. **Q8**–Were there any women in technology who inspired you? **Q9**–How do you view the gender roles in Information Technology? **Q10**–Please discuss your thoughts concerning gender wage and salary in technology related fields. **Q11**–Please explain any situations where you may have felt that your gender affected how you were treated. **Q12**–What would you say stood as main barriers or deterrents during your climb to leadership in technology? **Q13**–How did you handle challenges posed as barriers or deterrents during your pursuit to leadership in technology at a community college? **Q14**–What advice do you have for women aspiring a technology leadership role to help them persist through similar challenges to success? **Q15**–How would you describe a career in technology? **Q16**–Describe your view on inclusion and the level of equity in your workplace. **Q19**–How would you describe the climb for women to advance to technology leadership positions? **Q20**–How would you describe your overall experience of becoming a leader in technology? **Q21**–Please share any techniques that you may have drawn upon or used to help you succeed. **Q22**–Please share a trajectory outlook that you would share with women aspiring a technology career. **Q23**–What advice would you give to women considering a career in the technology industry? **Q24**–Is there anything during your journey to leadership in technology that you wish you had known sooner?	**Beatrice:** I went to the vice president who had moved me over above my boss's head and said, "Yes, that was very nice of you. I have more degrees, I have more responsibility, and these are examples of the salaries that are being paid to my male counterparts. Do something." **Beatrice:** Study job descriptions, salary scales, and look for counterparts, because that will help you to ensure that you can keep equity, because you can point to these things.

Emerging Themes

Factors were discovered through emerging themes that support persistence through potential social and systemic barriers and deterrents. This section allows greater insight into the journeys experienced by each participant through meaningful thematic narratives.

Keeping the research questions at the forefront of the study, I discovered several emerging themes that surfaced during various points of coding and analysis of the data. Many of the participants shared similar experiences, career shaping factors, and persistence viewpoints during their climbs to technology leadership; although they faced different situations and circumstances. Key emerging themes and patterns included 1) career calling experiences: desire to help people, STEM, education interests; 2) leadership development: learning experiences, hard worker, support, mentor, collaborator; 3) obstinate practices: tenacious, determined; and 4) insightful acumen: positive awareness, motivator. Each of these themes and patterns were intertwined throughout the participants' narratives, providing deeper understandings of the chief technology officers' experiences to technology leadership.

Theme One: Career Calling Experiences

Career calling experiences emerged from a multitude of the participants' experiences prior to their roles as technology leaders. These experiences included transitional pathways and educational interests that led to technology leadership careers, whether intentional or not. Many of the participants did not plan on a career in technology, but various callings steered them to the industry, such as encouragement from parents, mentors, and professors; passion for helping people, STEM and education interests, and love for the community college. The majority of participants stated that committing to a career in technology was the best career decision they made. Patterns included the desire to help, and education interests.

Initial Interests

Alberta's responses concerning experiences that influenced her career included statements that she had not originally planned on a career in technology. She was interested in medicine, but later decided on a Master's degree in information technology, after receiving a Bachelor's degree in humanities. She described stories of her experiences from high school and college. During high school, she said,

> We got a TI99 computer. They didn't even have a hard drive; it just had floppy drives, and you'd have to load–it–up every day. We had learned to program in 10Basic, and I learned it took me three weeks to write a program that lasted 30 seconds; that ran for 30 seconds. I said to myself, "Computers are never [going to] be a thing. They're never [going to] go nowhere, because this is too much work for not enough input; for nothing." So, I walked away. I was like, "This is stupid."

Beatrice's experiences include a background in information and sciences from a library perspective, but she initially wanted to become an attorney. She said,

> I got a Master's in information science as a librarian... I was right at the point when computing really started to take off as a practical application. While I was in college I took a Fortran 4 course in the engineering school across the city. ... I actually wanted to become an attorney and my interest was actually in the power of information. So, that's how I got into the libraries; and automation makes information retrieval fabulous. I was [going to] be a lawyer. That was my goal, but instead, I married a lawyer.

Dora has a background in sociology and says she "was at the right place, at the right time," when it came to a career in technology. Gaining employment at a community college inspired her to pursue a Ph.D., with aspirations of obtaining an executive leadership role:

> When I landed at the community college it really interested me; education. So, I went to pursue my Master's in education, in educational leadership, and then I really loved it. I already had an … undergraduate in sociology; but, because I was in education, I pursued a Master's and then my Ph.D., because I wanted to be … a college president. It was that drive; that wanting to do that.

Initially, Edna wanted to be a doctor, but due to family circumstances, she decided to study education. She started her career as a business education teacher. She taught all business courses, such as typing, shorthand, and accounting. To be effective, as a teacher and as the department chair, it became necessary for her to learn and utilize technology to help organize the courses, and to exchange files with other campus locations. This was during a time when the college was deploying stand–alone computers throughout the campuses.

Mary–Elizabeth thought of becoming a school teacher as a young girl, because she liked working with people; but by the time she was in high school, she was set on becoming a doctor. She received a scholarship and planned to attend college in another state, but had a change–of–heart about leaving home, so she followed her grandfather's advice:

> My grandfather was an adjunct professor and he loved computers, and he kept telling me, "Oh, you need to get into computers, because it's not many females in computing and it's a great advancement opportunity for young women." So, I decided to do my 2–year degree, stay home, and take my courses at Gunzella College. I didn't like the first semester, but after that, I really started to like it.

Mary–Elizabeth says working in technology was by accident, because it was not her dream. She viewed technology as being "nerdy," because she was an athlete, who wanted to be a surgeon.

Melodie once enrolled in a certificate program to become a high school social studies teacher, as a single mother of two. Through practical training, while in the program, she soon realized that work–hours at the high school began much earlier than her children's daycare; so it was an impractical career goal, because she had no one to care for her children during morning hours. Therefore, she applied for and obtained a position on a grant initiative at the college from which she graduated.

Rhonda was on a student visa and felt that her options were limited, so she wanted to study a program that would guarantee her immediate employment after completion, because she was drowning in student debt. She wasn't familiar with the career tracks in information technology, especially for women, minorities, and international students, so she sought guidance from an advisor:

> Paying international tuition was almost double what a typical American citizen would pay, so I was getting buried with debt. ... I talked to an advisor who I told exactly what I was looking for that would guarantee me a job. I honestly just went into IT just so that I can get a job. I think it was the best decision I made, because I have never been without a job since I graduated.

Transitional Pathway

After high school, Alberta planned to attend medical school, but had difficulty with chemisty, so she changed her major midway through her program to teaching. She completed work in education, history, and English, but said that she could not find a "teaching job" after she graduated. However, while in college, she discovered a talent for word processors:

> I messed around with word processors; and I worked a little bit on those. I found that I was good at it; figuring out what they do. I used to help out with a volunteer place where

> we would go and help put in voting results from presidential voting night. I was always wanting to see the programming behind that. I'd ask the programmer, who was walking behind me, “It's a little mainframe thing.” I'd say, “Tell me how to see this in other ways.” So, that's where my interest started in it.

Alberta’s discovery of word processing skills, curiosity of technology programs, and her general interest in education was instrumental in her route to technology leadership in education. Her early working years set the route for her climb to a career in technology.

During Beatrice’s work in the library, she anticipated sustainability with technology in the academic areas of payroll, course schedules, human resources, and registration, in addition to data processing, while searching for and buying datasets. Her work in the library allowed her to learn production and scheduling of multiple systems, and how they functioned. This work and a professor led to her interest in technology.

Her professor was an early user of digital technology for art media. She worked on a famous project, and was able to conduct filming on it and turn it into a digital educational project. As a student, Alberta was able to see the project before it was published, because she had several classes with the professor. Alberta admired her professor and said, “This woman is like, she's dynamite. I mean, she's really on the cutting edge. This is the kind of thing I can see myself doing.” The experience with her professor inspired Alberta to turn to the field of technology.

Dora began working at the college in program development, known as alternative education. Alternative education included all off–campus programs, weekend programs, and distance education that offered television courses using basic televisions and VCR (video cassette recorder) equipment, whicih was the first use of “high technology” at the institution. Dora says this was her start with technology, before distance education began to grow with

interactive capabilities, advanced two–way audio, one–way video, video conferencing, and online services using the internet. Dora's involvement with technolog grew. She said,

> I was very fortunate that my boss, at that time, just put me out there forefront working with technology. That's how I became involved; teleconferencing. We got a humongous grant in the '90s, and my job was to develop the distance ed network, and that's how I got involved with technology. After that I became the associate vice president of instructional technology.

The associate vice president of instructional technology was responsible for overseeing all computer labs with internet use. Dora was heavily involved with planning and development, and her responsibilites evolved as student use of computers and the internet grew on campus.

Edna created a network on her campus and showed other campuses how to connect without IT. Shortly afterward, the campuses were exchanging files. When informing the IT director of the computer setup she implemented, Edna stated:

> Oh, no, no, no. I just got connected. … I was only doing the work, the same work you could do from a dumb–terminal. I wasn't breaching any security or whatever, because in the same office I had a dumb–terminal, and we just figured out how to do it. Then, of course, once I did it I showed the other campuses how to do it, as well.

Eventually, Edna's actions led her to being appointed the first chief information officer of information technology by a newly appointed college president. The new president of the college wanted someone who he felt could unite IT with the telecommunications division from each campus. In addition, the president wanted someone who could create a master technology plan, so he appointed Edna to fulfil the duties.

Nevertheless, Mary–Elizabeth learned interactive design processing, which optimized work habits. She was encouraged by a program at the college that offered employment after completing an Associate's of Science degree. She liked design processing, so she completed the 2–year program and decided to obtain a 4–year degree. She accepted a programming job at the college that offered benefits to fund her education, which was a great opportunity.

It is critical to be able to communicate and work well with various people, and to obtain the right fit for teams. Fortunately, Mary–Elizabeth said she made the right decision with a career in technology.

Possessing the skills to create websites led Melodie to a position at a university, where she worked on forming their web–based instructional technology program, which was "learning and implementing their learning management systems" (LMS). They implemented four LMSs at one university, which was a big accomplishment. Afterward, Melodie decided to further her education:

> From there, I decided to get my Master's in instructional design and education technology, and that provided me with more opportunities for other positions, as well as being able to move up in my career. To be a director, you needed to have a Master's degree, as well as experience. I think I've been pretty fortunate … my supervisors have supported and provided me with opportunities to pursue my education; receive training.

Melodie is appreciative to have landed a career in technology:

> Technology kind of chose me. I think some of it was just being in the right place at the right time; but definitely, the experience that I learned in that first job, as far as learning how to create web pages and a little bit of coding, as well as training, put me on this path.

Melodie focused her education, professional development, and research opportunities in areas that she embraced with passion and curiosity, which she says led to positive experiences in general.

The first programming class for Rhonda was a new experience, but she was determined to stay in the program to complete. Her curiosity to learn new skills and information kept her interested. She said,

> What I think helped me kind of to stay there and not give up, because I was always curious about learning something new, so it's like learning a new language. So, that kept my interest going. I had no interest before—I mean, I didn't even know what an IT professional did before that.

In addition, Rhonda credits much of her success on the opportunity to obtain practical experience and being involved in the information technology "community" during her undergraduate work as a computer information systems major. She said, "I worked in the computer labs and I was fully engaged in what the actual career would look like when I left, so I had a good mentor. I think that definitely help toward my success." Per Rhonda, being an information technology student felt like being in a small association on the campus.

Theme Two: Leadership Development

Leadership development contains rich statements of participants' work experiences in a variety of professional settings. This includes past career shaping roles, relationships, and personal growth. Participants described their climbs to leadership, support mechanisms, and lessons learned over the years through their journeys to technology leadership. Patterns displayed past experiences, communication, collaboration, mentors and role models.

Support Systems

During Alberta's growth as a leader, she acquired knowledge from previous managers that she referred to as role models. Alberta worked as a temporary employee for a health group with a manager who had experience as a CEO of a hospital. The manager was knowledgeable, and Alberta said he was her best role model and taught her two things that she found interesting:

> He said, "Don't make enemies. Everybody comes back later and everybody shows up later in a higher position." He said, "In the length of your career you will hit the same people over and over again, and they're [going to] come back in a high [position], and with more authority, so don't make them mad. Just play it cool."

In addition, Alberta said he informed her of practical knowledge from a leader's point–of–view that she could use daily. Alberta said,

> The other thing he said that was really helpful is, "Keep your desk clean." He said, "The outward appearance of organization, a) makes you feel more organized, and b) inspires trust from others in you."

In addition to the lessons learned from her manager, Alberta picked–up interview methods that she developed from another manager. She said, in every interview this manager would ask, "What energizes you, what makes you feel charged at the end of the day, and what drains you?" Alberta believes that, "If you follow the path that makes you feel charged or energized … you'll follow the right path of what you want to do." Alberta adopted this method in her interviews, because it assists with assessing where an individual's interest and motivation stands.

Part of Dorothy's leadership development is credited to the opportunity to work for virtuous leaders. She said, "I look at good leaders; I know what a good leader looks like."

Dorothy found leadership support, in general, to be central in her leadership development. She said,

> I can remember in my early days in this field, when the three jobs were offered, I got the least job—had the highest grades—got the least job in the department, and got the least pay. When the director's job came opened … the dean of administration … saw something in me and said, “This is your job.”

Later, when the dean was laid–off of work, Dorothy reported directly to a new president, whom she considered as another mentor, who helped develop her as a leader, and gave her an opportunity that many people would not have given a woman at that time.

Sturdy family support was the basis for Mary–Elizabeth’s confidence and individuality displayed in her leadership. Her father raised her to be independent and not to rely on others by teaching her practical skills. She said,

> I was changing flat tires, and installing dishwashers, and putting in sprinklers … I never felt like I couldn't try something. I wasn't into personal computers, but all of a sudden, I was responsible for all personal computing in the college. I was started as a computer programmer, so I just—incrementally over time—I acquired more responsibility. I think that self–efficacy, that ability to say, “I can do this,” and have support from my family and my team, helped me. Those were two big factors.

Another impact on Mary–Elizabeth’s role as a leader in technology was having great supportive leadership, because she did not have a technology background, but was very interested in the business aspect of technology. Executive leadership believed in her and allowed her to be creative and voice her opinion. Mary–Elizabeth said,

> One of the factors was having a boss that allowed me to communicate my vision, so I was real big on planning and vision, and saying, "We could do this, and if we did this…" it wasn't just, "Tell me what you want from me." One of the factors was just having bosses that were very opened and influenced by what I had to say.

Under the guidance of the vice president of academic affairs, Melodie experienced leadership growth through training opportunities as a new employee:

> I came to that institution, again, it was a brand new created position. She [VP of academic affairs], along with the new director of assessment, really helped to mentor us. She provided us with a lot of opportunities to get additional training. [She] sent us to the Harvard leadership and management seminars, took us to conferences, and encouraged us to write and present.

Melodie was fortunate to have mentors to inspire her through her growth, especially in newly created positions.

An influential person for Mia was the chancellor at a university. She switched from the private sector to higher education. As a professor, Mia didn't have to be concerned with the bureaucracy of the institution, as would an executive administrator. The chancellor offered her the CIO position, although she had no administrative experience operating a college division. Mia said,

> He took a chance on me and he offered me the position. In the first year he really guided me and helped me with the various operation details, various policy procedures; helped me guide through this kind of bureaucracy. I think everybody will need someone like that.

Needless to say, Mia had not planned on being the CIO, and says it was by accident that she entered the technology field. Nevertheless, “So far, it's been a pretty good smooth ride for me,” said Mia.

A supporter during Tameco’s growth was the college’s leader. Having a kind and honest leader was a key factor in her decision to move across the country to work at Gilbert Community College District, because she admired the leader’s similarity in values:

> Working for someone that, not only you have the deepest respect for, but actually agree with the values and the ethics, and the direction—as the organization is being moved forward—it is absolutely a gift.

Sense to Guide

Among Chimere’s growth as a leader, she has worked to encourage and uplift other women on her team who appear to shy away from leading or stepping–up into advanced positions. Chimere feels it is important to spend time showing women first–hand accounts of what a leadership role entails. She often encourages women to shadow her throughout the workday. She said,

> Come to me with anything. I will freely share what my experiences have been in a particular situation; how I've gotten around it. I think just being opened to talking about the real facts behind a particular experience helps a lot of people to not feel alone, and be more willing to try something new.

Dora works with a program for young Latina girls that provides mentoring services concerning media, digital television, and the use of technology. The group visits television studios to learn the technology basics behind digital television. Dora says the technology climate is changing, and such programs are starting at very young ages now to work with young girls.

Through Dorothy's growth as a leader, she sees the importance of leveling the equity field for women and providing mentoring services:

> All my project managers are women. It's intentional; drives the rest of them crazy. We generally try to have on our architectural team, at least one of the two … it's often that architects have two people assigned to a bigger project, and we try to make sure one is a male; one's a female.

Dorothy intentionally strives for equity and diversity. At the college, she supports female students through a mentoring program that is run by a couple of women on her team. Dorothy said,

> The most interesting part is that we provide them [female students] with a mentor. They always have somebody they can talk to. We try to help them with careers. I hire a few student workers, so we try to make sure we hire a nice mix of men and women.

Frances feels that, as growth in leadership evolves, it is important for leaders to mentor and help others to lead. Frances works with organizations to help women and young girls in K–12 schools and college level move into STEM related fields. "There are more women graduating, but less in information technology, and what's the reason," asked Frances. Frances says she thinks the reason is because women have one of the most important roles of taking care of family, children, and the home. She said,

> I would just say we need to have kind of an infrastructure with every company, where we need to provide more support to the women who are trying to come into technology and make sure they don't fall back, because of these other domestic duties that they have to take care of.

Frances encourages women to continue pursuing their dreams in technology, in addition to caring for family and other duties.

Mia believes that role models can help these individuals navigate. She said, “The more we can get female faculty, female instructors, K–12 teachers; I think it will be a lot better, because I certainly … was inspired by these female role models when I was growing up.” It is especially important to have clear pathways in the higher education sector, because it tends to have a complex decision–making matrix. She said,

> Higher ed is very complicated than private sector … in private sector you tend to have [a] very clear decision making matrix, so you know who's in charge. You know who makes the decisions, and you know all that. But higher ed cannot be as clear.

Whether on STEM panels or during other occasions, Tameco intentionally tries to encourage women and young girls to be involved in technology in her volunteer work, and through recruiting and marketing efforts. However, the discrepancy in technology is apparent:

> Unfortunately, there is still a discrepancy and when you're looking at graduating rates of young girls in technology versus men in technology, I don't think the discrepancy is quite there. Then when you start with employment, and definitely by the time you go into the upper echelon of executive leadership, they [women] start disappearing.

Systemic Change

Many of Dorothy’s student employees are aligned to join the workforce after working under her leadership.

She said,

> We try to help them with careers. I hire a few student workers, so we try to make sure we hire a nice mix of men and women. There are companies around us that watch to see who

> I hire, and then they sort of—those folks always get jobs; always get jobs right out of two years of college, which is great. And, a lot of them, they get somebody else to pay.

Under Dorothy's leadership, local companies are hopeful to acquire skillful workers after they graduate from the college.

Over the years, Mary–Elizabeth developed and displayed strong leadership strategies to increase fairness in advancement and salaries. She partnered with the human resources department to conduct a compensation study for IT personnel and positions. It resulted in IT gaining their own classification of job profiles. This allowed her and her team to compare roles; for example, they could compare a finance analyst to a data analyst. She said,

> We had our own job family's classifications, and they marketed it against universities, and other community colleges, and the corporate world. … Across the state, we were probably in the top third of wages, after that first 3–year study.

For nearly 10 years she worked to obtain gender equality. Her department had one of the highest numbers of women in IT among other colleges. Also, Mary–Elizabeth used to speak at conferences and middle–schools to promote women in technology. In addition, she continued partnering with the human resources department in support of gender equality: "We had goals with HR every year to get more diverse, not just gender, but all ethnicities."

Tameco described an issue with hiring decisions in information technology. She said the people that make the decisions have a tendency to hire individuals similar to themselves, and Tameco argues that such practices need to be broken. She said,

> I think that one of the things that we do here in the Gilbert Community College District is ensure that we have [a] hiring panel that is not made up of the same type of people. It

doesn't matter what that one type of person is, it just has to be different, because that's the only way you're [going to] break out of that cycle.

To promote equality and limit internal bias during the hiring process, the college ensures to have a diverse hiring panel, which may be especially advantageous for women seeking a technology role. Tameco said,

> No matter how much we say to ourselves, "we are opened minded and [going to] make an objective decision," the internal biases are there. Inadvertently, we lean toward the people that are like us, that we resonate with, and that hurts women in technology.

Having a panel of different people is one way that Tameco says may break biased hiring cycles in technology.

Theme Three: Obstinate Practices

This theme described the techniques and practices the participants drew upon to sustain in technology during difficult or challenging circumstances. Such circumstances included having non–supportive leaders, proving worth, gender and salary discrimination, and dealing with the stress that accompanies technical outages. The participants described what they believed helped them to strive, have courage to stand for fairness and not be diminished, and to continue to technology leadership in a male dominated field. Patterns included tenacious and determined behaviors.

Managing Challenges and Bias

One challenge for Alberta involved leaders who did not provide opportunities to advance and grow. Alberta said,

> We had a boss at a previous company who is no longer there, who made a comment to me once. I said, "I really want to move up into this role," and he said, "Now is not the

> time, and that is not the role for you yet. It's not the time." He said, "I don't want you to feel glass–ceilinged by this." He said, "We'll get you more training and we'll get you positioned, so you can take this role in the future."

At first, Alberta thought her leader's comments made sense. However, once she reflected on the comments and the fact that she had a Master's degree, she wondered how long would she have to prove her value to advance. Women often must prove themselves, among men, as being knowledgeable and capable to address technical concerns.

Alberta's philosophy is to let her technical expertise speak for itself, and others will observe that she is knowledgeable. Despite Alberta's challenging experiences, she shared several techniques that she believes helped her to persist. She relied on methods of being knowlegeable, organized, and confident. Alberta said,

> I find it, if I know the steps of how I need to get something done, like a huge project, if I can envision the steps or I know technically, sort of theoretically how it's [going to] be done, I'm very confident I can get it done. ... The way that I handle that is organizing it as much as possible.

In addition, Alberta is a strong believer in manual notetaking. She organizes information electronically, as well, but says manual notetaking helps her to visualize and recall information quickly. Another strategy Alberta uses to persist as a leader is to expand her knowledge. She said, "Continuing to improve my technical skills and let my knowledge … help people judge me.

Furthermore, following a path of interest helped Alberta to continue in technology leadership. She liked systems and networking, but disliked programming. Therefore, when the opportunity arose for systems and networking, she followed the suitable path.

Aside from the aforementioned strategies, Alberta strongly believes in the ability to mark one's own accomplishment. She said,

> I am a big believer in self–determination. I think you can make your path. I really do. I think it's harder for some people than others. I think some people get a lot of advantage along the way, and a lot of people don't.

Accordingly, Alberta believes that people, including herself, can accomplish incredible feats on their own when they believe they can do it.

High paying technology salaries attracted Beatrice to the industry from a professorship in the library, which was part of why she crossed–over. Also, her leaders informed her that she would increase her salary potential in technology. She said,

> I could see the salaries were much higher in the technology areas than in the library area … and that's how they got me to cross–over; that was part of it. "Come over. I'm [going to] pay you a lot more money and you're [going to] do the same kinds of things, just in a larger pond."

She noticed subordinate men had higher salaries than hers. Therefore, she said,

> I went to the vice president who had moved me over above my boss's head and said, "Yes, that was very nice of you. I have more degrees, I have more responsibility, and these are examples of the salaries that are being paid to my male counterparts. Do something."

To avoid such discrimination, Beatrice adamantly informs individuals to study job descriptions and salary scales, and research what counterparts are earning, because it will provide leverage that may help ensure a level of equity. Employee reviews are a proper setting to have such conversations. Beatrice said, "During your review time say, "Look, I've done all of

this. I have excellent reviews. I'm in this [pay] range. Here's someone else, a counterpart, who's a male and he's making a third more money. Why?" It is beneficial to be prepared to have the discussion with leadership concerning fairness and to acquire growth experiences through the process.

Also, to effectively communicate the prioritization of IT projects and initiatives to colleagues and leadership, Beatrice said,

> You do as much as you possibly can to present a good program. Defend it, and then a lot of times you have to do what you have to do, if you're [going to] live in that environment. It's a choice you make each day. ... How far do you fight this issue?

However, Beatrice learned a practice from a colleague who showed her that, although leaders must address important concerns in a timely manner, it is often necessary to reflect and ensure that the best decision is made for the situation at that time. ... "It worked like a charm. It gave me enough time to step back, make whatever inquiries I needed, and be able to give them a cogent answer the next day."

Another method practiced by Beatrice was to consider her short–term and long–term goals to help her decide "which barriers you need to fight, you need to go through, and which ones you need to go around," said Beatrice:

> I had been the director of computer services at a university for eight years when the position of CIO opened up. I was very well respected and I applied for it. I was told, "No way in hell was a woman [going to] be the CIO." They sent, not the president of the university, they sent one of the assistants to discourage me from putting my application in. "You should stay right where you are." Then I met a woman who recruited me over to become the CIO at Roosevelt College. And that's when I slid over.

Chimere has seen companies prefer that women have more practical experience for positions than men:

> It has been my experience that companies are more willing to let a man come into a [role] who has no tech experience at all. I have seen this so many times. They know nothing, but will give them a leadership role over a group. Whereas, a woman has to have that tech experience and knowledge.

By Chimere possessing practical technical knowledge, it empowered her to lead with confidence, having the advantage of knowing if someone tried to mislead her concerning technical projects.

Aside from her skills, interestingly, Chimere has a method that she practices in meetings to assist demure women with coming forward and being acknowledged. She said,

> For the women on the team, especially ones who tended to be pushed out to the back walls at the meetings, we'd just go to the meetings early and we'd all just sit at the table. "Hey, we're here early." There's no reason to sit against the wall if you're early.

Chimere would use such an approach to help other women, because she said it is not a good feeling to be pushed aside. Another approach she adopted concerns pursuing desired roles, whether or not one meets all the recommended skills of the job profile. She said,

> I think it was a study that I read where, if there's a job posting and there are 10 things on there, if men have one or two [skills] they'll apply for it. Women, if they don't have all 10 they don't even bother applying, because they figure, "I'll have to either have everything or nothing." That knowledge helped me to stop doing it, because I found I did that exact same behavior. You're in a job; your next job should be a growth. You're not supposed to have all the skills; you're supposed to grow into it.

Chimere learned to change her approach to how she applied for jobs, and stated that she ensured to be transparent during interviews concerning skills she possessed, and those she did not possess. Hence, when she interviewed with employers she said, “No, in being fully transparent, I don't have all these skills; but, here's how I'm [going to] go about learning about them.” Chimere’s behavioral change led to this method of applying for positions and showing confidence in being able to learn the additional skills in order to get around the hurdles of not having 100% of the recommended skills for job openings.

Furthermore, when Chimere was overwhelmed during technical outages or other extremely stressful situations, she began a new time–management method:

> I learned to get to a point where I manage—when things were really overwhelming and I just wasn't sure where to go—I started managing in 5–minute increments. “I'm [going to] get through the next five minutes. Whatever happens, whatever I'm [going to] do, I'm [going to] focus on one thing; I'm [going to] get through five minutes.” If I can get through five minutes I can get through five more; that's now, ten.

It was necessary to insert intentional pauses during a crisis to align issues with possible solutions, therefore, as a team they would stop to discuss solutions to tackle overwhelming situations.

Dora would be in a meeting with male leaders who would make comments that she felt lacked professionalism, but others associated the comments as being direct: displaying strong leadership abilities. When Dora made a remark or challenged others, her manager would reprimand her after the meetings. She said, “When … I would make comments or I would challenge comments, I would be talked to after the meeting, “Oh it looks like you're not being a team player.”

Edna had concerns about the IT director's reaction to her being appointed CIO and whether or not he would work against her. Therefore, she knew it was important, as a leader, to administer the difficult conversations. Accordingly, Edna met with the director of technology and she said,

> I went down there, I mean, I said to him, "I didn't choose myself for this position. You didn't choose me for this position. I understand that we can either try to work together or we cannot, but it's [going to] be very difficult for you if you choose not to work with me."

As the leader, it is essential to stand in courage to have the tough conversations with individuals to resolve concerns in a dignified manner. Therefore, Edna suggested to others:

> You have to face those kinds of things with people directly. You have to talk to them directly and you have to basically say, "Listen, I want to work together," or "This is the problem that I'm having." Whether I need you to improve or whatever it is, you have to talk to people directly, one–on–one, to make sure that you can help them to continue to grow, and that's always worked for me.

Edna described another practice that worked for her as a technology leader. When she worked for the college to oversee a grant that brought along a very stressful situation, she remembered feeling overwhelmed and even crying at home, at one point. To gain control over the situation, Edna said,

> I remember going home and saying, "Ok, let me just go get some rest." All … I thought of the next morning is one step at a time. The first thing I had to do is to try to get the people hired, so I'd have some people to help me do this. So, the next day I woke up and I started to do that and the rest is history.

Edna was never afraid again. She said, “Even when I was the CIO, I never was afraid again on any other position that I couldn't do the job if I just took it one step at a time.”

After Frances received the CIO position, she began noticing gender differences among the men leaders in the executive meetings, from having been asked to take notes to having to prove value, as the only woman in the meeting. She said,

> I had to again, show in the meetings by adding more to the discussions. So, I had to do a lot more research, work harder to convince the group this is what I'm [going to] put forward in front of you. I had to work harder to get the gender equality in the meetings.

From a positive perspective, Frances belongs to an organization where she encourages both men and women to seek technology and STEM careers. In this organization, being the only woman in a room filled with nearly 50 men could be viewed as an intimidating environment because, most of the time, she is outnumbered in the meetings by the men. Bravely, Frances views being the only woman as an opportunity to promote women. She said,

> I was the only woman in the whole room out of the 50. That helped me to promote my ideas with the organization; that my gender helped me in at least promoting those ideas that women need to be encouraged to go into technology, [as] much as men.

Unfortunately, women not only had to compete against men in technology, but in meetings Mary–Elizabeth felt that there was a culture of competition among women executives, such as presidents and VPs. She said,

> When I was at the table, I saw a lot of … “Who's [going to] be like the person at the table today that they're [going to] give something to or get their way so–to–speak.” I've found sometimes, as I'm trying to lead and the president would say, “Ok, Mary–Elizabeth’s [going to] run with this initiative.” The initiative was a business initiative; it wasn't a

> technology thing. I would find that they would be like, “Uh no, no, no; I want to lead that,” so there was a little bit of that barrier to growing beyond the, “You're just an IT person”—because I loved the business part of it—and so, that was something that was hard to deal with.

Fortunately, confidence was a strong quality of Mary–Elizabeth’s, and she said that being an athlete helped her to create confidence. Consequently, a background in sports helpd her to sustain leadership among a team of men by using her knowledge of sports to form trust and for team building. She said,

> I'd have to talk about sports; I have to get on their level. I'd have to have beers with them; I'd have to let them see that I was just one of the guys, and then they'd listen to my thoughts, my creativity, my ideas; and over time, they accepted that. It took them awhile to realize that I had some valuable insights, I had good ideas...

She injected the team approach into her own IT team daily. She said, “We did a lot of after–hour events as a team. It was 50 of us at one time and we'd go to football games, we would go bowling as a group, one night a week.”

The team building approach expanded to others among the leadership team. Mary–Elizabeth and other leaders would meet to discuss advancement ideas. She said,

> We used to do Wine Wednesdays with some of the female VPs; how we would strategize, and we'd get together and we'd talk about if there's somebody that we needed to either bring into our ideas [to] move a big strategic vision forward. We would get the business together and just talk about it over having some hors d'oeuvres; some wine.

The Wine Wednesdays brought different mindsets to a relaxed social setting to brainstorm. This included a small group of 4–5 individuals, who were a mixture of traditional thinkers, such as senior VPs, and trending intellectuals, such as the IT technologists.

In addition, in the concept of team, when Mary–Elizabeth collaborated with other departments and wanted her point–of–view to be heard or considered, she said she would engage herself on their team:

> I would engage myself on their team, so if it was their idea, and it wasn't something that I really saw as the best approach, and I wanted my approach to be seen and heard, I would volunteer. I would say, "Let me be on that team."

Mia's experiences taught her to think positively, especially during difficult times, because it helps one to keep moving forward, particularly when a field aligns with one's principles. Mia said, "We always keep pushing. You have to keep pushing; stick with your principle. If you truly believe in the principle, truly believe in your cause … stick with it." Also, Mia felt strongly about having passion for the work one chooses. She said, "I think [the] most important thing is find something you are very passionate about," then you will stay with it to overcome obstacles.

Mia has a technique that she said is very common, which is to learn the decision matrix and organizational structure when you first begin in a new position. She said,

> You figure out the roles and responsibilities of each individual, each department, and get [an] idea of the landscape, the overall landscape. Spend time before you jump in [and] try to do something. Spend [a] few weeks; try to understand first, the people … understand your roles, your responsibility, and the relationships among the individuals; relationship among the team.

In addition, Mia believes that, “the best thing that you can do is … find a good mentor. Somebody will help.”

Rhonda turned to increasing her knowledge to stay competitive in the workplace, because she found it challenging at times. She said,

It's, very hard. You just have to absolutely 100% prove yourself all the time. I think it helps, especially in our institution—it's not so much that you were an expert in IT, you also needed to be an expert in education, and how the classes are run.

Tameco feels that women sometimes have to work twice or three times as hard to show that they are worth having the position. Unfortunately, this is a choice that women must make, said Tameco, because such choices are often tied to salaries. She said,

> Do I want this extra work and extra position, so I can prove that I can do that work, and I will do it … in addition to what I'm currently doing for the same salary, because I want to prove that I can do this.

Tameco focused on the work and every single task assigned to her, regardless of how trivial or vital, she provided her best effort to complete it.

Accordingly, undesirable work tasks should not be a discouragement for women, but instead an opportunity to excel. Tameco said,

> Sometimes, when people want you out of the way they give you a work that nobody else wants to do. So, you do the best you can, and you do the highest quality of work, and you do more. Volunteer for everything, and do some of the thinkless work, and accept some of the jobs without additional pay, and you make it.

Eventually, the exhibition of hard work and team spirit will speak for itself, highlighting leadership qualities displayed for the good of the team and the institution.

Tameco feels that many women wait to be asked to come to the leadership table and to be asked questions before engaging and providing feedback, although they may be the most knowledgeable persons on a particular topic. On the other hand, she feels that men display differing behavior:

> Men tend to say the first thing that comes to their minds, and they'll speak up and they'll say it. ... If you have something to contribute, jump in; say it. If it's a mistake, don't worry about it. You'll grow. Don't let a failure define who you are; get over it. Dust yourself off [and] get up there.

Sitting quietly is a practice that Tameco advises women to stop exhibiting, especially those who seek technology leadership roles.

Veronica said her supervisor was very hostile about her having children, but she continued creating her family. She said,

> When I told him I was pregnant the second time he was not—there was no congratulations or anything like that. He was all like, "Uhg gosh, you gotta be kidden me." But, he never treated me the same after that. ... He always had something against me after that.

With technology being a male dominated field, Veronica feels that, “sometimes you have to change people's perception, because they don't really think that a woman competes with a man in this area as well.” She believes that women will need to believe in themselves, because sometimes to get noticed they may need to take on tasks that are not included in their job descriptions. She said, “I will say being female, especially in a very male dominated field ... I always liked that saying that Sheryl Sandberg has, which is, you have to lean in.”

One interesting method that Veronica practices to deal with hostile or discouraging circumstances in the workplace is to not be easily intimidated. She said, “People always try to intimidate you. ... You might hold it inside, but ... you never let them see you sweat.” You go home and discuss your “crappy day” with your husband, but she said you go back the next day and you keep doing it.

Theme Four: Words of Wisdom

This theme provides indulgent information for women and others in technology, to reference throughout their technology training and careers. The participants shared helpful and encouraging advice that they received and learned along their journeys, in hopes of improving the journeys for aspiring women, especially when facing challenging conditions. Participants converse about coping techniques and tips that they learned along the paths to leadership, as well as information they wished they had known earlier in their careers.

Through their experiences and lessons learned, participants make this information available for immediate use to others who aspire technology careers, or for those who simply aspire coping mechanisms, while currently in the workplace. Patterns included insight and hindsight, positive awareness, and motivator.

Table 3 provides practical astuteness from each of the participants.

Table 3

Words of Wisdom

Participants	Practical Astuteness
Alberta	1. Keep learning and showing your technical expertise. 2. Look for ways to increase your confidence in speaking up in meetings.

3. If you have an idea that's good, but someone is rejecting it, get feedback from several other people. Then go back to present it from a different viewpoint.
4. Know your staff and praise them; you get higher regard when you praise them, than when you praise yourself.
5. Be willing to sit with some stress, but you have to be able to figure out how to let go of that stress. The way we let go of it is we joke a lot amongst our team, and we reward and praise each other for the way we solved something.
6. Don’t be afraid to move every five years or so, if you have to, for getting advancements. I know men do it, but I didn't do it, as well as I should have. That's probably where I could have moved a little faster.
7. Get the degrees. If you don't have a Bachelor's degree, get a Bachelor's degree. If you don't have a Master's degree, get a Master's degree. Degrees are better than certs; they've gotten me a lot farther for moving into management.
8. Keep your technical skills updated for as long as you can.
9. Don't be discouraged if someone says you can't do it. Rely on your own intelligence.
10. Follow the paths that interest you.
11. You own your career; think about how you will shape it.

	12. Don't be afraid to leave, if you have to, if there's nothing left for you at that company. If you're doing the same tasks, or you're doing all the work for somebody else, and they're taking all the credit; go. 13. I always felt better when I'm working in an industry where I'm giving back, even super indirectly, like technology does. 14. Technology helps people. 15. Technology is very rewarding in a lot of ways. It's fun, just constant change, but it's also stressful with the constant change. 16. Technology pays well, enough that you can make a good living, which is not every career, for sure.
Beatrice	1. Technology is a very exciting career. 2. I was always learning something new; there was always something to find out about. 3. You need to learn, you need to educate yourself, you need to be confident, you need to know what you're doing; if you do that, nobody can take anything away from you. 4. Study job descriptions, salary scales, and look for counterparts, because that will help you to ensure that you can keep equity, because you can point to these things. 5. During your review time say, look, I've done all of this, I have excellent reviews. I'm in this range ... why?

6. Make sure that you are well informed when you present a discussion. It doesn't have to be an academic dissertation, but you have to have enough information and data to present a cogent argument.
7. Once you reach a certain area in administration, it is very difficult to continue hands–on technical work. You need to depend on people with specific expertise that you can work with and that you can learn, as you need to.
8. IT leadership requires a lot of coordination.
9. I worked in the high schools on technology committees, and what I found in the beginning is that the women were afraid to crawl on the floor, or get their hands dirty, and that's what they thought technology was, but that’s not an accurate perception of technology.
10. Look at the other things you enjoy and bring that knowledge that you have to leadership.
11. Don't be afraid to get your hands dirty, don't be afraid to play around with things, women can do anything.
12. When dealing with people, you don't have to show it, but you have to have a certain level of skepticism with you at all times. I wish I'd known that from the beginning, because I was a little naive.
13. Ask yourself: Where am I going, what am I doing, where am I [going to] be in another year? Where am I [going to] be in three years? That helps you decide which barriers you need to fight, which you need to go through, and which ones you need to go around.

Chimere	1. Advocate for yourself, on your behalf, for your advancement. 2. Shadow a CIO. 3. Somebody who likes to do puzzles, take things apart, and then constantly looking to improve it, so when it's done, it's not done, it's just phase one; Somebody who really enjoys doing that, would really enjoy a career in technology. 4. I have seen individuals who think they can do a task or job, because they attended a boot–camp. If you don't like doing the task, because some of them aren't fun, you're just [going to] be miserable. It's just not for everybody. 5. If you've been in networking your whole career, you need to be able to branch beyond that, because leadership roles will span it all. 6. There are lots of free resources available. Go to edX, and take a free course. It's self–directed, on–demand, there's a ton of free courses. 7. Broaden your horizon. You don't have to become an expert in a new technical area, but you need to know enough about the different areas that would be reporting up through that leadership role, because you're [going to] be asked to talk about it, and you may be asked to talk about it more than a man, who's going for the exact same job. It pains me to say that, but I have just seen it happen so much. 8. Arm yourself with as much as you can. Learning has to be a constant. You don't get to a senior director and executive, a CIO, any of those roles without learning.

9. Foster that love of learning. Start to read articles, they don't all have to be formal courses, or even informal courses, but just reading articles and staying up–to–date, I think that is probably one of the biggest things that can help.
10. Look for opportunities. They may not be in your city; they may not be in your state. Assess whether you are in a position to move, are you in a position to go take this role and maybe uproot the entire family. Taking as many chances as you can early on, before you're completely settled, will really help.
11. Come on into technology, because we need a lot more, a lot, lot more women.
12. Connect with other women. The networking and the mentorship is so huge for getting in technology.
13. Mentors are huge. They are such an invaluable resource. Find someone who's truly [going to] be open with you. You don't want someone who's just telling you the fluff, you need someone who's [going to] tell you the good and the bad. Find a mentor early.
14. Form a group, if you have a few women who are at your company, being able to connect with them to be able to bounce projects off is helpful.
15. Finding a mentor when you're just getting started, do shadows. We love having people come and shadow us at the office. We had a middle–schooler come shadow us; also, individuals who are in college; individuals thinking about switching their careers. Go see what it's like, before you jump in. One

	view isn't, again, [going to] tell the story. You need to do it at multiple places, so that you can actually gather enough information to make a decision. 16. If you have a project that you think you're [going to] like, such as a project you're working on at school, take it to your mentor and ask if you can come to the office to talk to the development team, and get their feedback and ideas. 17. Be open to feedback. It's hard to hear negative things about yourself. It's not about you, but if you write code, and you've got people who have written code for 20 years, and they question your method, you've got to remember they're talking about your code, they're not talking about you, as an individual. 18. If I can hire a Mom, especially a Mom with multiple kids, I know that individual can get stuff done, because you have to for survival. 19. There's so much more in the people aspect. The true people connection aspect, I think, is much more of it than I ever expected it would be. 20. You cannot have a room of people who all look and think the same, and produce a great output that serves a large community. It just doesn't work.
Dora	1. I encourage women to get into the field of technology and not give up, because we know that there's value there, just don't give up. 2. Learn as much as you can, and just be well–rounded, so you can really understand the roles in technology.

3. It's not just about the technology in terms of the devices or the network, it's about people. Technology is about people.
4. If you want to work in senior leadership in technology, learn about working with people.
5. Get good planning skills, or develop good planning skills.
6. Be better mentors to women, so we can support them, and do networking for them to try to promote women.
7. You have to be persistent.
8. As women, you always have to work harder and smarter.
9. If you want to be in technology, don't let the fact that you don't have a technical background stop you from pursuing a leadership role in technology. I'm a perfect example of that, I don't have a technical background. I knew how to use technology and I knew how to promote it, but I think that if you have good leadership skills, good communication skills, that's what we need in the leadership role of technology.
10. We don't need you to connect cables, we need you to be at the table to be able to plan and negotiate for resources, so your team has the tools that they need.
11. In the technology industry there are a lot of roles, so again, you don't have to be somebody that connects cables and do all that, there's a lot of roles in the area of technology. Even somebody who's a good writer ... we need people to help us write policies, write procedures, write documents, things like that; so, there are many different roles in the area of technology.

	12. Once you enter technology, the sky's the limit. 13. It's been a great experience. I'm still as passionate about my job, as I was the first day. 14. I think my planning skills, and the fact that I worked on the instructional side, and student services side, because I worked with student activities and student government, so all of that helped me to think about the users when we're planning for technology. 15. The best asset that I have in my position now, is my team. I mean, they're geniuses. 16. Technology is exciting, and it's a dynamic field, I love it.
Dorothy	1. Welcome the opportunity to participate in any kind of professional development. 2. Mirror strong leadership styles. 3. Believe that when you do good work, people notice. 4. Stay true to who you are, and stay true to what is important to you; for me, that was student success. 5. You almost have to step back, stay focused in your head on what's important to you, to the students, to the college, to the mission, and just keep doing the job. 6. With technology, what your job is today, it's not next year; it changes. If you can't adjust, it's not the right field for you. 7. I think women have, today, a very good opportunity to advance.

8. Women role models are there, today, who at a minimum sit at that cabinet level, even if they don't directly report to the president. The fact that they're sitting in the meetings that the president is running is really important. Those women are the women they need to reach out to, and there are plenty of them out there.
9. Leaders who've had all the other experiences can be a guide for aspiring women.
10. Women have to know when they need to leave, if they really want to run a department; be at that leadership table. They have to know when to leave, and you have to do that pretty early in your career.
11. There are many different routes that you can take in technology. Find what works for you; find what you love.
12. Be engaged with the community at–large.
13. The longer you're in leadership, the less nitty–gritty you know about the practical side of IT, but you have the big picture, and you never lose that, and that always grows.
14. Seek out some kind of national organizations. Expand your relationships beyond the relationships you have at that specific organization.
15. Make sure you love change. If you don't love change, this is not the right field for you.
16. There’s always another lane to go to, and certifications help you to decide what maybe suits you best.
17. Do and be whatever you want to be.

	18. What seems to work for me better is to make sure that the men in the group respect my work. 19. I've been in this field for 50 years. I still love every single thing I do. I don't know if I love my field, as much as I love the community college mission.
Edna	1. Be open to everybody. Understand that everybody is important, and that everybody has ideas to contribute. 2. Even though it is a challenge when you go to all the technology meetings and you got all those guys ... you have to make it fun every single day, so that you keep enjoying it, and that you keep enjoying learning, because otherwise, it becomes a burden, and you don't want it to be a burden. 3. This is a whole new area of opportunity for women, and it's shocking to me that we don't have more women in this area. 4. Women, we need you. We need females in technology; we need people to help. Look at it from a female point–of–view; males don't make decisions the same way as we do. 5. You're learning every day, and you're never [going to] be bored. I was not bored, not one day in that job, ever. 6. As we're working through new technology, if you don't stay current, if you don't stay on top of things, you could get left behind really fast. 7. We're never the expert on everything. 8. Don’t be afraid to have the direct and difficult conversations. Talk to people directly, one–on–one, to make sure that you can help them to continue to grow, and that's always worked for me.

	9. Make sure you are the most knowledgeable; you keep yourself the most prepared; keep yourself up–to–date. 10. When you're in a meeting, sit back and don't let everybody necessarily know all you know, and you ask questions. Get other people to make recommendations along the lines you can support, because you want to support them; but it would be stronger than if you come up with the ideas by yourself. 11. Being CIO was fun and exciting every single day I went to work, I loved that job. 12. If you're starting out in a technology leadership position, you have to go and spend time with each of the areas, and all the levels of the people, so you really let them know that you're open to hearing their great ideas. 13. Embrace the future; embrace change. 14. Enjoy learning.
Frances	1. Keep relearning; keep learning on an ongoing basis. It's never a static process, it's always dynamic with new technologies being introduced. That's what keeps me going and that's what motivates also. 2. Make sure you create an environment around you that helps you to stay in that field, don't give it up if you have other duties to take care of. 3. It's very, very gratifying. I still love it; I still do it. It's gratifying, because you end up resolving problems for somebody in some way or the other. 4. Join external organizations, where the technology leaders come together to share their experiences is very important, because if you don't do that, you

lose track of what is new out there. You're behind very quickly in the field of technology, so you have to really make sure you are up–front, as far as knowing what's going on in the market consensus.

5. Keep in touch with all your peers and all your other colleagues from other schools and any other organizations.
6. Network, network, network, with other technology leaders, from other industries, not just higher education, but other industries. Talk to people ... that's very, very important. That helped me a lot.
7. You need the support of your leadership where ever you're working to climb, and you need to prove yourself by working hard.
8. Assume the challenge of working harder than the men. It's [going to] continue for some time, it hasn't changed, but just be aware of it, and work with it.
9. Provide more support to the women who are trying to come into technology, and make sure they don't fall back because of other domestic duties they have to take care of.
10. Tell the women not to stop pursuing their dreams, because that's not a problem at high school and college.
11. Be aware that it's not a 9–5 job.
12. Value the opinions of the women and the whole group.
13. It's definitely not an easy climb. We have to work much harder than the men in the same position.

Mary–Elizabeth	1. I loved a challenge, technology is challenging, because it changes every day; it's very dynamic. 2. Take the challenge, you can do anything; shoot for doing your best. Don't do mediocre ever. 3. There's no end to the ability to grow and advance in an IT world, as a woman. Be open–minded and willing to learn, because there's an awful lot of learning to verse that platform. 4. The trajectory right now, that I see really big, is data. The use of data, not just algorithmic data, but there's so many things right now that businesses need data for, and the credit card industries; business intelligence. 5. Don't be intimidated by the amount of work you have to put in to learn new things, because it does change every day. It's very dynamic work. 6. If you're the kind of person you learn something and that's it, and you want to stick with that the next 10 years, it's not for you. 7. Today, you might be coding in one language, and tomorrow you might be learning to fly drones, and the next day you might be building the next security code for bitcoin; so, be open–minded, and enjoy the learning. 8. Don't force yourself into a little niche. Just because you go in as a programmer doesn't mean you can't come out as the VP. 9. If you're female, if you can think it, you can dream it; you can do it. Go for it. 10. Be very confident. 11. The more you grow in an IT position, the more you want to lead.

	12. Use that data.
Melodie	1. Say, yes, when opportunities are presented to you. Don't be afraid to try something new; those were the times where doors opened for me. 2. Recognize the power of creating networks. I wish I had known that a little bit sooner. 3. Be intentional about mentoring. Share and develop other people along the way. 4. Don't expect one day to be the same as the next day. 5. If you are a curious person who likes to learn, who likes to be challenged, who is looking to make a change or impact, this is a great field to be in. 6. Leverage technology to create and improve learning experiences for students. 7. There are a lot of opportunities for women in technology. Most organizations value diversity within IT, because there are a million ways to look at a problem, and you need diverse opinions. We need more women in technology. 8. Don't be afraid to ask for help, and to ask for opportunities to learn. 9. I have learned that there's a reason that we were made with two ears and one mouth, so we listen twice as much as we talk. Maybe I could have learned more by listening. 10. Trust yourself to not be afraid to see yourself in another position. 11. It's acceptable to be proud of your accomplishments. 12. Acknowledge that you can't be an expert in every area.

13. Trust others to provide you with good accurate information, and facilitate those relationships.
14. Be really comfortable in your own skin and in your confidence
15. Seek out mentors.
16. Where ever that passion or curiosity led me is where I focused my professional development and education opportunities; attending conferences; doing research.
17. I didn't set out with an intention of becoming a vice president of information technology. I set out with the intention to be the best at whatever I was in, and to develop a team and process that helped to grow the institution; that helped to make learning experiences and access for students better.
18. As a leader, grow and encourage others.
19. Keep learning; keep training. Take a Coursera course, attend a free webinar, find a group to join; there are always opportunities to learn.
20. Find or create a network of others that you can depend on, and that you can talk with, and you can vent to.
21. We need to do a better job of supporting one another, as women, as we're facing challenges.
22. How women approach problems with empathy, and bring a different perspective; they force you to see the human in what we're working on in technology.

Mia	1. It's extremely rewarding in IT. You never deal with the same project twice; nothing ever repeats. 2. There's always new technology; there's never a dull moment. It is the best career for anybody. 3. To remain competitive, we have to be paid very competitively. 4. This is a great time to be in technology, and with the expansion of the technology field, it's no longer limited to just programmers and hardware engineers. There are all kinds of different fields that require technology knowledge; technology expertise. This is really a bright future for all females. 5. Everybody needs role models. Throughout my career, I was very fortunate I had excellent role models. 6. We're far more logical than men. 7. When you climb to a leadership role, it's not about technology anymore; it's really more about relationships you can build with your colleagues; understanding the culture of the institution. 8. Keep pushing, you have to keep pushing. 9. Stick with your principle. If you truly believe in the principle and your cause. 10. Find something you are very passionate about, and you will stick with it. When there are obstacles or pushback, you will find ways to overcome. 11. Engineering itself is a tough field, so you really need to love it. If you love it, you push on, and all the barriers will be worked out.

	12. Always attend to your curiosity. 13. Always prepare to try new things and to learn new things. 14. Polish communication and writing skills. 15. We need to get more females, more girls into the field. 16. Higher education seems to have more female CIOs than any other sector. 17. Many of us can handle complexity and are detailed oriented. 18. Technology is really a bright future for all females.
Rhonda	1. What helped me stay in technology and not give up was the fact that I was always curious about learning something new. 2. You get exposed to a lot of IT professionals when you travel for conferences, and you're constantly learning; information technology is constantly changing. 3. A career in technology is a multi–faceted career, basically. You can start out with technology and go anywhere you want. Once you have the credentials to be an IT person, it's easier to learn everything else; it's something that you can always build on. 4. You need to know multiple areas at the same time, so it's been great; it's been a learning experience and I'm still learning. 5. Go out there and get in the actual IT shop, and learn as much as you can. 6. You have to absolutely 100% prove yourself all the time. 7. Know the latest and greatest technology for faculty and students. 8. Don't pigeonhole yourself in one area; you want to grow in IT. 9. Document your processes and stay organized.

	10. It's always great to read and stay abreast of current technology trends; there's a lot of technology communities. 11. You will find a job anywhere with an IT background. 12. Know your interest early on. When you start taking classes at the university level, they give you an intro to different areas. Conduct your own research and talk to IT people, go to workshops. 13. Eventually, you will discover if you like the application side of things, the hardware, or the programming side of things. Once you know which area you like, search for what kind of careers are available in various industries, because any industry you pick will have a need for IT. 14. Knowing your IT interest area will help you, basically, line up your job, as you're getting closer and closer to graduation. 15. Research the salary, years of experience needed, and what you can do to get to that point; participate in internships. 16. Managing people is a huge part of technology leadership, and one of the hardest aspects of leadership. 17. A technology career was the best decision I made, because I have never been without a job, since I graduated.
Tameco	1. Technology is exciting and it's ever changing. If you have that curiosity of mind and passion for new things, it's like no other job. 2. If you like routines, that's not the job for you. 3. Find allies, men and women. Some of the best supporters that I've had have been men.

4. Find someone that you can lean on for moral support. The person doesn't have to be in your field.
5. Find a career coach, as you develop in your career, to consult and help navigate various bumps and options. I wish somebody would have told me that there were such people as career coaches.
6. Take advantage of networking opportunities with associations, professional organizations, and volunteering opportunities. Get a sense of what the work is really about.
7. Do what you love to do. Don't let the naysayers make your decisions. Make your own decisions, see for yourself.
8. Stop waiting to be asked to come to the table or waiting to be asked a question before stepping up to provide feedback. Often, a woman is the smartest person at the table or the person that has the most knowledge on that topic.
9. Sometimes you need a hand to pull you up. If you don't have that in your team, in your peers, in your extended network of collaborators, a mentor, or a personal support network, you're not [going to] make it through; or, you're [going to] make it through very painfully. It's easier with a little bit of a support group around you.
10. Be open to say what you do know and what you do not know, and trust yourself.
11. There are plenty of opportunities in technology. If that is something you're passionate about, if that's something you want to do, go for it.

	12. Don’t let things get to you. 13. I often think of myself as more of a glue for the team, than I think of myself as the head of the team. 14. I've made it into a leadership and technology, so whatever barriers and deterrents that have been there I have gone past them.
Veronica	1. Don’t be intimidated very easily, because people always try to intimidate you. 2. If you're in a field that you love, it just happens. I mean, it does, because you put in all the time and all the energy, because you love what you do and who you do it for, and the results that come from it. 3. What I have found is that every step of the way you gain something and you lose something. Every time I've ever moved up I had to consider that I'm not [going to] be doing this piece anymore. 4. Be resourceful. 5. Sometimes you have to lean in, like Sheryl Sandberg says. 6. Technology's everywhere. So, you have a lot of opportunities, it's in everything we do. 7. Find your niche in an arena that suits you. 8. Technology is interesting, because it's always changing. You don't have this chance to become bored and stagnant. 9. It's a long journey. It's worth it, but it is definitely hard, I'll say that it's hard, because you ‘gotta’ put in a lot of time and energy for people to recognize your worth.

10. Be prepared to work harder than the men.

Chapter Summary

This chapter provided a deeper understanding of the experiences and lessons learned of women chief technology officers in community colleges. This chapter also identified participants' awareness of possible deterrents and barriers associated with being in the technology profession, as women. Participants were aware that discrepancies and inequality existed in technology, especially in leadership, but were not deterred. They were familiar with the common struggles of being a woman in a male–dominate field, and the burden of having to constantly prove one's worth and technical competence. Each participant described different experiences, but the essence of much of their journeys were very similar.

This study discovered that, although the participants understood the negative aspects of being in the technology field, the passion they have for helping people through the use of technology, the community college, and growing women in technology to leverage equity in the future of technology for women, far outweighed any deterrents or barriers to persistence.

Findings of this study show that these participants had strong confidence and determination to be the change that they want reflected in technology. This study discovered how self–efficacy and positive outlooks helped the participants to technology leadership, as they relied on knowledge and unwavering work practices as tools, to prove value and fight bias. Chapter 5 provides further discussion and analysis of key findings, implications, recommendations, and concluding remarks.

Chapter 5 - Discussion

Introduction

This qualitative phenomenological study describes the experiences of women chief technology officers in community colleges. Chapter 5 reiterates the study chapters in the introduction, followed by the summary of the study, including the problem and purpose statements, and the research questions, followed by the summary of major findings, findings related to the literature, findings related to the primary and secondary theoretical frameworks, conclusion, implications for practice and policy, recommendations for further research, summary, and a personal reflection.

Chapter 1 introduced the topic, problem statement, purpose of the study, methodology, research questions, theoretical frameworks, significance of the study, delimitations, assumptions, limitations, definition of terms, and provided the organization of the study. Chapter 2 provided the literature review process, and the overview of the literature review, which was followed by an introduction leading into the research of the key literature that was reviewed. Chapter 3 explains the research methodology, including the research design, ethical considerations, population and sample, instrumentation, data collection procedures, data analysis, limitations, and a summary. Chapter 4 reports the findings of the study. It introduces the participants, findings by research questions, emerging themes, and summarizes the key findings.

Summary of Study

Problem Statement

Throughout the history of the United States, citizens have witnessed gender inequality in the workforce (Bailey & DiPrete, 2016; Wang & Degol, 2017), specifically in STEM fields

(Wang & Degol, 2017). Women make up a large percentage of the population in the United States, but only account for a small percentage of technology professionals comprising 30% of the STEM workforce (CoSTEM, 2018). The percentage of men to women in STEM jobs is a distant 76% for men versus 24% for women (Ritzdorf, 2015, p. 18). However, more women attend postsecondary institutions and outperform men in education attainment, specifically at community colleges, but women only earn 92 cents for every dollar earned by men (Community College Daily, 2018). Studies show that women leaders with an increased number of female employees run more productive companies and provide competitive salaries of 10 percentage points more, showing an upsurge in wages and production with women CEOs (Soyars, 2017). Furthermore, STEM occupations earned nearly 70% more than the national average of occupations in 2005 (Terrell, 2007). For instance, the average wage and salary earnings for engineers were $74,670 and technology earnings were $67,010. The average STEM wage and salary earnings for all occupations were $64,560; while all other occupations averaged earnings of $37,870 in 2005 (Terrell, 2007). STEM related jobs continue to pay more than other occupations. The total median annual wage in 2018 for all occupations was $38,640; that for STEM fields was $84,880, and non-STEM fields was $37,020 (U.S. Department of Labor, 2019).

The gender inequality faced by women in the workforce, specifically in technology fields, is a concern that promotes an absence of diversity, inclusion, female role models, and varied perspectives; which further supports inequality in salaries and leadership attainment. Without a balance, barriers that women face in the workforce today will continue to prevail.

This study investigated the experiences of women chief technology officers in community colleges. Women are underrepresented in STEM, specifically leadership, and earn

less than men; although women comprise half of the U.S. population, dominate the number of students enrolled in higher education, and represent a large percentage of employees in the workforce.

Purpose of Study

The purpose of this study was to describe the experiences of women chief technology officers in community colleges. The study sought to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. In addition, the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. The intent of the study was to discover and define their experiences in the workforce (specifically the technology sector), education, and organizational structures.

Research Questions

The research questions of the study were designed to gain a deeper understanding of the women chief technology officers' experiences that led to attainment of leadership roles in technology.

1) How do women chief technology officers in community colleges describe their experiences that shaped their careers?
2) What do they perceive as factors that shaped their careers? How do they perceive self–efficacy as a factor that shaped their careers?
3) How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership?

Summary of Major Findings

Anyone Can Learn

Findings revealed that many of the participants had not planned on a career in technology. They initially held other interests before various circumstances led them to a path toward technology. Many of the participants sought non–technical careers, such as teaching sociology and English, or studying medicine. One participant had not settled on a career choice until being introduced to technology as a means to obtain steady employment and a good living. Another participant chose technology after failing chemistry, which was required for her medical track.

Alberta completed work in education, history, and English, but said that she could not find a "teaching job" after she graduated. Dora has a background in sociology and says she "was at the right place, at the right time," when it came to a career in technology. Initially, Edna wanted to be a doctor, but studied education. She started her career as a business education teacher.

Rhonda admitted that she had not heard of information technology until speaking with an advisor on career choices. She said, "I talked to an advisor who I told exactly what I was looking for that would guarantee me a job. I honestly just went into IT just so that I can get a job."

This information shows that it is not a requirement to have a background in technology in order to obtain a lucrative career as a technology leader. Furthermore, it shows that anyone can learn some form of technology, even individuals who failed disciplines, such as chemistry. Women can learn and excel in technology without having had a previous interest or background in technology.

Many of the participants were encouraged by mentors and role models to enter the field and later discovered that they were good at acquiring technology skills, such as building web pages, or word processing. This information reveals that many of the women entered the technology field after they were made aware of its benefits, or understood that they were capable of learning skills in technology, although they did not have a background in technology. Therefore, informing young girls and women about the various areas of technology will increase awareness of technology opportunities, and will assist and guide individuals with choosing a career pathway in the field. The participants of this study welcomed opportunities to learn new skills. As women, they did not waver from entering a technical career that demanded constant learning to sustain in the workforce.

Leadership Support and the Community College

Further results show that aside from parents, leadership development and personal growth stemmed from support and advice of managers and leaders. Supportive leaders provided opportunities to attend trainings, conferences, professional development workshops, in addition to providing opportunities for advancement. Mia was offered the CIO position by the chancellor, although she had no administrative experience operating a college division. Mia said,

> He took a chance on me and he offered me the position. In the first year he really guided me and helped me with the various operation details, various policy procedures; helped me guide through this kind of bureaucracy. I think everybody will need someone like that.

Development also stemmed from common practices and advice from mentors and managers, showing that growth does not have to derive from profound experiences, but may be

common and readily accessible; for example, simply displaying organization by keeping a tidy desk or documenting processes.

Additionally, participants leveraged prior knowledge and experiences to advance in technology by drawing upon non–technical skills, such as planning, communication, and collaboration skills, but ultimately it was the support of leadership who helped them advance. Dora said, “I was very fortunate that my boss, at that time, just put me out there forefront working with technology...”

Maray–Elizabeth said,

> One of the factors was having a boss that allowed me to communicate my vision, so I was real big on planning and vision ... One of the factors was just having bosses that were very opened and influenced by what I had to say.

Melodie said her manager provided her with many training opportunities. She said, [She] sent us to the Harvard leadership and management seminars, took us to conferences, and encouraged us to write and present.

Dorothy found leadership support, in general, to be central in her leadership development. She said,

> I can remember in my early days in this field, when the three jobs were offered, I got the least job—had the highest grades—got the least job in the department, and got the least pay. When the director's job came opened … the dean of administration … saw something in me and said, “This is your job.”

Findings show that participants were able to draw upon prior experiences and skills they possessed to use and advance in the field of technology, such as planning and communication skills, which will be seen by others, including managerial leaders. In addition to prior skills,

along with support of leaders, the participants were able to advance to leadership in technology. These findings mean that community college leaders, especially women leaders in technology, are poised to mentor, guide, and provide opportunities for aspiring and current women in technology to grow and excel in the technology industry. Community colleges can be a forefront platform where leaders can grow students and women aspiring technology leadership.

Mentoring: Strengthening the Pipeline

Further findings revealed that much of personal growth as a leader involves growing other individuals. There is a sense of obligation to grow other women in technology. Many of the participants work with outside organizations to mentor and bring about awareness and growth among young girls and women aspiring a technology career.

Chimere feels it is important to spend time showing women first–hand accounts of what a leadership role entails. She often encourages women to shadow her throughout the workday. She refers to herself as an open mentor, available to those who want to advance. She said,

> Come to me with anything. I will freely share what my experiences have been in a particular situation; how I've gotten around it. I think just being opened to talking about the real facts behind a particular experience helps a lot of people to not feel alone, and be more willing to try something new.

Dora works with a program for young Latina girls that provides mentoring services concerning media, digital television, and the use of technology and Frances works with organizations to help women and young girls in K–12 schools and college level move into STEM related fields.

These findings mean that women leaders can support the effort to leverage the technology field by growing young girls and women in the technology pipeline. Recruiting

young girls and women early, and mentoring and guiding them along the path to technology, will support the effort to increase the number of women in technology and leadership roles. In turn, supporting aspiring women seeking technology leadership through networking and mentoring will increase the number of role models for women aspiring a technology career. These current women leaders in community colleges take on the roles of being models, whether they are aware of it or not, for others to mimic and develop for increased attainment for women seeking technology careers. In the vicarious source, participants observed others succeed through adverse situations (Bandura & Adams, 1977). By observing others overcome threatening activities, they developed a sense of expectations that they, too, may overcome adverse situations and improve if they "intensify and persist in their efforts" (Bandura, 1977, p. 197). Many of the women used expanding their knowledge to help persist in their efforts.

Systemic Change

Further findings show that the participants' perceptions of deterrents and barriers that they experienced during their journeys to technology leadership fueled their drive and motivation to persistence, make change, and did not deter them from continuing in technology.

Chimere is naturally aggressive and is not easily intimidated. She said,

> Especially in technology, where there are not many women at the table, and there would be times where men would try to intimidate. I'm like, "Oh, I'm sorry, you don't know what's [going to] happen here. We can have this conversation."

Chimere believes that sports helped her to feel "confident in that space" to drive and be successful in technology, despite the field being male–dominated.

In fact, these participants were faced with various deterrents, but instead of leaving technology, they sought to continue working, and to stand for equality and make systemic

change in the technology divisions to eradicate gender disparity in technology. Some of the participants have been intentional in being the change that they want accessible for women in the technology field, as well as the young girls in the technology pipeline.

When Beatrice noticed that subordinate men had higher salaries than hers, she stood in courage to address the issue. She said,

> I went to the vice president who had moved me over above my boss's head and said, "Yes, that was very nice of you. I have more degrees, I have more responsibility, and these are examples of the salaries that are being paid to my male counterparts. Do something."

To avoid such discrimination, Beatrice adamantly informs individuals to study job descriptions and salary scales, and research what counterparts are earning, because it will provide leverage that may help ensure a level of equity.

Mary–Elizabeth partnered with the human resources department to conduct a compensation study for IT personnel and positions in pursuit of fair wages. It resulted in IT gaining their own classification of job profiles. She said,

> We had our own job family's classifications, and they marketed it against universities, and other community colleges, and the corporate world. … Across the state, we were probably in the top third of wages, after that first 3–year study.

Tameco sought to make changes in the hiring process. She said the people that make the decisions have a tendency to hire individuals similar to themselves, and Tameco argues that such practices need to be broken, because in technology it is a disadvantage for women. She said,

> I think that one of the things that we do here in the Gilbert Community College District is ensure that we have [a] hiring panel that is not made up of the same type of people. It

doesn't matter what that one type of person is, it just has to be different, because that's the only way you're [going to] break out of that cycle.

To promote equality and limit internal bias during the hiring process, the college ensures to have a diverse hiring panel, which may be especially advantageous for women seeking a technology role.

These participants were confident in advancing in the field and changing policies and practices that support the disparities in technology, which include an absence of diversity, inclusion, female role models, and varied perspectives, in addition to gender and salary discrimination. Instead of abandoning the technology field, due to the social barriers, these women chose to stay and not be pushed away.

Findings Related to Literature

Bias

This study has both similarities and differences to the current literature. The most significant findings related to the current literature showed that the participants of this study experienced much of the deterrents and barriers identified in the current literature (Williams, Korn, Rincon, & Finn, 2018), notably bias and stereotype threats; however, the participants' reactions to the deterrents were much different than the literature explained.

Although the participants experienced bias and discrimination in various forms and situations throughout their journeys, each of the essential biases, as explained in the study by the Society of Women Engineers and the Center for WorkLife Law at the University of California, Hastings College of the Law (WLL), was found in my study to be deterrents that many of the participants encountered. As stated in chapter 2, the study identified four biases: The Tightrope, Prove–It–Again, Maternal Wall, and the Tug of War biases (Williams et al., 2018). These biases

expanded from workplace processes, including hiring and performance evaluations, bias against mothers, and pitting women against one another (Williams et al., 2018).

Dora explained an experience that identifies with the Tightrope bias. Dora attended meetings with male leaders who made comments that she felt lacked professionalism, but others associated the comments as being direct and displaying strong leadership abilities. When Dora made a remark or challenged others, her manager would reprimand her after the meetings. She said,

> When … I would make comments or I would challenge comments, I would be talked to after the meeting, "Oh it looks like you're not being a team player. Why are you asking those questions?" There were deterrents, but they were kind of demoralizing sometimes. Because it's like, I just said the same thing that other person said, so why is it being brought to my attention?

Most of the participants stated that they had to constantly prove themselves as technically competent, as identified with the Prove–It–Again bias. Francis said, a "few things that are very important is you need the support of your leadership wherever you're working to climb and you need to prove yourself by working hard..." Rhonda expanded her knowledge to stay competitive in the workplace, because she found it challenging at times. She said, "It's very hard. You just have to absolutely 100% prove yourself all the time." Additionally, Tameco feels that women sometimes have to work twice or three times as hard to show that they are worth having the position. Unfortunately, this is a choice that women must make, said Tameco, because such choices are often tied to salaries. She said,

> Do I want this extra work and extra position, so I can prove that I can do that work, and I will do it … in addition to what I'm currently doing for the same salary, because I want to prove that I can do this.

Veronica experienced instances of the Maternal Wall bias against mothers. She recalls working in the IT industry during her child–rearing years, prior to working for the community college. She said,

> I had a supervisor who did not really—he didn't appreciate that I was having children. I was [going to] be gone, and he was like, “Oh my gosh. What are you thinking.” I think I'm [going to] have a baby, that's what.

Veronica said her supervisor was very hostile about her having children, but she continued creating her family. She said,

> When I told him I was pregnant the second time he was not—there was no congratulations or anything like that. He was all like, "Uhg gosh, you gotta be kidden me." But, he never treated me the same after that. ... He always had something against me after that.

Mary–Elizabeth felt that there was a culture of competition among women executives, such as presidents and VPs, which identifies with the Tug of War bias. She said,

> When I was at the table, I saw a lot of … “Who's [going to] be like the person at the table today that they're [going to] give something to or get their way so–to–speak.” I've found sometimes, as I'm trying to lead and the president would say, “Ok, Mary–Elizabeth’s [going to] run with this initiative.” The initiative was a business initiative; it wasn't a technology thing. I would find that they would be like, “Uh no, no, no; I want to lead that,” so there was a little bit of that barrier to growing beyond the, “You're just an IT

person"—because I loved the business part of it—and so, that was something that was hard to deal with.

The Society of Women Engineers and the Center for WWL study revealed that high levels of bias accompanied "feelings of exclusion, belonging, and lower intent to stay with one's employer" (Williams et al., 2018, p. 5). Nevertheless, the participants in my study did not let the biases deter them from continuing in technology.

Stereotype Threat

In opposition to the outcome of exposure to stereotype threats as described in current literature, the women chief technology officers of this study did not allow the negative stereotyping of women and assumptions that men were better suited for technology cause them to perform poorly. Current literature states that stereotype threats exist when negative stereotypes concerning a specific social group, such as women, produce suboptimal performance by that particular group (Beilock et al., 2007). Literature discusses how stereotyping a social group of people in a negative manner may impact their performance. These stereotype threats can result in impaired performance because they may cause women to psychologically, as well as physiologically, believe the stereotypes (Hill, Corbett, & Rose, 2010).

The participants of this study did not believe that they were any less capable than men to learn and perform in technology roles. The beliefs of one's competence and how they view their "capabilities affect[s] their motivation and will to act, it consequently affects their performance" (Peguero & Shaffer, 2015, p. 48). In fact, some of the women felt that they were smarter and more logical thinkers than men. Mia said, "We're far more logical than men." The women also welcomed the challenges to excel through the barriers.

In addition, contrary to the aforementioned literature, Meiksins et al. (2019) discuss a study reporting that "interest" in engineering was a gender difference and may be associated with the "leaky pipeline" (Meiksins et al., 2019). The report states that women identified less with engineering and had a lower level of interest, partly due to viewing themselves as less competent. This may, in turn, be a factor as to why some women drop out or leave engineering technology for other majors or careers producing a "leak in the pipeline" (Meiksins et al., 2019). The women in this study expressed that they believe women leave technology due to other critical responsibilities, such as being the primary caregiver for the family.

These findings show that although women in technology face deterrents and barriers they do not allow the bias or stereotype threats to stop them from pursuing advancement, leadership, motherhood, or expansion of knowledge. The participants are motivated to change the perceptions of women in technology through constant learning and display of their knowledge as evidence of their worth. It is understood that an increase of women in technology will support the effort to eliminate disparities women face in technology. These women believe that they are just as, if not more, competent in technology as men and welcome opportunities to take on the unwanted tasks, work harder and longer hours, because eventually, they become leaders in technology who used what was meant as deterrents to highlight and excel their worth, competence, and team camaraderie, while others refused to undertake the adverse tasks.

Reform

Literature discusses that leadership is key to scale systemic STEM education. The Committee appointed by the National Academies of Sciences, Engineering, and Medicine (2016) discussed systemic barriers for students, STEM in particular, at 2–year and 4–year institutions. However, in addition to barriers, "opportunities to promote completion of undergraduate STEM

degrees" (NASEM, 2016, p. 1) were discussed. Included were opportunities in which leaders may invest to increase student success in a systemic manner, where noticeable reform may occur in education institutions.

The results of this study show that participants agree that systemic reform is necessary and that leadership is the key to change, but the focus steered on a need for reform within the workforce with hiring practices, salary scales, and internal support for caregivers more so than reform in the educational institutions. The participants believe that women are excelling in education and are out performing men in earning credentials, but may lack support when it comes to working and advancing in technology, while having other critical responsibilities, such as being primary caregivers. Many of the challenges women face as caregivers were highlighted during the COVID–19 pandemics, where leaders entered into the homes of co–workers via video conferencing meetings. One manager said many of the women on her team seemed to have to care for children, while attending work meetings, but the husbands worked uninterrupted behind closed doors. Advancing in technology often requires working long hours, which proves to be challenging and often puts women at a disadvantage for advancement, so leadership and systemic change in the workplace is key to leveraging equality.

Findings Related to Primary and Secondary Theoretical Frameworks

The primary theoretical framework for this study was Bandura's (1977) Self–Efficacy Theory. Through the lens of Bandura's theory of self–efficacy, the dimensions of the four sources of information for efficacy expectations deepened the understanding of the participants' experiences. Appreciative Inquiry Approach was a secondary concept used to strengthen the structure of the study through the use of its four tenets, as it sought to inquire what worked for the participants during their journeys.

Self–Efficacy Framework

In Bandura's social learning analysis, he states that efficacy expectations are derived from four main sources of information: Performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1977, p. 195).

The more successes participants have the higher their mastery expectations will appear, making performance source the most influential, because it is based on personal mastery experiences (Bandura, 1977; Bandura & Adams, 1977).

Alberta said,

> I find it, if I know the steps of how I need to get something done, like a huge project, if I can envision the steps or I know technically, sort of theoretically how it's [going to] be done, I'm very confident I can get it done. ... The way that I handle that is organizing it as much as possible.

Because of Chimere's practical successes, she has high mastery expectations for herself and her team. She said,

> I think being able to take the hands–on experience of truly having done the work that I can understand when I'm asking someone to hit a deadline and write a piece of software. I know what goes into that; it's a lot harder to snow me than it might be [for] someone who has never written code before. They might say, "Oh, you need four weeks." Whereas I say, "Yeah, I'm pretty sure I could write that this afternoon. Then that becomes a very different conversation, so we're able to do more things faster without burning–out the team.

In the vicarious source, participants observed others succeed through adverse situations (Bandura & Adams, 1977). By observing others overcome threatening activities, they developed

a sense of expectations that they, too, may overcome adverse situations and improve if they "intensify and persist in their efforts" (Bandura, 1977, p. 197). Melodie said,

> Faculty were really not happy with the administration's changes and … her [administrator's] house was actually shot at as a result of some of the changes. Watching how she composed herself and led through that really tense … conflict was really impactful, and how I tried to model myself when I'm faced with adverse situations or places where I'm not very popular.

Having successful coping strategies falls under verbal persuasion (Bandura & Adams, 1977), and according to Bandura (1977), although verbal persuasions are greatly used to "influence human behavior" due to accessibility, they are a weak source for efficacy expectations. Telling people what to expect will rarely produce expected outcomes compared to one's own experiences. Dorothy said, "My father gave me confidence. I could do and be whatever I wanted to be. He gave me the confidence to hang in there, and [was] always telling me that my work was really good; that helped."

The fourth source of expectancy was physiological arousal where anxiety and vulnerability to adverse situations were observed. This arousal may affect "perceived self–efficacy in coping" with stress (Bandura, 1977). Veronica said,

> I had a supervisor who did not really—he didn't appreciate that I was having children. I was [going to] be gone, and he was like, "Oh my gosh. What are you thinking." I think I'm [going to] have a baby, that's what.
>
> When I told him I was pregnant the second time he was not—there was no congratulations or anything like that. He was all like, "Uhg gosh, you gotta be kidden

me." But, he never treated me the same after that. ... He always had something against me after that.

Appreciative Inquiry Approach

Aligned with the purpose of the study, I utilized appreciative inquiry, as a secondary conceptual framework, to acquire knowledge concerning positive factors that supported the participants to attain leadership roles in technology.

The appreciative inquiry (positive strength-based) approach supported identifying what "worked" or what was "right" during their journeys (Egan & Feyerherm, 2005). There are four basic tenets of appreciative inquiry beginning with Discovery: appreciating what is or what worked well. Frances said,

> I was the only woman in the whole room out of the 50. That helped me to promote my ideas with the organization; that my gender helped me in at least promoting those ideas that women need to be encouraged to go into technology, [as] much as men.

Dream: envisioning or imagining what could be, Tameco feels that women sometimes have to work twice or three times as hard to show that they are worth having the position. Unfortunately, this is a choice that women must make, said Tameco, because such choices are often tied to salaries. She said,

> Do I want this extra work and extra position, so I can prove that I can do that work, and I will do it … in addition to what I'm currently doing for the same salary, because I want to prove that I can do this.

Design: determining what should be, Mary–Elizabeth partnered with the human resources department to conduct a compensation study for IT personnel and positions in pursuit of fair wages. It resulted in IT gaining their own classification of job profiles. She said,

> We had our own job family's classifications, and they marketed it against universities, and other community colleges, and the corporate world. … Across the state, we were probably in the top third of wages, after that first 3–year study.

Destiny: creating or executing what will be: Tameco sought to make changes in the hiring process. She said the people that make the decisions have a tendency to hire individuals similar to themselves, and Tameco argues that such practices need to be broken, because in technology it is a disadvantage for women. She said,

> I think that one of the things that we do here in the Gilbert Community College District is ensure that we have [a] hiring panel that is not made up of the same type of people. It doesn't matter what that one type of person is, it just has to be different, because that's the only way you're [going to] break out of that cycle.

To promote equality and limit internal bias during the hiring process, the college ensures to have a diverse hiring panel, which may be especially advantageous for women seeking a technology role.

The discovery process of the appreciative inquiry approach allowed me to identify and share positive attributes from the journeys to use in the future. The dream process helped shape an optimistic vision of how one imagines a better institution or STEM industry. During the design process, a blueprint for change was created that integrates the past, future, and positive desires that were relevant to today's reality (Egan & Feyerherm, 2005). Last, the destiny process executed transforming the design into reality (Egan & Feyerherm, 2005).

I sought to obtain data using appreciative inquiry processes in the interviews that would lend to the knowledge of the field, as the study sought to discover factors that supported persistence through potential social and systemic barriers and deterrents. "During the discovery

process of inquiry ... best experiences are collected…" (Somerville & Farner, 2012, p. 10). The four appreciative inquiry processes were embedded in the research questions. In addition, interview questions structured with positive appreciative inquiry processes in mind provide positive support information that institutions and aspiring women in technology may use to increase diversity, success in technology leadership, and skilled technology professionals.

The frameworks provided understanding of my findings by serving as a guide for me to methodologically and analytically make sense of the data. These lens assisted me with obtaining meaning of data and themes pertaining to the experiences of the participants as they relate to persistence, overcoming barriers, and how they perceived efficacy during their pursuit of technology leadership roles.

Furthermore, the frameworks heightened my awareness for efficacy expectations and the mindsets or behavior of the participants; how they related to the phenomenon. For instance, the frameworks heightened awareness to how participants perceived their experiences in certain situations and then how they reacted to the experiences; or modeling, as Bandura would call it, based on their perceptions. The concept of appreciative inquiry shows that positive mindsets were displayed, even throughout difficult and challenging circumstances, and served as an underlying value of what worked for the participants; emerging as a key factor to persistence.

Conclusion

1) How do women chief technology officers in community colleges describe their experiences that shaped their careers? These women described their experiences through reflecting on past educational and work aspirations. They described their experiences with family and leadership support that initiated transitional pathways to unexpected leadership roles in technology.

2) What do they perceive as factors that shaped their careers? How do they perceive self–efficacy as a factor that shaped their careers? The women in this study perceived expansion of skills, past knowledge and experiences, support from family and leadership, and commitment to work hard to demand a space in technology as career shaping factors. They perceived self-efficacy, directly and indirectly, as a factor and driving force to accomplish any goals they chose. They were very confident in believing that they could do anything they desired.

3) How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership? The women in this study conceptualized their persistence strategies through honing positive mindsets; viewing barriers and deterrents as nuisances to conquer. They believed they persisted to technology leadership by working harder than men, obtaining leadership growth through taking–on the undervalued work projects, and keeping their technology and people's skills current.

Implications for Practice and Policy

This study was conducted to describe the experiences of women chief technology officers in community colleges. The study sought to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. The results of the study discovered and defined their experiences in the workforce (specifically the technology sector), education, and organizational structures. In addition, the results of this study discovered factors that support persistence through potential social and systemic barriers and deterrents.

Practitioners and Aspiring Women

1. Women practitioners can use the techniques presented through the lessons learned of the women technology leaders of this study to persist in technology and leadership as an effort to support the representation of women in technology. Results define positive methods to persisting through barriers and deterrents. Expanding technical knowledge, and strengthening the pipeline were key motivators to persist.
2. Increased awareness and understanding of the numerous technology tracks will help women decide on pathways that are better suited for them in technology. Some women associate technology with crawling on floors and under desks to fix cables, but there are various roles in technology to choose from that do not require physical labor. Knowing this information will help women practitioners better understand how to succeed in the field.
3. Results show that women chief technology officers in community colleges are poised as role models and mentors for aspiring women to support the increase of women in technology and leadership, which further advances the vantage point for equality. The study shows women turning deterrents into opportunities for growth and advancement.
4. Information from this study can be used to strengthen the vantage point for equality in salaries and leadership attainment. The study provides information on how to address disparities in the workforce through leaders and the use of employee evaluations.
5. Results imply that men, too, may benefit from this study by being made aware of how their co–workers or women counterparts view the environments of the male–dominant technology field. Results shed light on the barriers and deterrents women face in technology to promote self–reflection among men and their behavior in hopes of

diminishing the level of challenges women face, ultimately increasing the number of women in technology.

6. Results imply that women who emit confidence and a strong sense of self–efficacy may persist successfully in a male–dominant field, such as technology; even if they are not aware of possessing a strong sense of self–efficacy. Results show women displaying attitudes, abilities, and beliefs that are aligned with a strong sense of self–efficacy.

Implications for Policy

1. The results of this study show that leaders and policy–makers working together are key to making scale change that can level gender disparities. Current women leaders in technology can work with vital departments, such as human resources and executive leadership, to instill reform policy for sustainability and equality for women. Salary scales and hiring practices are main areas of concern for change.
2. The results inform policy by highlighting disparities faced by women in technology. The study shows that disparities are a disservice to the workforce, locally and nationally, for it is necessary for communities to increase its talented technology workforce and leadership pools. Increasing women in technology will provide skillful individuals who can address the problems of this world, such as creating vaccines for pandemic, regardless of gender. All individuals, not only women, will benefit from the increase of women in technology.
3. In addition to the talent increase of women in technology benefitting women, it will also inform policy to benefit the local business economy and workforce by contributing to the shortage of skilled technology professionals. This will in turn support the effort to position the United States to continue to be a global competitor with skilled technology individuals who can solve complex world issues of today.

Community Colleges

Community colleges provide opportunities for women to excel and attain formal credentials, and provide suitable and flexible workplaces where women can advance in technology and leadership.

Women chief technology officers in community colleges can help shape and change the perception of women in technology, because more women attend postsecondary institutions and outperform men in education attainment, specifically at community colleges, where underrepresented groups tend to earn additional skills or formal training credentials (Community College Daily, 2018). These women can make efforts to provide professional development and training, change policy, increase recruiting efforts, and provide guidance through the technology pathways. These women are role models who can attract aspiring women in technology.

Recommendations for Further Research

1. This study contained diverse participants who were from various types of organizational structures from across the country. Although this study was a qualitative phenomenological study, it may be beneficial to conduct a case study on the technological accomplishments of a woman chief technology officer at a large multi–campus community college, from a rural or urban setting, to take a broad view of her success methods.
2. Technology careers are often identified with individuals needing to be highly intelligent, especially in math and science. It is recommended that quantitative research be conducted on women in technology comparing their level of math and science knowledge to find if a high level of knowledge for these disciplines are required to succeed in technology or whether having the aptitude and confidence to learn technology is most effective.

3. The women in this study held differing ethnicities, with several of the women being natives of other countries before moving to the U.S. Their socio–economic backgrounds and ethnicity were not variants for the population and sample criteria for this study. Therefore, it may be beneficial to replicate this study using women leaders based on their socio–economic backgrounds, ethnicity, or whether or not they were first generation students to research associations between these variants, motivation, and self–efficacy, as they pertain to persistence and determination to succeed.
4. It may also be beneficial to conduct a quantitative study on the number women in technology leadership who played sports or learned male–dominant skills at a young age, such as fixing dishwashers, as this correlates to confidence and persistence through barriers in technology, a male–dominant field. Such a study may allow greater comparison to state or national data and generalizations.

Summary

This study goes beyond the barriers and deterrents that current literature highlights, and informs the technology field by providing practical methods through the use of positive mindsets that project an invincible determination to persist in technology. Those with high self–efficacy levels may view barriers as tasks to master and conquer (Zimmerman, Schunk, & DiBenedetto, 2015). The women of this study viewed barriers as temporary nuisances that they had to go through, over, or around to master or conquer, but never did they view barriers as permanent obstacles keeping them from reaching their goals.

Positive mindsets allowed the women to reverse negative barriers into opportunities for the women chief technology officers in community colleges. The women took intimidating settings, such as meetings filled with men, and used such situations as platforms to promote

women in technology among the men. When the women were tasked with completing degrading work with no extra pay, they accepted the tasks and completed them as if they were high priority tasks, and volunteered to complete additional projects that others refused, thus displaying unintentional leadership qualities to executive management. In addition, during leadership development, the women used common daily practices, such as staying organized, documenting processes, and showing respect to all levels. These are simple methods that women aspiring technology can apply immediately in the workplace.

The bulk of the women did not have initial interests or backgrounds in technology, but welcomed the opportunities to apply current knowledge, and to learn new skills in the dynamic field of technology. These women also felt obliged to commit to mentoring young girls and women in technology through organizations, thus providing role models for the pipeline of young girls and women in technology.

A deeper understanding of the lessons learned from the women chief technology officers in community colleges in this study contributes to knowledge of how more women may persist and attain technology leadership success.

Personal Reflection

Upon reflecting on the start of this journey, I remember sitting in class considering topics of interests before choosing women chief technology officers in community colleges. I wrestled with the title, since I knew senior women technology leaders were identified by various professional titles, especially in community colleges. I decided to choose chief technology officers over the popular chief information officers, because I wanted to be direct with emphasizing technology in the title of the paper.

As I reflected, I remembered that I, too, played sports. I was the softball team captain, starting pitcher (number one position), fourth batter (known as the cleanup hitter), and awarded the most valuable player. I believe, as some of the participants, that sports played a part in the confidence and fearlessness I possess, or maybe it was the low socio–economic community in which I was raised.

Interviewing the participants took me further into reflection where I found my journey to be very similar to many of the participants' journeys. Prior to employment at a community college, I was a data engineer for a fortune 500 company overseeing a global network for commercial customers, before being promoted to an implementation engineer. I began my technology career as a toll–free repair technician in telecommunications. As a toll–free technician, I sat outside of the network operations center (NOC) along with the small group of women who held such positions. All the men were engineers inside of the NOC. Most of the engineers were White men, many with military backgrounds. I remember seeing men leaving the NOC heading to lunch with their black and red polo shirts, Dockers pants, and ID badges with lanyards around their necks. I remember two women obtaining jobs in the NOC, both quit after a few weeks, and one ran out crying. One of the women was the manager of the toll–free repair department.

Curiosity led me to glance inside the NOC and inquire about the work performed in that area, especially after seeing the walls covered with sophisticated technology, world clocks, and televisions in the late 1990s. Never once had I considered why the other women quit. Factors that helped me to persist in technology were driven by reaching my personal goals, learning, and earning a good living.

I inquired of the positions inside the NOC. A manager shared the salary ranges and study materials with me to learn the technology. The data engineers earned the highest salaries among three types of engineers, so that was the position I sought to conquer. I never considered not being able to learn what was required. I believed that I could do and learn anything I wanted. I was informed that my interview for the data engineering position was one of the hardest interviews administered to applicants. Nevertheless, I obtained the job and later became the shift lead over the group. Usually, I was the only woman on the team and sometimes the only Black person, until a group of contractors from D.C. and California joined the team. Although being a double minority in the NOC could be viewed as an intimidating environment for many women, it was never intimidating for me. I was always a quiet, but firm and direct person who, similar to many of the participants, depended on expanding my knowledge to demand respect as an engineer.

Several years later I started a family, so I left the company to stay home with my first child, as a housewife. My title as housewife only lasted for 11 months before I realized it was not as adventurous as the technology industry. I reentered the workforce in the information technology department at a community college. IT at the college was less tense and more flexible; definitely a better fit for me as a mother. I have continued to work at the college since 2003.

I learned enormously about myself through this study. Being a woman in technology, the study caused me to reflect on my own experiences and feelings, which were very similar to the participants' experiences. Like the participants, I never viewed barriers and deterrents as challenges to stop me from succeeding, but as mere nuisances to overcome. The study showed me that I possessed what I call the 3Cs to persist: *Curiosity* led me into the NOC with the male

engineers; *courage* helped me to remain in a male–dominant environment, and *commitment* to learn and expand my knowledge made me a leader in that technology setting.

I advise women aspiring technology to be curious and ask questions, follow your ethical compass for decision making, and remember to grow other leaders.

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Appendix A - Interview Questions

Greetings

Questions

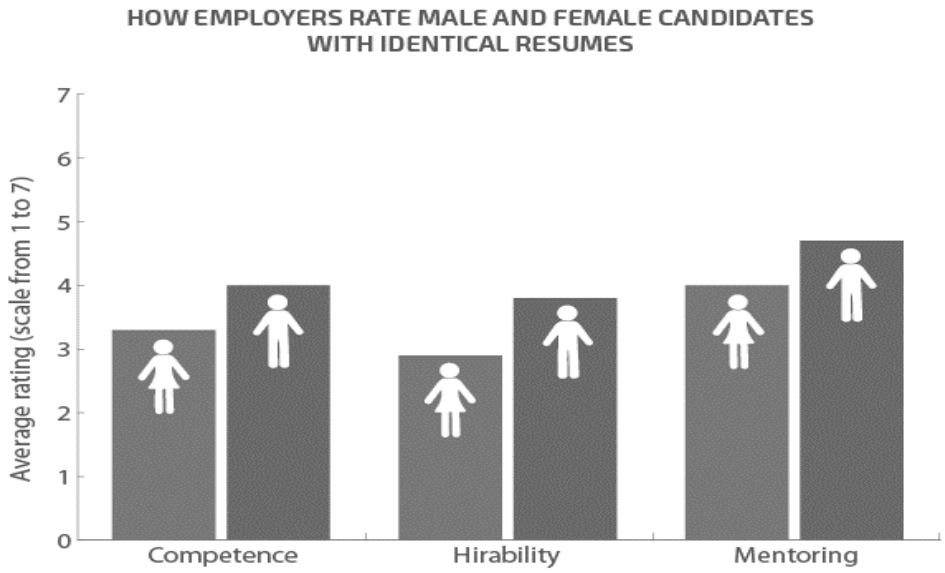
1) Please share a little about your work.
2) Explain what a typical workday is like for you.
3) How did you decide on a career in technology?
4) Was technology always an area of interest?
5) What factors would you say helped to shape your career in technology leadership at a community college?
6) How might have self-efficacy influenced these factors?
7) Please explain your experience with role models.
8) Were there any women in technology who inspired you?
9) How do you view the gender roles in Information Technology?
10) Please discuss your thoughts concerning gender wage and salary in technology related fields.
11) Please explain any situations where you may have felt that your gender affected how you were treated.
12) What would you say stood as main barriers or deterrents during your climb to leadership in technology?
13) How did you handle challenges posed as barriers or deterrents during your pursuit to leadership in technology at a community college?
14) What advice do you have for women aspiring a technology leadership role to help them persist through similar challenges to success?
15) How would you describe a career in technology?

16) Describe your view on inclusion and the level of equity in your workplace.
17) Describe the structure of the Information Technology Department at your institution.
18) Describe the organizational leadership at your institution from your viewpoint.
19) How would you describe the climb for women to advance to technology leadership positions?
20) How would you describe your overall experience of becoming a leader in technology?
21) Please share any techniques that you may have drawn upon or used to help you succeed.
22) Please share a trajectory outlook that you would share with women aspiring a technology career.
23) What advice would you give to women considering a career in the technology industry?
24) Is there anything during your journey to leadership in technology that you wish you had known sooner?

Conclusion & Statement of Gratitude

Appendix B - How Employers Rate Male and Female Candidates with Identical Resumes

Figure 1. Displays how science faculty rated women lower than men with identical resumes in areas of competence, hire–ability, and mentoring for a hypothetical lab position.



Source: Corbett, C., & Hill, C. (2015, March). Solving the equation: The variables for women's success in engineering and computing.

Appendix C - Bracketing Interview Statement

Bracketing Statement

Conducted in May, 2020

Prior to administering interviews with participants, I underwent a bracketing interview by a colleague, as an attempt to identify any biases I may have had with the phenomenon of the study (Lochmiller & Lester, 2017). The colleague interviewed me using the same research instrument to be administered to the participants.

Upon completion of the full interview, it was discovered that biases existed where I identified with women who display strong self–efficacy beliefs. As a woman in technology at a community college, it was necessary to be made aware of such biases prior to interviewing and conversing with the participants.

Having been made aware of my favor toward what I refer to as a warrior woman (alpha woman), it allowed me to ensure that the interview questions were asked without my interjecting opinionated comments into the process. Each question was asked of each participant, and I allowed each of them to fully respond to the questions. Follow–up questions were not asked in an attempt to sway participants' responses, but were asked in conjunction only to responses that either needed further clarification, or explanation.

Appendix D - Invitation to Participate

Research Opportunity: Women Chief Technology Officers in Community Colleges

Hello,

My name is Monica Wiggins, a doctoral candidate at Kansas State University, John E. Roueche Center for Community College Leadership. I am conducting an IRB–approved research study that focuses on the experiences of women chief technology officers in community colleges.

I am seeking women senior executives overseeing the technology divisions/departments in community colleges to participate in the study. Senior executives may be referenced by various titles, including, but not limited to chief information officers, chief technology officers, and other titles preferred by your institutions.

For the purposes of this study, community colleges are defined as any not-for-profit institution regionally accredited to award the associate in arts or the associate in science as its predominant degree. This includes the comprehensive 2–year college, as well as many technical institutes, both public and private.

Participation will require 30-60 minutes of your time to be interviewed via digital conferencing equipment, with or without video (such as Zoom). All participation is voluntary and responses will be anonymous. There is no compensation for participation.

Thank you for considering to participate in this study. If you meet the criteria and are interested in participating in the study, please sign and return the attached Informed Consent form to me at mwigg88@k-state.edu.

If you have questions or concerns, please email me at mwigg88@k-state.edu.

Thank You and Be Safe,

Monica Wiggins

Appendix E - IRB Informed Consent Form

Informed Consent Form

PROJECT TITLE:
Women Chief Technology Officers in Community Colleges

PROJECT APPROVAL DATE:	5/15/2020	**PROJECT EXPIRATION DATE:**	5/15/2023	**LENGTH OF STUDY:**	3 Years

PRINCIPAL INVESTIGATOR:
Dr. George R. Boggs
785-532-5525
grboggs@ksu.edu

CO-INVESTIGATOR(S):
N/A

CONTACT DETAILS FOR PROBLEMS/QUESTIONS:
Dr. George R. Boggs
785-532-5525
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IRB CHAIR CONTACT INFORMATION:
Rick Scheidt
Chair, Committee on Research Involving Human Subjects
203 Fairchild Hall
Kansas State University
Manhattan, KS. 66506
785-532-3224

PURPOSE OF THE RESEARCH:
This is a research project.

The purpose of this study is to describe the experiences of women Chief Technology Officers in community colleges. The study seeks to identify the lessons learned during their journeys to gain a deeper understanding of their experiences that led to attainment of leadership roles in technology. The intent is to discover and define their experiences in the workforce (specifically the technology sector), education, and organizational structures. In addition, the

study seeks to discover factors that support persistence through potential social and systemic barriers and deterrents.

PROCEDURES OR METHODS TO BE USED:

The methodology of the study is qualitative using a phenomenological method with in-depth open- ended interview questions using a semi-structured interview protocol.

Participants will be interviewed via Zoom or other video conferencing tools. Length of interviews are expected to be between 30-60 minutes. There will be audio, and/or videotaping of interview sessions. Hand-written notetaking will also take place during interviews. It is understood that there is no paid compensation for participating in the study.

RISKS OR DISCOMFORTS ANTICIPATED:

There are no known or expected risks in the study.

BENEFITS ANTICIPATED:

Anticipated benefits of the study include: To add to the knowledge in the field through identified lessons learned, inform women who aspire technology roles, inform practice and policy concerning disparities in the STEM workforce faced by underrepresented groups, specifically women, and may add to strengthening the vantage-point for equality in STEM leadership.

EXTENT OF CONFIDENTIALITY:

Information, data, and identities of participants and names of institutions will be kept confidential. All collected data sources, audio/video recordings, hand-written notes/journals, images, word processing files, and data from interviews; including any relevant archival records, physical artifacts, or documents that the participants may share in the study, will be kept confidential.

Pseudo names will be used in the findings for participants in the study to seal their identities. Institutions will be referenced by their regions, states, localities, or type of college structure.

For example, a multi-campus community college in the Midwest may be used versus the name of the actual institution.

Electronic data will be stored on a secured password protected local hard-drive. Physical data will be stored away in a locked secured private location. Only the researcher and the Principal Investigator will have access to the data.

Terms of participation: I understand this project is research, and that my participation is voluntary. I also understand that if I decide to participate in this study, I may withdraw my consent at any time, and stop participating at any time without explanation, penalty, or loss of benefits, or academic standing to which I may otherwise be entitled.

I verify that my signature below indicates that I have read and understand this consent form, and willingly agree to participate in this study under the terms described, and that my signature acknowledges that I have received a signed and dated copy of this consent form.

(Remember that it is a requirement for the P.I. to maintain a signed and dated copy of the same consent form signed and kept by the participant).

PARTICIPANT NAME: _____

PARTICIPANT SIGNATURE: _____ **DATE:** _____

WITNESS TO SIGNATURE: (PROJECT STAFF) **DATE:**

Appendix F - Instrument Alignment Matrix

Research Questions	Corresponding Interview Questions
1. How do women chief technology officers in community colleges describe their experiences that shaped their careers?	Q1–Please share a little about your work. Q2–Explain what a typical workday is like for you. Q3–How did you decide on a career in technology? Q4–Was technology always an area of interest? Q8–Were there any women in technology who inspired you? Q15–How would you describe a career in technology? Q16–Describe your view on inclusion and the level of equity in your workplace. Q17–Describe the structure of the information technology department at your institution.

	Q18–Describe the organizational leadership at your institution from your viewpoint. Q20–How would you describe your overall experience of becoming a leader in technology?
2. What do they perceive as factors that shaped their careers? How do they perceive self–efficacy as a factor that shaped their careers?	Q5–What factors would you say helped to shape your career in technology leadership at a community college? Q7–Please explain your experience with role models. Q8–Were there any women in technology who inspired you? Q9–How do you view the gender roles in Information Technology? Q10–Please discuss your thoughts concerning gender wage and salary in technology related fields. Q11–Please explain any situations where you may have felt that your gender affected how you were treated.

	Q12–What would you say stood as main barriers or deterrents during your climb to leadership in technology? Q15–How would you describe a career in technology? Q16–Describe your view on inclusion and the level of equity in your workplace. Q19–How would you describe the climb for women to advance to technology leadership positions? Q20–How would you describe your overall experience of becoming a leader in technology? Q21–Please share any techniques that you may have drawn upon or used to help you succeed.
3. How do participants conceptualize their persistence strategies for addressing social barriers and deterrents to success? What worked…How do they believe they persisted to technology leadership?	Q6–How might have self-efficacy influenced these factors? Q7– explain your experience with role models.

Q8–Were there any women in technology who inspired you?

Q9–How do you view the gender roles in Information Technology?

Q10–Please discuss your thoughts concerning gender wage and salary in technology related fields.

Q11–Please explain any situations where you may have felt that your gender affected how you were treated.

Q12–What would you say stood as main barriers or deterrents during your climb to leadership in technology?

Q13–How did you handle challenges posed as barriers or deterrents during your pursuit to leadership in technology at a community college?

Q14–What advice do you have for women aspiring a technology leadership role to help them persist through similar challenges to success?

Q15–How would you describe a career in technology?

Q16–Describe your view on inclusion and the level of equity in your workplace.

Q19–How would you describe the climb for women to advance to technology leadership positions?

Q20–How would you describe your overall experience of becoming a leader in technology?

Q21–Please share any techniques that you may have drawn upon or used to help you succeed.

Q22–Please share a trajectory outlook that you would share with women aspiring a technology career.

Q23–What advice would you give to women considering a career in the technology industry?

Q24–Is there anything during your journey to leadership in technology that you wish you had known sooner?

Appendix G - Interview Reflection Form

Kansas State University

College of Education

Interview Reflection Form

Title of Study: Women Chief Technology Officers in Community Colleges

Dear Research Participant,

Per our post–interview discussion, this notification reflects on the verbal interview to affirm the conversation, and to ensure that the accounted information aligns with your reality.

The Researcher–Scholar has provided a summary gist of key highlighted areas of the interview.

In consideration of your time, there is no need to respond if you affirm the question responses.

Conversely, if you have any concerns, please communicate them via email within 24–48 hours of receipt of this notification. A "no–response" after this timeframe, will undergo the assumption that all is affirmed.

Thank you so much for your time, sharing your technology leadership experiences, and for contributing and providing your awesome input to the study. You are greatly appreciated.

Sincerely,

Monica Wiggins

Monica Wiggins, Kansas State University Doctoral Candidate

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Appendix H - Participants' Narratives

Participants' Narratives

Alberta

Theme One: Career Calling Experiences

Alberta's responses concerning experiences that influenced her career include statements that she had not originally planned on a career in technology. She was interested in medicine, but later decided on a Master's degree in information technology, after receiving a Bachelor's degree in humanities. She described stories of her experiences from high school and college:

> Interestingly, when I was in high school, our school—I went to a small high school. Thirty kids in the graduating class was the biggest class they'd ever had. We got a TI99 computer. They didn't even have a hard drive; it just had floppy drives, and you'd have to load–it–up every day. We had learned to program in 10Basic, and I learned it took me three weeks to write a program that lasted 30 seconds; that ran for 30 seconds. I said to myself, "Computers are never [going to] be a thing. They're never [going to] go nowhere, because this is too much work for not enough input; for nothing." So, I walked away. I was like, "This is stupid."

After high school Alberta planned to attend a university as a medical student, but had difficulty with chemisty, so she changed her major midway through her program. Although she was the valedictorian at her high school, she said she "learned how hard it is to walk into a college where there are more people in the college than there are in your county," so she later decided to switch to teaching. She completed work in education, history, and English, but said that she could not find a "teaching job" after she graduated. However, while in college, she discovered a talent for word processors:

I messed around with word processors; and I worked a little bit on those. I found that I was good at it; figuring out what they do. When I was doing office manager stuff, I used to help out with a volunteer place where we would go and help put in voting results from presidential voting night. People would call in from the voting centers and tell us their exit polls, and we would put the votes in. So, the things that come out on TV that tell you how the votes are going were coming from us at that time, and this was the early '90s.

I was always wanting to see the programming behind that. I'd ask the programmer, who was walking behind me, "It's a little mainframe thing." I'd say, "Tell me how to see this in other ways." So, that's where my interest started in it. Well, I guess my interest in education in general. I've always been involved in teaching somehow. I've always done riding lessons with horses, with kids. I've done voice lessons in helping little pageant girls sing songs in pageants, and then I worked at a national education organization, which is a higher ed institution. I actually worked there for seven years.

Alberta's discovery of word processing skills, curiosity of technology programs, and her general interest in education was instrumental in her route to technology leadership in education. Her early working years set the route for her climb to a career in technology.

Theme Two: Leadership Development

Alberta's experiences in her early employment endeavors were essential career shaping factors that guided her to technology leadership. She shared her experiences of various encounters as she climbed to a career she had not previously considered. Alberta described her work experiences as an office manager for a medical facility:

I worked for them some years, and they grew a new managed care mental health product that they were piloting. I said, "We can't keep growing without some sort of computer

system. We're doing everything on paper." This was in the mid–'90s, and I go, "We gotta do something on a computer." So, we went out and found mainframe programmers and hired them as consultants to create a little homegrown computer system for us—a little management system for our mental health patients. And we developed a way to take intakes, put them into a computer system, [and] refer them to a therapist who was in our office. He would type in his notes and then we would print out paperwork to be sent to the therapist that we assigned the ticket, the case to.

When we built that, the guys who built it for us said, "Well, somebody needs to sort of manage the computer system. You know more about computers by having touched one in high school and one in college; you're [going to] be the person." So, that's what I did.

Alberta informed a choir member of the work she was doing and he informed her that she was performing the work of a systems administrator. She was not familiar with the term, but said she moved into the role, and eventually, she became the first IT manager for the office. She said, "I had no idea what I was doing, but you know, I'm doing the IT stuff." This led Alberta to seek a Master's degree in IT with an emphasis on networking and management of technology, as a dual emphasis. From systems administration she advanced through to her current role in technology leadership.

During Alberta's growth as a leader, she acquired knowledge from previous managers that she referred to as role models. Alberta worked as a temporary employee for a mental health group with a manager who had experience as a CEO of a mental health hospital. He was recruited to inform the health group of ways to grow their company. Anderson was

knowledgeable, and Alberta said he was her best role model and taught her two things that she found interesting:

> He said, “Don't make enemies. Everybody comes back later and everybody shows up later in a higher position.” He said, “In the length of your career you will hit the same people over and over again, and they’re [going to] come back in a high [position], and with more authority, so don't make them mad. Just play it cool.”

In addition, Alberta said the manager informed her of practical knowledge from a leader’s point–of–view that she could use daily. Alberta said,

> The other thing he said that was really helpful is, “Keep your desk clean.” He said, “The outward appearance of organization, a) makes you feel more organized, and b) inspires trust from others in you.”

Alberta’s desk was usually in disarray, as she described it as being a nightmare. The manager would enter her office and start to speak against the appearance of her work space, and Alberta would exclaim, “I can't handle it! I can't handle all the stuff that's going off.” This prompted Alberta to start using notebooks to become organized, because she said, “I couldn't handle it mentally anymore.” The manager informed Alberta that when her desk is clean she projects that to others and to herself.

In addition to the lessons learned from her manager, Alberta picked–up interview methods that she developed from another manager. She said, in every interview this manager would ask, “What energizes you, what makes you feel charged at the end of the day, and what drains you?” Alberta believes that, “If you follow the path that makes you feel charged or energized … you'll follow the right path of what you want to do.” Alberta adopted this method in

her interviews, because she believes it assists with assessing where an individual's interest and motivation stands.

Theme Three: Obstinate Practices

Alberta shared experiences that she believes helped her to persist to technology leadership through social barriers and deterrents.

During difficult economic periods, Alberta had her share of challenges, such as the loss of three jobs within the first decade of the 2000s. With the economy being a barrier, she said, "It keeps kicking me back down." Alberta was poised to advance prior to losing employment. She said,

> I would just be on the verge of being able to move up, and then I would lose them [jobs], and I have to get back to work. … The only jobs that would be available were lateral jobs. So, I'd take a new job of the same type. I wasn't able to move up for quite awhile. In order to move up I had to quit to go somewhere else to get a higher role.

Another challenge involved leaders who did not provide opportunities to advance and grow. Alberta said,

> We had a boss at one of the education institutions who is no longer there, who made a comment to me once. I said, "I really want to move up into this role," and he said, "Now is not the time, and that is not the role for you yet. It's not the time." He said, "I don't want you to feel glass–ceilinged by this." He said, "We'll get you more training and we'll get you positioned, so you can take this role in the future."

At first, Alberta thought her leader's comments made sense. However, once she reflected on the comment and the fact that she had a Master's degree, she wondered how long would she have to prove her value to advance. Frustrated, she confided with a co–worker, who informed her

that he was told the exact words when he inquired about advancing to a higher postion, as well. Albert said,

> That must be the speech he gives when he just doesn't want you to take the role. That particular person, I watched him very closely, and I very much saw that he made many decisions on appearance and gender. The only people he moved up were guys, and the only ones he moved up were ones who looked like himself.

Alberta continued describing other experiences at this institution. She admits that she was excited to find women leaders there. Nonetheless, she described her observation of the progression of Edemics conferences, where vendors realized that many of the customer companies were represented by women, and should be marketed as such. At Alberta's first conference in 2009, women were manning the vendor booths in what may have been seen as inappropriate attire, such as catsuits. By the time Alberta left the institution in 2016, women were wearing more respectable attire, such as Polo shirts. Alberta said,

> I've watched the evolution at the conferences toward the vendors' understanding that … there are women in charge. They were respectably dressed. They were talking on an intelligent level with the other women; the customers being the people you talk to. So, there's a real change in how all women were presented in those booths. In this institution, I truly believe there are more women in higher ed IT than there are in corporate IT. Once those vendors started to get that, once they started to see that the women are CIOs, the women are Directors, that there are a lot of women coming into that—they really started changing their marketing tactics.

Alberta experienced similar behavior when she was searching for a new telephone system for the institution. Bob, a man, was the first point–of–contact for vendors on Alberta's team for

this project. When the vendor's representative, a woman, thought that Bob was the decision–maker, she dressed in a professionally seductive manner, as Alberta saw it, with a low–cut dress and high heeled shoes. Once she realized that Alberta was the decision–maker the next meeting was focused more on presenting the telecommunication products and services. Alberta said, "She knows her market. … This is interesting. It is sad that we have to do that, yes." Consequently, such experiences strengthen leadership growth, as women demand respect in the workplace.

Alberta shared additional discouraging experiences while working with technical support companies as a woman. She said,

> When I—and I'm being very candid—When I have to call southern Asia for support, which is a lot of companies, I find that they will start me at a lower place in support than they'll do with the man. So, they will often say to me, "Well, have you rebooted that server?" I'm like, "You're talking to a technical person. I have already done *a, b, c, d, e, and f*." They're like, "Well, you need to restart it for me again, please, before we start." They will not do that to a man.

Alberta has had her share of late–night troubleshooting trying to resolve issues withs her team, and calling technical support. She said, "When I've talked to Ireland, when I have talked to England, when I talk to South Africa, Australia, any of the other follow–the–sun sort of support models, not a problem." Most of the time Alberta does not experience support issues, as with calling support at the company she contacts in southern Asia.

In addition, women often must prove themselves among men, as being knowledgeable and capable to address technical concerns. Alberta had a male on her team from southwest Europe, who was known as a flirt among the women. It took him three weeks to acknowledge

that she had technical skills and knew her work. In lieu of this, Alberta's philosophy is to let her technical expertise speak for itself, and others will observe that she is knowledgeable.

Another challenging experience for Alberta involved salary discrimination. Alberta worked at a foundation and they outsourced the IT department, leaving her to search for another place of employment. She, and one of the men from her team, applied to a technical helpdesk position at a large technology corporation. She explained:

> A guy that I supervised got a call from [a large technology company] to go to work on their helpdesk. We had both applied to try to find a job. He was offered $17 an hour; I was offered the same job for $11 an hour. I had a Master's degree; he had a high school degree, and it was the same job.

Fortunately, Alberta had not experienced such salary discriminations in her current professions.

Despite Alberta's challenging experiences, she shared several techniques that she believes helped her to persist. She relied on methods of being knowlegeable, organized, and confident. Alberta said,

> I find it, if I know the steps of how I need to get something done, like a huge project, if I can envision the steps or I know technically, sort of theoretically how it's [going to] be done, I'm very confident I can get it done. What's really difficult for me is when I don't know those steps or I don't know the technology to get there. Then it's hard for me to forge ahead without feeling, you know, shaky about it. The way that I handle that is organizing it as much as possible.

In fact, Alberta's manager informed her that the success of a major datacenter conversion was due to her planning and being prepared for the change–over. Alberta said,

> He's never real effusive with praise … but he said, "You being that organized saved your butt in the datacenter." I think he meant it to mean, "You did a really good job with organization that made that work," as opposed to, "You were about to fail."

To help with organization and planning, Alberta is a strong believer in manual notetaking. She organizes information electronically, as well, but says manual notetaking helps her to visualize and recall information quickly.

Another strategy Alberta uses to persist as a leader is to expand her knowledge. She said, "Continuing to improve my technical skills and let my knowledge … help people judge me. I do have to tell one of my team members not to *mansplain* to me every once in awhile." Alberta said he does it because he thinks he is the smartest on the team. She said, "I've had a few conversations with him where he understands that when I say, "I've got it," or "I understand," he can stop. Hence, expanding one's expertise and skills helps to project and receive information with self–assurance to stand and govern as the leader.

Furthermore, following a path of interest helped Alberta to continue in technology leadership. She liked systems and networking, but disliked programming. Therefore, when the opportunity arose for systems and networking, she followed the suitable path. "I don't think I did well in the wealth management, because it just wasn't an area of interest for me," said Alberta. Choosing a path of interest was a strategic aspect in continuing a technical career choice.

Aside from the aforementioned strategies, Albert strongly believes in the ability to mark one's own accomplishment. She said,

> I am a big believer in self–determination. I think you can make your path. I really do. I think it's harder for some people than others. I think some people get a lot of advantage along the way, and a lot of people don't.

Accordingly, Alberta believes that people, including herself, can accomplish incredible feats on their own when they believe they can do it.

Beatrice

Theme One: Career Calling Experiences

Beatrice's experiences include a background in information and sciences from a library perspective, but she initially wanted to become an attorney. She said,

> I went to...[an institution] and I got a Master's in information science as a librarian at that point. It's kind of interesting, because I was right—both in college and at [the institution]—I was right at the point when computing really started to take off as a practical application. While I was in college I took a Fortran 4 course in the engineering school across the city. I went to … the... girl school, and from there … I went to library school...
>
> So, it's really interesting. My stepfather owned a film library, so I had an experience there. I actually wanted to become an attorney and my interest was actually in the power of information. So, that's how I got into the libraries; and automation makes information retrieval fabulous. I was [going to] be a lawyer. That was my goal, but instead, I married a lawyer.

During Beatrice's work in the library, she anticipated sustainability with technology in the academic areas of payroll, course schedules, human resources, and registration, in addition to data processing, while searching for and buying datasets. Her work in the library allowed her to learn production and scheduling of multiple systems, and how they all functioned. This work and a professor led to her interest in technology.

The professor was an early user of digital technology for art media. She worked on a project overseas, and was able to conduct filming on it and turn it into a digital educational project. As a student, Alberta was able to see the project before it was published, because she had several classes with her [the professor]. Alberta admired the professor and said, “This woman is like, she's dynamite. I mean, she's really on the cutting edge. This is the kind of thing I can see myself doing.” The experience with the professor inspired Alberta to turn to the field of technology.

Theme Two: Leadership Development

Beatrice worked under a director at a high school library where she described career–shaping factors that guided her to technology leadership. The high school library was one of the first libraries that converted into digital–mark readable format, and Beatrice had the opportunity to work on the project.

In addition, Beatrice had the chance to work with the interlibrary–run fax network, which was a national network and cutting–edge technology at the time. This experience paved the way to higher education and it “gave me a lot of background to be able to step into the community college environment,” said Beatrice.

Beatrice took an offer in higher education to advance in technology. Before becoming the CIO at Roosevelt College, Beatrice was director of administrative and academic computing services at a university in the southeast region. Beatrice said, while at the university, she learned a lot about leadership, promoting women, and networking through the tremendous influence of a friend who ran the women’s labor center for the institution. She said, “I was able to get a lot of things done because of that network.”

Furthermore, once Beatrice was at the community college, her background, knowledge, and opportunity to work with the various cultures of the community college campuses helped Beatrice to grow in her career roles. Each campus offered different cultures and she had indirect (a dotted–line) supervision over the campus technology offices. Beatrice said,

> I learned quickly how to lead, not by command from the top–down, but to try to gain a consensus and listen to everyone's interests. This was a very raucous time. People were not very cooperative. The campuses competed against each other. They were very secretive; the presidents did the same thing, and they brought their staff along to behave in the same fashion. The idea was, "How do you get them to work together?"

Through collaboration and a deep knowledge of technology, Beatrice's career developed effectively, because of her prior experiences:

> I got brought in for a couple of reasons. One, they needed someone to help clean up the administrative computing platform, which was being written by a community college consortium and it wasn't working. Second, was because we were creating this big telecommunications network, and I had experience from the university in developing the state's information resource network.

Beatrcie spoke of technology as mind–blowing, as she described some of the work she conducted to help evolve the community college's technology systems:

> We did a little AI [artificial intelligence]. We never really got into robotics, but there were always things that were coming up. … This actually started at the university, we went from telephone registration to kiosks. There was not a network in place that we could use across the … campus to do what we now do across computers, register for classes; request library books…that was not there. … We created the beginning of

technology across the campuses. We brought that technology across to the community college and that's how we started.

> We had a cutting–edge library system; we had online registration. After the kiosks, we put them in the student labs, and after the student labs we opened up the network. For me, it was a wonderful experience. I was always learning something new. There was always something to find out about. I went from reading—as a librarian, I spent a lot time reading literature reviews; instructional information. As a CIO, I switched to the Wall Street Journal and the business section of the New York Times.

Beatrice's knowledge and experience with trailblazing technology at the university aided in shaping and advancing her career in technology leadership at the community college.

Theme Three: Obstinate Practices

Beatrice shared experiences of challenges and described strategies that she believes helped her to persist through the challenges in technology leadership.

High paying technology salaries attracted Beatrice to the industry from a professorship in the library, which was part of why she crossed–over. Also, her leaders informed her that she would increase her salary potential in technology. She said,

> I could see the salaries were much higher in the technology areas than in the library area … and that's how they got me to cross over; that was part of it. "Come over. I'm [going to] pay you a lot more money and you're [going to] do the same kinds of things, just in a larger pond." You're [going to] do this in an ocean not in a pond, and I was very interested in technology in libraries.

Interestingly, management didn't realize that Beatrice had full access to the salary scale for all employees. She noticed subordinate men had higher salaries than hers. Therefore, she said,

> I went to the vice president who had moved me over above my boss's head and said, "Yes, that was very nice of you. I have more degrees, I have more responsibility, and these are examples of the salaries that are being paid to my male counterparts. Do something." Do something. They had someone who they put in the catbird seat who could see everything. I could see I was being discriminated against from a salary equity point. I was doing more work and they were getting paid more money.

To avoid such descrimination, Beatrice adamantly informs individuals to study job descriptions and salary scales, and research what counterparts are earning, because it will provide leverage that may help ensure a level of equity. Employee reviews are a proper setting to have such conversations. Beatrice said, "During your review time say, "Look, I've done all of this. I have excellent reviews. I'm in this [pay] range. Here's someone else, a counterpart, who's a male and he's making a third more money. Why?" It is beneficial to be prepared to have the discussion with leadership concerning fairness and to acquire growth experiences through the process.

Among the strategies employed by Beatrice was her view of technology as a tool and a means to solve problems, rather than equipment of admiration. Through intelligent inquiry, Beatrice questioned how technology, as a tool, could help solve problems for the institution. Some co–workers would inquire about the robustness or newness of the equipment, but Beatrice wanted to know how the equipment could help them meet goals**.** She said, "Knowledge is power. What can you do with it? How do you make it—it's not to have the fastest computer—because

they [men] sit in meetings and say, "Hey, I gotta covert laser. Do you have one?"" This mindset of Beatrice's co–workers was a huge obstacle for her, as she sought to obtain necessary technology to assist with software assets, because she needed to replenish inventory using the existing funding in the budget, but her co–workers felt it was a waste of money.

She said,

> I tried very hard to present arguments about what tools were actually necessary. Same thing with software. Just because there's a new piece of software on the market doesn't necessarily mean you need it.

In such circumstances, to communicate the prioritization of IT projects and initiatives to colleagues and leadership, Beatrice said,

> Once again, you present. You do as much as you possibly can to present a good program. Defend it, and then a lot of times you have to do what you have to do, if you're [going to] live in that environment. It's a choice you make each day. How important is it? Is it important enough for me to give up my job or to put myself in a weakening position, or how far do you fight this issue?

As a leader in technology, these are the kinds of decisions to be made quite often, as technologies change constantly.

However, Beatrice learned a practice from a colleague who showed her that, although leaders must address important concerns in a timely manner, they need to reflect to ensure the best decision is made for the situation at that time. Beatrice's colleague was a provost at a university that she and others would tease about the work–pile on his desk. She said,

> We used to tease him and we would say, "My God! That pile of stuff on your desk, it just never moves." He would say to us, "The important things I will deal with. The other

things; the people will get disgusted and they'll just take it back and do what they should have done before." So, I thought that was great.

Therefore, Beatrice adopted portions of this practice to use for non–critical technical support requests:

> When people would back me into a situation where they said, "But I need that answer and I need it now!" I'd say, “I would be happy to give it to you tomorrow, but I need to sleep on it.”

Although there were issues that required additional pondering, Beatrice refused to be pressured into making haste decisions. Therefore, she would rely on the method she learned from the provost. She said, “It worked like a charm. It gave me enough time to step back, make whatever inquiries I needed, and be able to give them a cogent answer the next day.”

Another method practiced by Beatrice was to consider her short–term and long–term goals to help her decide “which barriers you need to fight, you need to go through, and which ones you need to go around,” said Beatrice:

> I had been the director of computer services at [the university] for eight years when the position of CIO opened up. I was very well respected and I applied for it. I was told, “No way in hell was a woman [going to] be the CIO.” They sent, not the president of the university, they sent one of the assistants to discourage me from putting my application in. “You should stay right where you are.” Then I met [an administrator] who recruited me over to become the CIO at Roosevelt College. And that's when I slid over.

Consequently, Beatrice understands the need for current leaders to support and develop individuals to help them advance and grow in their technology roles.

Chimere

Theme One: Career Calling Experiences

Chimere's experiences describe a love for science. She had an interest in biology and chemistry that led her to a university. At the university her attention veered to engineering, which led specifically to biomedical engineering. The biomedical engineering program provided opportunities to enroll in various engineering disciplines. With training in engineering, Chimere planned to work for companies that manufactured implantable devices, but she never considered computers. She remembered her first computer class and instructor as being boring and lacking engagement. Nonetheless, the assignments of building motherboards, welding, and trying new functions were exciting. Still, after that class, Chimere did not think about computers until her first job as a consultant at a consulting company. As a consultant, she learned to write the programming language "C," which started her "career in technology from a computer perspective," she stated.

Amazingly, Chimere's mother worked in technology and is her "greatest role model in that space." Her mother was one of two women engineers hired at a steel company in the 1960s. Chimere said her mother never let anything stop her:

> When she was [going to] college she wanted to study physics. At...[one school], they told her, "Oh no. Women study education." But, ... [another school] said, "Come on. You can study whatever you want. Just come on." So, she chose to go to ... [the other school], a less well known school in STEM at that time, because she then had those opportunities to study what she wanted. She was often the only woman on a team in a department.

Chimere had not realized that watching her mother's determination to accomplish her educational and professional goals, subconsciously provided her with tools that she utilizes today. She continued describing her experiences of women who inspired her:

> Reading back, Grace Hopper … I call [her] the mother of computer science and some people will call her the grandmother. But, women who really just sort of went out there and just did it; didn't ask for permission. Just said, "I'm good at this. I have ideas; I'm [going to] be in this space." Marie Curie, from a science perspective, and just the advances that she made. In terms of sports, Pat Summits. I'm a huge Lady Vols fan. Watching Pat Summitt lead those teams when she took over that Tennessee team when she was like 22 years old. She drove the van, she washed their uniforms, and to see it start from that to—every player who stayed with her throughout their entire four years graduated. … It's just women who have just—they just took it and they said, "I'm [going to] do this and I'm [going to] do it to the best of my abilities," and that has always really stayed with me.

Today, as a technologist, Chimere says, "I love all things zeros and ones. I still get an opportunity to do some of the hands–on pieces that, at a much bigger institution or maybe at a corporate entity, you wouldn't get a chance to do." She is inquisitive, explorative, and finds all sciences fascinating. Chimere questioned why programs worked and how they were configured. She asked, "But, why does it work? I want to know the ins–and–out. Why was that decision made? Did we think about doing *a, b, c, d*?" Chimere says that, "somebody who likes to do puzzles, take things apart, and then constantly looking to improve it, so when it's done, it's not done, it's just phase one," would really enjoy a technology career.

Theme Two: Leadership Development

Chimere ascribed much of her career shaping factors that guided her to technology leadership to having a practical background and being decisive. She said,

> I was a software developer for a very long time, before I moved into a manager role of a clinical division at a hospital; and it was after that I moved into the community college space. Combined with when I managed this clinical group in a hospital setting, I mean, I didn't know anything about these hospital applications, but being able to learn very quickly; and you just had to be able to respond in a moment's notice, take the information you had, [and] make the best decision you could, but you had to make a choice. I see that a lot in higher education, where making a choice is hard for leadership teams to do sometimes, so we don't let that stop us. We make the very best choice that we can, and we're always open to pivoting if new information comes in and really, we need to go in a different direction.

Once in the IT field, Chimere always wanted to become a CIO, so she drove toward making that goal a reality. She didn't realize the magnitude of politics that accompanied such a position. With this in mind, commuinicating, while taming her frankness, posed its challenges:

> I like to be pretty frank and you can't always do that. The number of times I started an email, deleted it, started another one, deleted it...and I mean, it has helped me grow, I think, a lot as a person.

Among Chimere's growth as a leader, she has worked to encourage and uplift other women on her team who appear to shy away from leading or stepping–up into advanced positions. She aims to help them find the confidence that aids to seat them at the leadership table. Chimere is naturally aggressive, but says that if you try to be aggressive when you are not naturally an aggressive person, this could be uncomfortable, leading to discouragment. This may be more likely in a male dominated field.

Chimere said,

> Especially in technology, where there are not many women at the table, and there would be times where men would try to intimidate. I'm like, “Oh, I'm sorry, you don't know what's [going to] happen here. We can have this conversation.”

Chimere believes that sports helped her to feel “confident in that space” to drive and be successful in technology, despite the field being male–dominated.

In lieu of this, Chimere feels it is important to spend time showing women first–hand accounts of what a leadership role entails. She often encourages women to shadow her throughout the workday. She informs women that the role is not glamorous, and is highly political, but she informs them that, “You can lead in your own way within a team. We can create a manager's position where you can have some of the responsibility in terms of setting some deadlines across a team.”

It is important to get “them to work as a strong unit together, and how you manage those personalities, because everyone's [going to] have something different that motivates them,” said Chimere. She refers to herself as an open mentor, available to those who want to advance. She said,

> Come to me with anything. I will freely share what my experiences have been in a particular situation; how I've gotten around it. I think just being opened to talking about the real facts behind a particular experience helps a lot of people to not feel alone, and be more willing to try something new.

Chimere admits to being a workaholic, having committed many years to working all night, staying late at the office, and becoming a mother later in her career, but she realizes that this should not be the route to career advancement. She argues that this route promotes missed

opportunities for the discovery of good leaders. “It keeps good leaders out,” said Chimere. Speaking of discovery of leaders, it is important for Chimere to ensure that her team is diverse:

> We worked really hard to make sure that we have a diverse team in place. You cannot have a room of people who all look and think the same, and produce a great output that serves a large community. It just doesn't work.

Diversity is important to Chimere, and she committs to finding candidates who will bring diverse ideas, experiences, and views to the team with every open employment position.

Theme Three: Obstinate Practices

Chimere shared experiences that she believes helped her to persist to technology leadership. These experiences included divergent ladders for women, the need for practical experience and knowledge, refocusing time–management, and team collaboration. Chimere said,

> When my Mom had me back in the ‘70s she had to quit her job. There was no maternity leave; there was no coming back from that. I think sometimes about how many missed opportunities we have, because of that ladder for women.

It is especially difficult for women to advance who have to care for family, “because you can't both be at work and get your kid off the bus. … I think it's most difficult, because of the societal norms that are still in place,” said Chimere. Women tend to perform as the main caregivers. However, now there may be more partnerships between couples caring for children than there were historically. Unfortunately, if women are not present, most likely they will not be considered for advancement in new roles, said Chimere.

In addition, Chimere has seen where companies tend to prefer that women have more practical experience for positions than men:

> It has been my experience that companies are more willing to let a man come into a [role] who has no tech experience at all. I have seen this so many times. They know nothing, but will give them a leadership role over a group. Whereas, a woman has to have that tech experience and knowledge.

Conversely, Chimere feels that having had both the practical experience and formal training, it is more difficult for someone to deceive her concerning work deadlines and assignments, because she clearly understands the tasks and time for completion. For example, having been a programmer she said,

> I think being able to take the hands–on experience of truly having done the work that I can understand when I'm asking someone to hit a deadline and write a piece of software. I know what goes into that; it's a lot harder to snow me than it might be [for] someone who has never written code before. They might say, “Oh, you need four weeks.” Whereas I say, “Yeah, I'm pretty sure I could write that this afternoon.” Then that becomes a very different conversation, so we're able to do more things faster without burning–out the team.

By Chimere possessing technical knowledge, it empowered her to lead with confidence, having the advantage of knowing if someone tried to mislead her concerning technical projects.

Additionally, Chimere has a method that she practices in meetings to assist demure women with coming forward and being acknowledged. She said,

> For the women on the team, especially ones who tended to be pushed out to the back walls at the meetings, we'd just go to the meetings early and we'd all just sit at the table. “Hey, we're here early.” There's no reason to sit against the wall if you're early.

Chimere would use such approach to help other women, because she said it is not a good feeling to be pushed aside. Another approach she adopted concerns pursuing desired roles, whether or not one meets all the recommended skills of the job profile. She said,

> I think it was a study that I read where, if there's a job posting and there are 10 things on there, if men have one or two [skills] they'll apply for it. Women, if they don't have all 10 they don't even bother applying, because they figure, "I'll have to either have everything or nothing." That knowledge helped me to stop doing it, because I found I did that exact same behavior. You're in a job; your next job should be a growth. You're not supposed to have all the skills; you're supposed to grow into it.

Chimere learned to change her approach to how she applied for jobs, and stated that she ensured to be transparent during interviews concerning skills she possessed, and those she did not possess. Hence, when she interviewed with employers she said, "No, in being fully transparent, I don't have all these skills; but, here's how I'm [going to] go about learning about them." Chimere's behavioral change led to this method of applying for positions and showing confidence in being able to learn the additional skills in order to get around the hurdles of not having 100% of the recommended skills for job openings.

Furthermore, Chimere described how she addressed challenging roles and shortcomings on the job. Being on a small IT team at a hospital working 80–90 hours per week, changed Chimere's perception of how she needed to manage her time to meet the workloads. The hospital had systems that would often malfunction around 8 p.m., because the software patching was not updated. When Chimere was overwhelmed and was not sure of the next steps in such a stressful situation, she began a new time–management method:

> I learned to get to a point where I manage—when things were really overwhelming and I just wasn't sure where to go—I started managing in 5–minute increments. “I'm [going to] get through the next five minutes. Whatever happens, whatever I'm [going to] do, I'm [going to] focus on one thing; I'm [going to] get through five minutes.” If I can get through five minutes I can get through five more; that's now, ten.

Chimere was able to regain control over chaotic situations at the institution by managing issues in 5–minute increments. When everyone panicked she said,

> Ok, let's all take a pause. We seriously just need to take a breath. Let's talk about what we know. … What is the minimal one thing we have to get done today? Let's get that done; anything else is gravy.

It was necessary to insert intentional pauses during a crisis to align issues with possible solutions, so as a team they would stop to discuss solutions to tackle overwhelming situations.

Considering the undertaking difficult conditions, Chimere admits to being an aggressive person, and credits sports for this character trait. She feels that sports played a huge role in shaping her into the leader she is today. She said,

> A lot of the times I'm a pretty aggressive person. That comes from sports, so I don't let it kind of get away from me. I'm 5′4″, but I'm a basketball player. I always told people, “If I want the ball from you I'm [going to] take it.” Being on teams, having to lead teams; know when it's your time to step up; when it's time to get the ball to someone else, because they're hot. I think that really gave me the confidence, because I don't jump very high. I'm not the fastest person, but I'm determined. I think being able to use sports as a way to grow that and feel comfortable that I can do, really, whatever I put my mind to; I think that really helped me.

Understandably, the team structure of sports played an essential role in developing Chimere into a confident athlete who was a team leader, and appreciated collaboration and camaraderie among teammates. Chimere realized the importance of collaboration and serving people. As CIO, she ensures a team culture of collaboration. She said,

> I tell our teams all the time, "If we give a direction, I don't want you to just do it. I want to hear your input. I want to hear your thoughts." I think creating an environment that truly is collaborative has also helped us get to that state.

Chimere recognizes that there is so much more in the people aspect of technology leadership and she governs her team by that concept. She said, "If there's one constant, it's connecting with people outside of our department." Negotiating is an imperative part of leadership and Chimere spends a tremendous amount of time building relationships, which is key to accomplishment.

Dora

Theme One: Career Calling Experiences

Dora has a background in sociology and says she "was at the right place, at the right time," when it came to a career in technology. Gaining employment at a community college inspired her to pursue a Ph.D., with aspirations of obtaining an executive leadership role:

> When I landed at the community college it really interested me; education. So, I went to pursue my Master's in education, in educational leadership, and then I really loved it. I already had an … undergraduate in sociology; but, because I was in education, I pursued a Master's and then my Ph.D., because I wanted to be … a college president. It was that drive; that wanting to do that.

Dora began working at the college in program development, known as alternative education. Alternative education included all off–campus programs, weekend programs, and distance education that offered television courses using basic televisions and VCR (video cassette recorder) equipment, whicih was the first use of “high technology” at the institution. Dora says this was her start with technology, before distance education began to grow with interactive capabilities, advanced two–way audio, one–way video, video conferencing, and online services using the internet. Dora’s involvement with technolog grew. She said,

> I was very fortunate that my boss, at that time, just put me out there forefront working with technology. That's how I became involved; teleconferencing. We got a humongous grant in the ‘90s, and my job was to develop the distance ed network, and that's how I got involved with technology. After that I became the associate vice president of instructional technology.

The associate vice president of instructional technology was responsible for overseeing all computer labs with internet use. Dora was heavily involved with planning and development, and her responsibilites evolved as student use of computers and the internet grew on campus.

Theme Two: Leadership Development

Dora ascribed having a background in development and planning on the instructional side, as factors that helped with the progress as a technology leader. She said she had never been into technology gadgets, but loves planning.

Dora’s planning skills helped to develop the distance education program prior to the program becoming mainstream. In the beginning, she had to convince individuals to teach distance education, assuring them that it was just as rewarding as the regular courses and

programs. She said that she is fortunate to have had role models who promoted her in technology to develop programs in different areas.

Although Dora has been at the college for 37 years, she finds it ideal to be able to work with today's young engineers and technicians, who bring different visions and viewpoints to the growth and development of the team. She said, "The young engineers and the vision they have, always developing, always exploring; it's just wonderful. They're very quiet, kind of introverted; [but] very good communicators." The engineers often accompany Dora to meetings, because of the innovative ideas they produce. She says they sit in meetings quietly processing ideas in their minds. When they return to the office they share possible solutions to the problems mentioned in the meetings, which is exciting to Dora and expands her growth. "I've learned a lot, especially with cyber security. And, there was a time when I had to train myself in technology," said Dora.

Dora feels that a key part of her role is to be a role model for young technology professionals. Dora said, "I know they have it, they're good." She says it is her obligation to be a role model and to build succession plans to help them advance in their careers, because she sees the potential in them.

In addition, Dora works with a program for young Latina girls that provides mentoring services concerning media, digital television, and the use of technology. The group visits television studios to learn the technology basics behind digital television. Dora says the technology climate is changing, and such programs are starting at very young ages now to work with young girls. Although the climate is changing, Dora said it is changing slowly, because "part of that, I think, we need to be better mentors to women, so that we can support them. And even do some networking for them, right, to try to promote some of these women." Dora wishes

that she could bring in more women to work on her team, but her applicant pool is dominated by male applicants.

However, under Dora's leadership, the IT departmental processes and customer focused services have enhanced. Prior to her leadership, she said,

> If users needed something, it would take years to get something done. Sometimes people would show up to work and their computer was not working, because people [IT technician] had made changes or updates, and that caused a lot of frustration. So, for me, being on the user side before has really helped me work with my team to [ensure] that we're a viable component of the institution. You have to notify people. Everybody can understand that we're [going to] make changes and there's [going to] be down–time and all that. But, if you notify people, they'll be ok. It's when they walk in to do their job and things aren't working, and that's what causes a lot of frustration. So, if I have to say that I made a change in the institution regarding IT, it's [going to] be that.
>
> Now, my team thinks about the students, thinks about the users; I've gotten them to communicate more effectively. So, again, I think that planning and my knowledge with the organization has really helped.

Under the leadership of Dora, IT puts the end–users and the needs of the institution at the forefront of their technology support services for improved service delivery. She says that the role of technology is not about the technology, it's about people.

Theme Three: Obstinate Practices

Dora explained experiences that she believes helped her to persist to technology leadership through social barriers and deterrents. Having a resilient demeanor and great mentors helped her to prosper.

One constraint for Dora was her communication style, although she believes the true constraint was being a woman of color. Nevertheless, her messages were often misunderstood. Dora would be in a meeting with others who would make comments that she felt lacked professionalism, but others associated the comments as being direct: displaying strong leadership abilities. When Dora made a remark or challenged others, her manager would reprimand her after the meetings. She said,

> When … I would make comments or I would challenge comments, I would be talked to after the meeting, "Oh it looks like you're not being a team player. Why are you asking those questions?" There were deterrents, but they were kind of demoralizing sometimes. Because it's like, I just said the same thing that other person said, so why is it being brought to my attention or even the leadership, or the—no, I'm sorry, the communication styles between men and women, also very different.

Dora says that many times women make statements that are ignored in meetings, but a man may make the same comment and it is viewed as a good idea. In lieu of this, "you have to develop a tough skin" she said. This is one of the spaces where women have to stand their ground and be "strong and tough," and not let such actions stand as deterrents.

Often, with vendor relations, Dora faced similar issues of being overlooked, as a woman, in favor of working with men:

> I think with vendors, when I talk with vendors and my team is there, they're male, of course. The vendors don't even look at me, you know, they're looking at the men over here, and finally the team is like, "No, no, no, she's the one that makes the decisions."

Having to undergo such circumstances can be very discouraging for women in technology leadership, but women must push through such circumstances, as they are common.

Therefore, Dora believed that having a strong and tough demeanor was necessary to persist through deterrents and difficult situations, as a woman in technology leadership. Also, she found it important to remain knowledgeable, because she said, **"**Well, as women, you always have to work harder and smarter." Knowing this working in the education sector, Dora pursued her Master's degree, then her Ph.D.

Accordingly, Dora stands firm behind displaying a tough demeanor, although she says it makes her unpopular at work. She says the IT department is often the least liked in institutions, because they must impose restrictions concerning the use of computer systems by end–users (staff, students, and faculty). When stating the limitations imposed by IT, they often tell end–users what they are not permitted to perform using the computers:

> No, you can't use that … you can't use that software, you can't do what you do at home. So, I'm not very popular at my school, but that's ok; it's not my job. So, again, that's why we have to develop these … well, I don't want to say thick skin, but don't take those things personal. I mean, that's business; those are business decisions.

Furthermore, Dora feels fortunate to have had various role models during different times of her professional career to encourage her to take risks in unknown territories, such as technology, program development, and pursuing her Ph.D. She said,

> I say they're great models, because they challenged me. … Otherwise, I would have stayed in my comfort zone. I would have probably been doing the same thing for 37 years, but they really challenged me and put me out there, which in those days I wasn't thinking it was a good thing, but now, I look back, it's like, what great opportunities.

Great opportunities with both men and women as role models were advancement tools for Dora. One of Dora's role models, who is now a community college president, had confidence

to appoint her as VP of technology, when she was the AVP of instructional technology, said Dora. In addition, there were also great colleagues for Dora to lean on. She said,

> I've had very good colleagues that have assisted me and they've been good inspiration for me. They're good colleagues and they're in the private industry sector, so they keep me informed … they brought me into their group, their network group, and they're an inspiration to me.

Therefore, Dora acknowledged those whom she regard as role models or mentors, as extending encouragement to progress to technology leadership. Directly, she admits that there were limited women in technology, and says that leaders need to do better at becoming mentors to support women.

Unfortunately, as Dora sat in the back of the room at a conference in August of 2019, she was disappointed to find that there were nearly no women or people of color in attendance. She said,

> I was counting the number of women and the people of color; it was limited, which was disappointing to me because again, we have a lot of people that are in the technology area, but I don't think they're at those high levels. We still have them as programmers; as engineers, which we all need to support all the technology, because they're geniuses.

Consequently, Dora questions the route to advance people of color to the executive levels, and especially the route for women. Dora whole–heartedly believes that she is obligated to be a role model and mentor to others. Accordingly, she said, "We need to be better mentors to women, so that we can support them; even maybe do some networking for them to try to promote some of these women," as she was helped. She said,

> I'm still as passionate about my job as I was the first day. It's been a great experience—the leadership roles—and, because I moved up the ranks … I think that helped me, because again, I was being mentored. I was given great opportunities for training [and] for professional development; I was exposed to a lot of things. So, for me, it was exciting … and it helped me a lot. I think from that, I think I'm working with my team to make sure they have those same opportunities.

Dora believes that other women, as she did, may benefit from mentors and having role models to help them to persevere in technology leadership. Therefore, it is imperative for women in leadership to provide mentoring opportunities for aspiring women in technology. Dora believes mentoring is a personal obligation, as a woman in technology leadership.

Dorothy

Theme One: Career Calling Experiences

Dorothy decided on studying computer science during the end of her eighth–grade school year. At that time, computer science was referred to as data processing. There was a chapter at the end of her math book on data processing that awakened her curiosity. In retrospect, Dorothy said,

> I was curious and that just stuck with me all the way through. The community college in my county offered data processing. When I graduated there were two colleges that offered it. One was ... [a university], and one was Reginald County Community College. I couldn't find any other place that was driveable, because I was a first gen student and my parents did not believe that your children should go away to college. So, I had to find someplace I could drive to. I decided on the community college, because to be perfectly honest, I was just a little bit apprehensive, and I really didn't have a good support system.

> I had supportive parents, but they couldn't explain to me what I was walking into. I just thought, “Oh, the community college—I know other people going there; that's [going to] be fine.” That was really my entry into the field. I graduated in two years. They hired me; paid me. They hired three students, because they were just building the administrative side of that department, and the rest is sort of history.

Dorothy worked and lived in her county her whole life and stated that it was a “good fit” for her, because she finds it important to give back; despite other job opportunities in both corporate and educational institutions. She has been in the technology field for fifty years, and Dorothy said she is not sure if she loves her field as much as she loves the community college mission. Reminiscing about an IT coordinator’s job she obtained in 1977, she said, “The very first thing I did was created a banner. I put it outside by my office door and it said, “students come first.” In 1977, nobody in technology ever used the words, students come first.” Dorothy had a deep passion for supporting students, making student affairs an alternate interest area for her, but ultimately she chose to support students through the use of technology.

Theme Two: Leadership Development

Leadership development for Dorothy was shaped by strong leadership, a passion for student success, and centered around supporting and helping others advance.

Nationally, Dorothy is active in technology organizations and is frequently looked upon to conduct presentations. Often, it may be assumed that she will take the leadership role over activities that involve her participation. One example of this assumption is when she was involved in a grant process that focused on student success, as an information technology leader. Dorothy said,

> I have a personal interest in student success. So, maybe 10–12 years ago, I was co–author for a Gates grant and we actually were awarded that—and it was … around advising and student success. We were successful with that grant. I led that work, even as an IT person, even though most of [the] other people leading the work … were VPs of academic affairs or student affairs. I was lucky enough—the college was lucky enough to get that grant. I led the second effort, as well; so that was six years of leading work that it was really centered around student success.

Part of Dorothy's leadership development is credited to the opportunity to work for virtuous leaders. She said, "I look at good leaders; I know what a good leader looks like." Dorothy found leadership support, in general, to be central in her leadership development. She said,

> I can remember in my early days in this field, when the three jobs were offered, I got the least job, had the highest grades, got the least job in the department, and got the least pay. When the director's job came opened … the dean of administration … saw something in me and said, "This is your job."

Although the president did not believe women should work, the pushback came from among the dean's peers. Dorothy said,

> There was pushback at his level, not so much with the president. The president didn't believe women should ever be in the workplace, but … it was the peers who said, "We really think technology needs to be driven by a man."

Therefore, Dorothy contemplates whether the dean was a mentor for her or if he was someone who saw potential in her and decided to help her push through various obstacles to advance. Later, when the dean was laid–off of work, Dorothy reported directly to a new

president, whom she considered as another mentor, who helped develop her as a leader, and gave her an opportunity that many people would not have given a woman at that time.

Consequently, Dorothy supports mirroring strong leadership, and feels that self awareness helps with leadership, as well. Therefore, she always welcome the opportunity to promote and participate in professional development.

Through Dorothy's growth as a leader, she sees the importance of leveling the equity field for women and providing mentoring services:

> I have done some really interesting things. We hire external for project management for construction. All my project managers are women. It's intentional; drives the rest of them crazy. We generally try to have on our architectural team, at least one of the two … it's often that architects have two people assigned to a bigger project, and we try to make sure one is a male; one's a female.

Dorothy intentionally strives for equity and diversity. At the college, she supports female students through a mentoring program that is run by a couple of women on her team. Dorothy said,

> The most interesting part is that we provide them [female students] with a mentor. They always have somebody they can talk to. We try to help them with careers. I hire a few student workers, so we try to make sure we hire a nice mix of men and women. It's pretty new for the college; what we're doing. I think we're in our second year, I would say, and we usually see six to ten women a year max.

Many of Dorothy's student employees are aligned to join the workforce after working under her leadership. She said,

> There are companies around us that watch to see who I hire, and then they sort of—those folks always get jobs; always get jobs right out of two years of college, which is great. And, a lot of them, they get somebody else to pay.

Under Dorothy's leadership, local companies are hopeful to acquire skillful workers after they graduate from the college.

Dorothy is satisfied with the services she and her team provides through the mentoring program, but she believes that this type of work needs to be systemic at the college, and not just in one department. However, the institution is working hard to provide education for people to understand equity, and is working diligently to have faculty understand the equity concept of "meeting students where they are," says Dorothy. She is hopeful that she is seen as a leader who works with individuals based on their strengths, and from an opportunity standpoint; not based on race or other differences. Dorothy says, "I've got a department that's equally balanced between men and women out of the 42 people, so I'm pretty proud of that." Conversely, Dorothy says that the direct reports on her leadership team is not as balanced, but she would like to see more women.

Theme Three: Obstinate Practices

Dorothy described experiences that she believes helped her to persist to technology leadership through social barriers and deterrents often encountered by women. She said,

> I'm a woman, so the early years were not easy. Lot's of bumps in the road, lots of underpay compared to the men, lots of questions about whether I was [going to] have children. Luckily those days are all past us. … Maybe it's because I'm a woman, but I'm very sensitive to making sure the women are being paid what the men are being paid in my department.

Dorothy's personal experiences described technology roles intended for men and those for women, and they could be perceived as hurdles. Since she is involved with national organizations, she believes this concept occurs throughout the United States:

> If you're in instructional design, you're likely a woman. If you are in networking, you're likely a man. If you're in IT security, you're likely a man. If you are in programming, and if it's just programming and not development [that] you're programming, you're a woman. If you're in development using Python or any of those other languages that come up, come and go, and you're doing hard core development, it's likely a man, I think. So, there are absolutely the compartments.

Dorothy believes that most institutions advance individuals from the infrastructure or security side of IT, more so than the application side, which is Dorothy's background. She said, "I think we're seeing, as far as women and climbing that ladder … I think there's a lot of opportunity out there and a lot of talent. I think a lot of women don't want the responsibility."

Dorothy described additional challenges she experienced. When Dorothy was a coordinator, she was denied the title of director because she did not have a Master's degree. She was informed that a Master's degree was required in order to become a director, although the previous person in that role was a man with a Bachelor's degree.

In addition, Dorothy often observes adverse reactions from others after they find that she is the leader, especially when it concerns her role of overseeing the construction area at the college. She said,

> Running construction, I feel like I'm back in the 1950s. I think people die when they see that I'm the vice president they have to deal with, and it's all because of how I look. … I'm 5'1", so the height goes against me in that world, the fact that I'm a woman goes

against me in that world, and the fact that my background is not construction, but IT, that goes against me, as well.

But, I don't take any nonsense. I mean, I actually—I hate it. I wouldn't say I treat them differently, but I know that I have to clearly lay out expectations … and these are external people who we're hiring to do building. I only have one person who works for me who's a college employee. Everybody else is consultants, always.

Work–life balance is another challenge for women, especially today with the stay–at–home executive orders from many state officials, due to the COVID–19 pandemic. Dorothy finds that, although both the husband and wife may have professional jobs, the women on her team with young children seem to be the persons responsible for caring for the children, while working and meeting from home. Dorothy said,

> If the husband and wife were both working at home, the wife had to continue to figure out a way to work and [watch] the kids. And the husband was always in, without exception, was always in a room behind a closed door. … And the kids were never allowed to go anywhere near that room. So, I think that I finally got why some women don't really want to be IT leaders. Because, they don't have the time, and by the time in their career they do, they've almost missed the opportunity to sort of climb up the ladder.

Dorothy said she would not have known the direct challenge of work–life–balance placed on the women on her team had they not been required to work from home, opening a portion of their home lives to co–workers via video–conferencing. It is sometimes harder for women to advance than men, but it is beneficial to make career moves early, said Dorothy. Working from home did not pose a challenge for Dorothy, because her husband is retired and supports her work.

Throughout all the challenges Dorothy faced, she believes in letting her work speak for itself. She said, “For me, it was always work hard, and if it takes an extra year for somebody to notice you, that's ok. Eventually, they will notice you and it has always worked for me.” Along with working hard, Dorothy believes in providing good customer support in a timely manner. She said she has no patience, so she doesn’t like to prolong solutions. She said,

> You almost have to step back, stay focused in your head on what's important to you, to the students, to the college, to the mission, and just keep doing the job. I think that's why I was able to stay.

Many people would not have continued in the roles, said Dorothy, but her father promoted confidence in her at an early age and she felt that she could do anything. She said, “My father gave me confidence. I could do and be whatever I wanted to be. He gave me the confidence to hang in there, and [was] always telling me that my work was really good; that helped.” There were not many women role models for Dorothy during her earlier years in 1970, but she said today, there are more women in positions to mentor and be role models for other women. She said,

> I can see that young people today, women role models … who at a minimum sit at that cabinet level, even if they don't directly report to the president, that they're sitting in the meetings that the president is running is really important. And, I think those women are the women they need to reach out to, and there are plenty of them out there. I think that really helps, because those of us who've had all the other experiences can sort of guide that piece for them.

Tentatively, Dorothy explained that men seem to display more confidence and less humility than women, although she appreciates working with her male IT colleagues. She said,

> Women always feel like they have to continue to prove themselves. Men seem to maybe give themselves more credit than what they deserve. … They exude confidence, whether they should or shouldn't. The women are a little bit less confident, or even if they're confident, they're a little bit more reserved about that confidence.

Being involved in organizations may help build confidence through a network of women in technology with various perspectives. At numerous points in Dorothy's career, individuals advised her to join various women's groups and organizations to support leadership growth and sustainability. Dorothy thought, "Ok, fine. Let me try those things." Yet, Dorothy explained that she believes that hard work would not go unnoticed. She said, "What seemed to work for me better, is to make sure that the men in the group respect my work, and they see what I can do, and that seems to have helped me." Nevertheless, Dorothy continues to rely on approaches in which she has self–assurance that helped her through obstacles to technology leadership.

Edna

Theme One: Career Calling Experiences

Initially, Edna wanted to be a doctor, but due to family circumstances, she decided to study education. She started her career as a business education teacher. She taught all business courses, such as typing, shorthand, and accounting. To be effective, as a teacher and as the department chair, it became necessary for her to learn and utilize technology to help organize the courses, and to exchange files with other campus locations. This was during a time when the college was deploying stand–alone computers throughout the campuses.

Edna requested for IT to have the computers networked and connected to the mainframe, so end–users on the campuses could communicate campus wide. The information technology department did not acknowledge her request, so she created a network on her campus and

showed other campuses how to connect without IT. Shortly afterward, the campuses were exchanging files. When informing the IT director of the computer setup she implemented, Edna stated:

> I said, "Oh, no, no, no. I just got connected. … I was only doing the work, the same work you could do from a dumb–terminal." I wasn't breaching any security or whatever, because in the same office I had a dumb–terminal, and we just figured out how to do it. Then, of course, once I did it I showed the other campuses how to do it, as well.

Needless to say, the director was not pleased to hear that Edna bypassed IT to connect the computers.

Eventually, Edna's actions led her to being appointed the first chief information officer of information technology by a newly appointed college president. The new president of the college wanted someone who he felt could unite IT with the telecommunications division from each campus, said Edna. In addition, the president wanted someone who could create a master technology plan, so he appointed Edna to fulfil the duties.

Edna was apprehensive about her new position at first, because she had not worked with the IT staff on a day–to–day basis, and was concerned about how the director would behave by her being his new superior, but her feelings of apprehension were short–lived:

> I was amazed when I went there, and of course, immediately started involving the people; not only the people in IT, but the people in telecommunications. I was really surprised by how much support that I had, even from the very beginning. I think … there were people who … saw me clearly as somebody who was [going to] embrace the future. Also, they saw me as somebody who had the blessing of the college president.

Contrary to a hierarchical structure, Edna's leadership promoted collaboration and engagement with individuals of all areas of the campuses, which was a change embraced by the college president who appointed her. She said,

> I think that they felt that there needed to be planning. There was a very hierarchical thing about, "we're up here, we're the boss, and we decide everything." And now, somebody was there saying to every level, "No, no, no. What do you think we should do? What's the most important? Where should our priorities be? We have a limited amount of money, what should we spend this year; what should we spend next year?"

Edna solicited the opinions of others in the instituion and they were pleased to provide input and be involved in the decision–making process.

Theme Two: Leadership Development

Edna's experiences in her early employment endeavors were essential factors that guided her to technology leadership. She shared experiences that highlighted her spirit of innovation, courage, and collaboration.

When Edna was an academic dean, she was seen as one of the technology leaders throughout the college. Being from the campus–side of the institution, Edna was familiar with the campus needs and knew that eventually, everyone would need to have a work computer.

Therefore, the college had a new president and one of the first appointments of the new college president was to assign his first chief information officer of the information technology department, and he chose Edna. She loved technology and was excited to accept the offer. Edna was tasked to oversee the technology department, create a new 5–year technology plan, and incorporate the telecommunications division. She began working with the campuses to create a

long–term master technology plan for computer acquisition, deployment, and support that began with engagement and collaboration among various college departments. Edna said,

> We put together this college–wide committee that had people from IT, people from telecommunications, and people from the campuses. [There were] really a lot of people from the campuses, and not only the academic areas, but student service area, [and] the support areas in terms of the people that supported things on the campus.

The first tasks were to identify areas to receive computers, and decide on whether the college would procure systems with an Apple Macintosh or a Microsoft Windows platform to deploy. This was during a time when computers were becoming mainstream, and many employees wanted to participate on the committee. When choosing the platform, Edna admits to nearly making a mistake:

> I'm [going to] be very honest with you, because I thought it would be—having read and talked to a lot of other schools—I thought it would be cheaper if everybody was on the same technology and everybody was on the same platform.

However, once the college–wide committee was created, everyone attended the first meeting and was very attentive. This included the staff from the media arts area, who preferred the Macintosh systems for design. During one of the leadership meetings concerning the systems, Edna said,

> I remember this one meeting … this was [going to] be the meeting in which we were [going to] decide [which platform]. We really thought that meeting was [going to] end up with all of us coming out with the recommendation that we only go with one platform. We go to this meeting, and there must have been, I don't know, I think there were probably 100 people that showed up. Not only the people that were on the committee, but

> an audience that wanted to watch and support. People who were really interested, and people who wanted to basically, make sure they could get a computer, if they didn't already have one.

In that meeting, the staff from the media arts department made the most logical and passionate plea showing why that particular area would benefit most from a Macintosh platform, said Edna. She said,

> When we finally took the final vote, the vote was we would have mostly PCs, but in those areas, we would support the MAC platform. Everybody was ecstatic, everybody was happy, and it became, it really became a turning point. At that point, it became a big, big, big win, because now, 100% of people were behind the whole thing, and they were all waiting to get their hands on the computer.

The next charge was to present the priorities of the master plan explaining how the department would move forward providing and supporting the institution's technology. Fortunately, during this time, the college president and the board of trustees had several million dollars set aside that IT could utilize to plan the acquisition and deployment of technology to support the district administration and the campuses. Now, IT could present a plan to show how they would use the funds to ensure that Joseph College would be the leader in terms of technology. In lieue of this, more people wanted to be involved in the committee, so Edna said,

> We would move the meetings between campuses, and as we were making our decisions, and making our recommendations, we would let people know where we were. We'd then ask people on all the campuses, and all the district administrative offices, to come forward with what were their priorities in terms of what we needed to do with technology for the future.

> I will never forget, after we did the whole master plan for technology, we presented it at the board [of trustees], it was voted on; everybody was ecstatic. We had to give them a whole list of priorities for the next five years, as to how we should spend their money, and what we should buy next, and the plan was underway.

The forementioned leadership experiences with the committee and the technology plan provided Edna with college–wide visibility. She was seen as someone who wanted what was best for students, faculty, and all functional departments. Edna said,

> If I would not have been that way, and been that opened to being convinced of ideas that were not mine, then we would have never been successful.You have to make sure that you are talking to everybody. As we go up the ladder in terms of these positions, sometimes we're talking to our immediate leadership team, and we forget to get out and talk to the people who are just starting out, and who are just beginning their careers in technology, or who are just beginning their careers in the custodial area on the campus.

Edna spent time meeting and talking to individuals of all levels of the institution in various departments. She felt that it was important for people to trust leadership and feel comfortable conversing with them.

Theme Three: Obstinate Practices

When Edna was the CIO, there were not many women in technology, which could be seen as a deterrent for prospective technlogy women, but for Edna it was motivation to attract more women to technology. She recalls attending a conference at Microsoft shortly after becoming CIO. She said,

> After I'd been appointed CIO, I got an invitation to go to a conference at Microsoft, and I was very flattered. And, I go to the conference of chief information officers, because that

> was the new title everybody was using … and I will tell you that there were probably, I want to say around 500 people, maybe it was 300 … Other than the people from Microsoft, there were no other females in the entire room, but me. Other than the staff from Microsoft, I was the only female. As CIO being invited, I remember looking around the room and going, "Oh my God. Wait a minute; where are the females?" I remember thinking, "Whoa, wait a minute; don't women realize this is a brand new field and a brand new area in which we can succeed?"

With technology being a new field, Edna's excitement grew. Aside from a discontent in the lack of women in such a new and exciting field, Edna had an interest and curiosity in technology to learn how the use of technology could help her perform tasks more efficiently. In addition, Edna intentionally encouraged as many individuals, as she could, to take roles in technology, which is one of the reasons why Joseph College has had only women CIOs, with the exception of one man who did not last in the position.

Edna described how she handled challenges along her path to technology leadership and how she handled such situations. She said**,**

> The director of technology for the college, certainly, he never took me seriously; first of all, because I was from the campus, but mostly, because I was a woman. That's why he was so shocked when I was appointed as the CIO. Not only that I was [going to] be the CIO, but that I was [going to] be his boss.

Naturally, Edna had concerns about the director's reaction to her being appointed CIO and whether or not he would work against her. Therefore, she knew it was important, as a leader, to administer the difficult conversations, as well. Accordingly, Edna met with the director of technology and she said,

> I went down there, I mean, I said to him, “I didn't choose myself for this position. You didn't choose me for this position. I understand that we can either try to work together or we cannot, but it's [going to] be very difficult for you if you choose not to work with me.” He really fought it. He fought a lot of things during that time that I was there as chief information officer.

As the leader, it is essential to stand in courage to have the tough conversations with individuals to resolve concerns in a dignified manner. Therefore, Edna suggested to others:

> You have to face those kinds of things with people directly. You have to talk to them directly and you have to basically say, “Listen, I want to work together,” or “This is the problem that I'm having.” Whether I need you to improve or whatever it is, you have to talk to people directly, one–on–one, to make sure that you can help them to continue to grow, and that's always worked for me.

However, to Edna’s surprise, she had a good transition into the IT department. After she arrived to the IT department, she said, “I was amazed when I went there, and of course, immediately started involving the people; not only the people in IT, but the people in telecommunications.” The method of uniting various individuals of the institution through communication was an ability that Edna understood and mastered. Conversing with individuals, whether for clarity, to help them grow, or to extend a reprimand was a successfel practice for Edna.

Edna described another practice that worked for her as a technology leader. When she worked for the college to oversee a grant that brought along a very stressful situation, she remembered feeling overwhelmed and even crying at one point. To gain control over the situation, Edna said,

> I remember going home and saying, “Ok, let me just go get some rest.” All … I thought of the next morning is one step at a time. The first thing I had to do is to try to get the people hired, so I'd have some people to help me do this. So, the next day I woke up and I started to do that and the rest is history.

Edna was never afraid again. She said, “Even when I was the CIO, I never was afraid, again, on any other position that I couldn't do the job if I just took it one step at a time.” Taking the time to reflect allowed Edna to plan her next steps to move the grant project forward with choices that allowed others to assist her with satifying the requirements of the project.

Edna’s resolve and tenacity as a technology leader ignited throughout her career. During Edna’s 40 years at the college, her most uncomfortable challenge was the experience with the department chair, who was annoyed because she was the only person appointed to his department that he had not selected. Although Edna viewed the situation as an opportunity for the chair to receive a permitted faculty person who could lighten the teaching workload for him; he displayed opposing views. Instead, Edna said,

> I was the only person in that department that he hadn't selected … and he was not that happy, even though … he got a free faculty member. He gave me some of the courses … he would have been teaching, and you would have thought he would be ecstatic. No way; he wasn't happy, because he hadn't chosen me.

Edna and the department chair had a difficult relationship, because the chair provided no support for her. Nevertheless, as a leader, Edna did not let that interfere with her work ethics. She got involved in much of the campus life for over three years until the opportunity to transfer to the downtown campus emerged. Edna said, “I decided this is not [going to] ever work happily for me here, and I put in for a transfer to the downtown campus; best decision I ever made.”

Edna continued to collaborate and communicate with others, and involved herself in campus tasks, as she pushed forward to work in a non–supportive environment, until she transferred. She did not let the chair discourage her from doing the best job she could, while she was in that position.

Appreciatively, Edna credits her mother for much of her self–confidence and courage that strongly underlined her technology leadership perseverance. She said,

> I was very fortunate to have a very strong mother in my life, and somebody who was supportive of me regardless. She was somebody who, basically, had me believe that no matter what it was that I wanted to do, I could accomplish it as long as I put my mind to it, and, as long as I had my mind open to, not only the direction I wanted to go in, but taking input from other people, which you see how this tied into the whole idea of the master plan for technology.

Edna's support early in life anchored the foundation for her to build leadership qualities of courage, uniting people, and displaying innovative methods that led her to succeed in technology leadership.

Frances

Theme One: Career Calling Experiences

Frances had an initial interest in medicine, with technology as a second choice. Although her interests were STEM related, she feels she was more successful with her choice of technology. In the early 1980s, when she was studying overseas, computers were fairly new technology to most areas, and there weren't many women in the field. She said,

> What got me interested was, first of all, something new that I was [going to] be learning. I already liked to get into fields that were more challenging and interesting, so that's what drove me to it; and once I started as a programmer—and then just moved my area up.

Frances's move from overseas to the United States caused her to restart her career from a substandard level than she had established:

> I was at this same senior level back home, but when I moved here I had to start from a low level again. Then for me it was a climb two times, the different cultures, but both had very good different experiences. So, few things that are very important is, "you need the support of your leadership wherever you're working to climb and you need to prove yourself by working hard," so it's been a wonderful experience for me. I'm still looking to go higher.

Frances finds a career in technology gratifying, because she can help people resolve problems through the use of technology.

Theme Two: Leadership Development

Frances' interest in improving the college's technology infrastructure, showing value, and supportive leaders were key factors that led to developing her into a technology leader. She said,

> I started taking more interest in how we can make improvements in these current systems, as far as the technology in the classrooms, or the application systems, or even the helpdesk support for students on an ongoing basis. We had challenges, but challenges were on all ends—hardware, software, staffing. The whole initiative of how we can make improvements got me started on this journey. The executive team at the top was very, very supportive of that, and they helped me grow in that role, I should say.

Frances had a good work record in her previous positions, which made it easier for her to convince leadership to appoint her to the position of chief information officer of IT. She said, “In this culture, taking initiative is very much encouraged by the leadership and supported, but it's important that we have to take the initiative on our own.” Taking the initiative to improve the technology infrastructure was a big factor in getting to the technology leadership role.

As a leader, she brought best practices from other schools to present to the executive leadership team. Frances explained what technology equipment the college needed, and showed them the business value of adding such technology, covering hardware and software, along with expenses. After Frances obtained the position, she had to convince leadership that IT was not only adding expenses to the college, but that it was a business value. Frances explained to leadership that, “If we do spend this much, this is [going to] be the added value to the college.” She would then provide details of how technology would add value. She said, “bringing best practices from other schools, trying to show the business value helped a lot in overcoming.” Although Frances had the support of her leader, she felt she had to prove herself:

> I had to again, show in the meetings by adding more to the discussions. So, I had to do lot more research, work harder to convince the group this is what I'm [going to] put forward in front of you, so I had to work harder to get the gender equality in the meetings. It's not easy. I was fortunate that I got the support of the executive leadership, but it's definitely not an easy climb. We have to work much harder than the men in the same position.

Overall, Frances says it was a gratifying experience that was both very interesting and challenging.

As growth in leadership evolves, it is important for leaders to mentor and help others to lead. Frances works with organizations to help women and young girls in K–12 schools and

college level move into STEM related fields. “There are more women graduating, but less in information technology, and what's the reason,” asked Frances. Frances says she thinks the reason is because women have one of the most important roles of taking care of family, children, and the home. She said,

> I would just say we need to have kind of an infrastructure with every company, where we need to provide more support to the women who are trying to come into technology and make sure they don't fall back, because of these other domestic duties that they have to take care of.

Frances encourages women to continue pursuing their dreams in technology, in addition to caring for family and other duties. She states that systemic processes should be instilled throughout various levels of society to ensure that such women have support to continue their pursuit for technology.

Theme Three: Obstinate Practices

Frances dealt with what many would concider organizational barriers or deterrents. She had issues with the technical infrastructure challenges the institution faced, as a whole. Each day brought different issues. She started her day early and ended it late, often receiving midnight calls when systems would malfunction. There were long daily meetings, which increased difficulty of managing daily operations for an entire district. She said,

> I started as a systems administrator or a developer, and the biggest challenge here at Paul Community College District was we were dealing with very, very old systems, and we had a student population from every different kind of area within the state, or even within the country. The different expectations, the age range was so wide, their expectations

were so different, and then here we were dealing with some very, very antiquated systems.

The diverse student population and ongoing challenges Frances experienced as the systems developer led to a deeper interest for her to improve the antiquated infrastructure, especially for application systems, classroom, and student support.

Frances described how technology has different aspects or components of skilled technology areas; some of which may possibly be viewed as deterrents. She said,

> In information technology there are different aspects of the whole technology that needs to be catered to. As an example, if you're thinking of maybe providing a helpdesk support for desktops, going under the desk and going behind the desks to fix the cables, I think that can be a little challenging for the women. I'm not [going to] say it's something women can't do; we have women doing that now, but there are certain restrictions or challenges on [a] few of the aspects. Overall, I think women are equally capable, and they have the skills to do it.

Although Frances knows that women can perform the duties of a helpdesk technician, she feels that some women will view minute aspects of the position, such as kneeling under desks, as deterrents.

Contrariwise, Frances believes that she was her own obstacle by displaying leadership as a “hard task master.” She said,

> The barrier was basically my own trait of, I would say, of trying to get the best out of the team, and not being that flexible with the team. After I got the [CIO] position, that's when I realized some of these barriers ... and some of them were my own making. My expectations of the team were very high, and I think that's where the whole thought

process of who's best at doing what should have been done; that analysis of the whole team.

Another challenge Frances faced was not having enough staff with the appropriate technical skillsets needed to address various levels of the stakeholders' expectations. With all the challenges Frances faced, she often took her concerns before the leadership team to plead for additional staffing and state–of–the–art equipment, and at times, convincing the leadership team was not an easy achievement. After Frances received the CIO position, she began noticing gender differences among the men leaders in the executive meetings, such as being asked to take notes, as the only woman in the meeting. She said,

> I had to again, show in the meetings by adding more to the discussions. So, I had to do [a] lot more research, work harder to convince the group this is what I'm [going to] put forward in front of you. I had to work harder to get the gender equality in the meetings. It's definitely not a easy climb. We have to work much harder than the men in the same position.

It is unfortunate that the climb for women is harder, because they have to work much harder than the men in the same position, said Frances.

Nonetheless, dealing with antiquated equipment lengthened the workday for Frances, which may also be seen as a deterrent for some women. When systems are malfunctioning, depending on the area affected, there are no set work hours by which to abide. Frances said,

> If the system is down, even at the lower level, you may have to work at midnight and even early morning. That's the kind of attitude or culture that everyone has to have; that you have to be available and be aware that it's not a 9–5 job, so it can be after five, it can be before nine, but that did not deter me.

Therefore, by Frances having the mindset to work harder, longer, and smarter, she was able to sustain through to technology leadership.

However, even though Frances was part of the leadership team and was in the meetings, she adds that it is essential to understand that there are different angles to inclusion:

> You may include the women in the group in decision making processes, but you may not value their opinion. So, you may have them in the meetings and you may just ignore them. I think that's something we need to be very careful with.

Frances argues that inclusion means involving women in the whole process, which includes the decision–making process, and valuing the opinions of all leaders of the team, including women.

The motivation behind Frances to continue to move forward through challenges in technology is the fact that technology is constantly evolving at a fast pace. She said, “You have to keep relearning, keep learning on an ongoing basis. It's never a static process, it's always dynamic with new technologies being introduced, so that's what keeps me going and that's what motivates.” Also, she finds it gratifying because, through the use of technology, problems for society and people in general are resolved, and “I will always continue to do it, said Frances.

From a positive perspective, Frances belongs to an organization where she encourages both men and women to seek technology and STEM careers. In this organization, being the only woman in a room filled with nearly 50 men could be viewed as an intimidating environment because, most of the time, she is outnumbered in the meetings by the men. Bravely, Frances views being the only woman as an opportunity to promote women. She said,

> I was the only woman in the whole room out of the 50. That helped me to promote my ideas with the organization; that my gender helped me in at least promoting those ideas that women need to be encouraged to go into technology, [as] much as men.

Although women are often outnumbered in technology leadership, fortunately, Frances can admit to having been inspired by a woman CIO at one of the big three automobile companies, but acknowledged a collection of role models among team members, as she mirrored useful methods and qualities displayed daily. She said,

> I always pick the best qualities from different people I work with, so you could be my role model for something, but the team that I work with, everyone taught me something different. I won't say that I had one role model, but I learned from everybody, and I try to stay with the positive that I learned from each and every one.

Additional methods to withstanding challenges included networking. Essentially, keeping in touch with peers and colleagues from other schools, colleges, and organizations is important with staying abreast of current technology and leadership trends. Frances said,

> Joining external organizations where the technology leaders come together to share their experiences is very important because, if you don't do that, you lose track of what is new out there. You're behind very quickly in the field of technology, so you have to really make sure you are up–front, as far as knowing what's going on in the market consensus.

Frances encourages others to network with technology leaders and become members of organizations, in addition to gaining support of management. Communicating with others helped her tremendously in sustaining technology leadership. She said,

> Make sure you create an environment around you that helps you to stay in that field. Don't give it up if you have other duties to take care of. Second thing is network, network, network with other technology leaders from other industries, not just higher ed, but other industries, and that's important.

Frances said women will need to assume the challenge of working harder than men, “It's [going to] continue for some time; it hasn't changed, but just be aware of it, and work with it,” she said. Therefore, creating an environment of support, working hard, and expanding knowledge promoted continuance in the field of technology for Frances.

Mary–Elizabeth

Theme One: Career Calling Experiences

Mary–Elizabeth thought of becoming a school teacher as a young girl, because she liked working with people; but by the time she was in high school, she was set on becoming a doctor. She received a scholarship and planned to attend college in the southeast, but had a change–of–heart about leaving home, so she followed her grandfather’s advice:

> My grandfather was an adjunct professor and he loved computers, and he kept telling me, “Oh, you need to get into computers, because it's not many females in computing and it's a great advancement opportunity for young women.” So, I decided to do my 2–year degree, stay home, and take my courses at Gunzella College. I didn't like the first semester, but after that, I really started to like it.

Mary–Elizabeth says working in technology was by accident, because it was not her dream. She viewed technology as being “nerdy,” because she was an athlete, who wanted to be a surgeon.

Nevertheless, Mary–Elizabeth learned interactive design processing, which optimized work habits. She was encouraged by a program at the college that offered employment after completing an Associate’s of Science degree. She liked design processing, so she completed the 2–year program and decided to obtain a 4–year degree. She accepted a programming job at the

college that offered benefits to fund her education, which was a great opportunity. As she moved higher up the career ranks she said,

> I needed to know more about how different people work well together, so we did a lot of diagnostic testing. We did mind–brains … to see who's [going to] work well together on a team, as I got higher and higher up.

It is critical to be able to communicate and work well with various people, and to obtain the right fit for teams. Fortunately, Mary–Elizabeth said she made the right decision with a career in technology.

Theme Two: Leadership Development

Key influences in Mary–Elizabeth's leadership development include experiences displaying independence, collaboration, virtuous leaders, and team building.

Sturdy family support was the basis for Mary–Elizabeth's confidence and individuality displayed in her leadership. Her father raised her to be independent and not to rely on others by teaching her practical skills. She said,

> I was changing flat tires, and installing dishwashers, and putting in sprinklers … I never felt like I couldn't try something. I wasn't into personal computers, but all of a sudden, I was responsible for all personal computing in the college. I was started as a computer programmer, so I just—incrementally over time—I acquired more responsibility. I think that self–efficacy, that ability to say, "I can do this," and have support from my family and my team, helped me. Those were two big factors.

Another impact on Mary–Elizabeth's role as a leader in technology was having great supportive leadership, because she did not have a technology background, but was very

interested in the business aspect of technology. Executive leadership believed in her and allowed her to be creative and voice her opinion. Mary–Elizabeth said,

> One of the factors was having a boss that allowed me to communicate my vision, so I was real big on planning and vision, and saying, "We could do this, and if we did this…" it wasn't just, "Tell me what you want from me." One of the factors was just having bosses that were very opened and influenced by what I had to say.

Mary–Elizabeth had another leader who she considered a role model. He was the president of the college and he personally knew the names of each person on her team. He ensured to meet each person individually, and Mary–Elizabeth found that to be very impressive:

> I would say to him, how do you remember their names? How do you know who these people are? He says, "It's a gift, and when you have it, you have it." I didn't have it, because I had [to] write these people's names down. Then he finally told me after 10 years. He says, "I just put something with them that resonates or relates to me, and then I remember, "Oh, that person is into golf, or she likes soccer." So, he knew every team member I had, and at the time, I was over like 40 people. He was inspiring, because he made it personal. He knew everything about my team, so I learned to do that from him—he was the president of the college.

Team members were other role models that Mary–Elizabeth said would push her to think outside of the normal processes to critically question decisions, and see the larger picture from a realistic point–of–view.

Mary–Elizabeth attributes these role models to helping her grow as a technology leader throughout her 37–year career. She said at different points in her career, one role model made it

personal, one made her believe that she could accomplish any goals she set , and others kept her grounded in reality.

Over the years, Mary–Elizabeth developed and displayed strong leadership strategies to increase fairness in advancement and salaries. She partnered with the human resources department to conduct a compensation study for IT personnel and positions. It resulted in IT gaining their own classification of job profiles. This allowed her and her team to compare roles, for example, they could compare a finance analyst to a data analyst. She said,

> We had our own job family's classifications, and they marketed it against universities, and other community colleges, and the corporate world. … Across the state, we were probably in the top third of wages, after that first 3–year study.
>
> We also had what we called levels of progression. We would say … you're [going to] be a network specialist and eventually you're [going to] become a network engineer. Then we would train them … we provide the education. We'd say, "In three years, this is what you need to do." And, they would advance through that; they didn't have to wait for somebody leave to get that pay. That's how we had really good longevity. People stayed a long time, because they did advance every … three years or so; they could see a significant difference in pay.

Mary–Elizabeth said she had to be creative with funding sources for the new initiatives, because she wasn't given additional funding to support them, so funding was often a big impediment.

Another leadership strategy that developed during Mary–Elizabeth's reign, was the business–front process management platform. Under this management platform, members of the IT department learned how to build business processes of the functional business areas of the

college. Each functional business division was assigned a relationship manager from IT, who would dissect and document processes that involved the use of technology programs and systems. She said,

> We had a liaison in IT that kind of sat in the business and helped the business understand their IT systems. It's kind of where it evolved to the last three years I was there. … We did make sure we put a major focused person in their department that they could talk to about their needs, their wants, their priorities, and then we made them, at the same time, understand their business processes.

There were not many community colleges taking advantage of this strategy in IT during this time. This was a practice known mostly to the private business sector.

Mary–Elizabeth had several innovative strategies in addition to those aforementioned. For nearly 10 years she worked to obtain gender equality. Her department had one of the highest numbers of women in IT among other colleges. Also, Mary–Elizabeth used to speak at conferences and at middle–schools to promote women in technology. In addition, she continued partnering with the human resources department in support of gender equality:

> We had goals with HR every year to get more diverse, not just gender, but all ethnicities. It wasn't all Asian programmers, or it wasn't all White men running the network. I was fortunate to be in a place where there was a lot of inclusion, and it was great.

Furthermore, Mary–Elizabeth adopted the "co–op credit" model that was used when she was a student. She worked in the data processing center without pay to complete her degree. She said,

> We got the gender, we got the women in there, and we got the diversity.

> But it was definitely part of our strategic plan. You can't do it if you don't put it in writing, and say, “we gotta do this and measure it.”

Mary–Elizabeth mimicked that model to use at Gunzella College to help students complete, and she said there was a keen focus on that model.

Theme Three: Obstinate Practices

Mary–Elizabeth described experiences that she believes helped her to persist to technology leadership and among them were two inspiring women. Mary–Elizabeth said the women built their own consortium and ERP systems. She said,

> Those women were powerful to me. I was young and learning, and they just seem like they had all this power sitting at the table. So, I kind of learned from them, quite a bit, how to … play at the same level, because I was never like, “Oh, I'm a female and I need more; I need power. I was never into that, but I could see how they really got power, and someday I'm [going to] have that power.

In addition to being inspired by women role–models, Mary–Elizabeth welcomed the challenges that accompanied the dynamic field of technology. She liked that technologies were introduced often. This reminded her of her father, who was one of her first role models. She said, “One of my role models was just my Dad helping me understand that, “Take the challenge. You can do anything. Shoot for doing your best.” Don't do mediocre ever,” and these encouraging words from her father helped instill confidence to face change and challenges, which is helpful in a dynamic field, such as technology.

Funding proved to be another challenge for Mary–Elizabeth, because she had a 3–year strategic vision where she worked with an IT research and consultancy company striving to make her college a leader in technology, impacting the technological capabilities for the students. “So,

funding was a big impediment," as previously stated by Mary–Elizabeth. Again, she said she had to be creative with choosing current accounts from which she would take funding in order to supply the strategic vision.

The following impediment for Mary–Elizabeth was surprising. Unfortunately, women not only had to compete against men in technology, but in meetings, Mary–Elizabeth felt that there was a culture of competition among women executives, such as presidents and VPs. She said,

> When I was at the table, I saw a lot of … "Who's [going to] be like the person at the table today that they're [going to] give something to or get their way so–to–speak." I've found sometimes, as I'm trying to lead and the president would say, "Ok, Mary–Elizabeth's [going to] run with this initiative." The initiative was a business initiative; it wasn't a technology thing. I would find that they would be like, "Uh no, no, no; I want to lead that," so there was a little bit of that barrier to growing beyond the, "You're just an IT person"—because I loved the business part of it—and so, that was something that was hard to deal with.

Although this was a disheartening situation for Mary–Elizabeth to cope with, she was steadfast and confident with leading her initiatives, despite the competition.

Accordingly, confidence was a strong quality of Mary–Elizabeth's, and she said that being an athlete helped her to create confidence. Therefore, a background in sports helpd her to sustain leadership among a team of men by using her knowledge of sports to form trust and for team building. She said,

> I'd have to talk about sports; I have to get on their level. I'd have to have beers with them; I'd have to let them see that I was just one of the guys, and then they'd listen to my thoughts, my creativity, my ideas; and over time, they accepted that. It took them awhile

> to realize that I had some valuable insights, I had good ideas, and then they'd … let me take on and lead something, and then all of a sudden they'd say, "Like wow, she's getting...[stuff] done."

Mary–Elizabeth said the men on the team liked having someone else complete the work, so being accepted as someone they could count on to successfully complete tasks had its pros and cons. However, Mary–Elizabeth adapted and said women have to find a way to fit into the male–dominate technology faction and be valued.

Fortunately, Mary–Elizabeth was a coach for 30 years and it gave her insight to when a team player needed encouragement or discipline. She said, "I knew that somebody right here needed this push, or I knew this one, and I think that came from my coaching career." Such insight helped Mary–Elizabeth to connect with her IT team, providing individual support and consideration, while leveraging her sports qualities.

Furthermore, Mary–Elizabeth had a strong concept of team that she displayed throughout her career as a technology leader. She injected the team approach into her own IT team daily:

> We did a lot of after–hour events as a team. It was 50 of us at one time and we'd go to football games, we would go bowling as a group, one night a week. We had international day, where different people would bring food, that we had people from India and people from all over, [from] very different … cultures, so we did a lot of social picnics and things outside of the norm to make it feel more inclusive.

Others of the leadership team would ask how she was able to conduct such team building in IT outside of working hours, and Mary–Elizabeth would say, "You just say this is what you're [going to] do and do it." Mary–Elizabeth felt it was necessary for her team to indulge in such outings, because she felt that it was important to maintain the success of the work progressions

and inclusive environments that she worked hard to build. This included the climate she built for advancing women in IT through growing women from the business side to learn the technology to better support the business functions.

The team building approach expanded to others among the leadership team. Mary–Elizabeth and other leaders would meet to discuss advancement ideas. She said,

> We used to do Wine Wednesdays with some of the female VPs; how we would strategize, and we'd get together and we'd talk about if there's somebody that we needed to either bring into our ideas [to] move a big strategic vision forward. We would get the business together and just talk about it over having some hors d'oeuvres; some wine.

The Wine Wednesdays brought different mindsets to a relaxed social setting to brainstorm. This included a small group of 4–5 individuals, who were a mixture of traditional thinkers, such as senior VPs, and trending intellectuals, such as the IT technologists. “We could get so much done already, if we could just reorganize the whole college in half a day,” said Mary–Elizabeth. Wine Wednesdays was a successful approach for collaborating and strategizing among various areas of the institution to hone innovative ideas for moving an agenda forward for sustainability; accomplishing the goals they set.

In addition, in the concept of team, when Mary–Elizabeth collaborated with other departments and wanted her point–of–view to be heard or considered, she said she would engage herself on their team:

> I would engage myself on their team, so if it was their idea, and it wasn't something that I really saw as the best approach, and I wanted my approach to be seen and heard, I would volunteer. I would say, “Let me be on that team.”

Mary–Elizabeth introduced ideas and asked questions to better support students. She said, "I would say, "What about this? What about that? Did you ever think that—oh, by the way—that students, they can't do that, because we're charging an application fee." This allowed Mary–Elizabeth to listen to what other team leaders proposed, and then she would be in a position to introduce other viewpoints with inquiry to make her point. She used that approach in many meetings with various teams throughout the institution to gain greater visibility and knowledge. Mary–Elizabeth said it was overwhelming at times, but she felt it was the only way she could be productive.

Additionally, other strategies were built around creating proposals and learning not to automatically choose the least expensive offer, nor guess at what a functional area needed, but to collaborate with them on the needs, and choose the most feasible in cost and quality. If three options were provided, Mary–Elizabeth would present the functional areas or leadership team with all three options:

> I would present all three options, and I would say, "This is why we can't do that." … I said, "If we don't do this, here's the impact, here's the impact to students, here's the impact to your employees. That was a technique that worked fabulously.

The basis of Mary–Elizabeth's technique was to show the impact of not engaging in a particular task or not considering her viewpoint. She was passionate about her choices, and her techniques were more beneficial than outright asking for more funding for a new initiative or a new network. Those listening were not technology people, so they found Mary–Elizabeth to be encouraging and they wanted to hear her ideas and viewpoints. Along with having a great team, having fun in the workplace, and having your viewpoints appreciated were among factors that Mary–Elizabeth said helped her to persevere.

Melodie

Theme One: Career Calling Experiences

Melodie first attended a small liberal arts college on the east coast that she credits for providing her with a foundation to be inquisitive, write, problem solve, communicate, and think critically. She said attending the liberal arts college assisted her with the tools necessary to succeed. She said,

> I was thrown into them—maybe two positions in my entire career. Those positions were newly created. Nobody had those jobs before, so most of my career … I've had to step into a brand newly created position and make it work.

Melodie enrolled in a certificate program to become a high school social studies teacher, as a single mother of two. Through practical training, while in the program, she soon realized that work–hours at the high school began much earlier than her children's daycare; so it was an impractical career goal, because she had no one to care for her children during morning hours. Therefore, she applied for and obtained a position on a grant initiative at the college from which she graduated. The initiative was to help small businesses learn how to use and create websites. Possessing the skills to create websites led Melodie to a position at a university, where she worked on forming their web–based instructional technology program, which was "learning and implementing their learning management systems" (LMS). They implemented four LMSs at one university, which was a big accomplishment. Afterward, Melodie decided to further her education:

> From there, I decided to get my Master's in instructional design and education technology, and that provided me with more opportunities for other positions, as well as being able to move up in my career. To be a director, you needed to have a Master's

> degree, as well as experience. I think I've been pretty fortunate … my supervisors have supported and provided me with opportunities to pursue my education; receive training.

Melodie is appreciative to have landed a career in technology:

> Technology kind of chose me. I think some of it was just being in the right place at the right time; but definitely, the experience that I learned in that first job, as far as learning how to create web pages and a little bit of coding, as well as training, put me on this path.

Melodie focused her education, professional development, and research opportunities in areas that she embraced with passion and curiosity, which she says led to positive experiences in general.

Theme Two: Leadership Development

Melodie said obtaining the position of the learning management system administrator played a key part in defining her career role, because she was responsible for multiple areas:

> I had to do everything from installing applications on a server, to training the faculty, to supporting students; everything from the ground up. I think believing that I have the ability to confront problems, and ask for help, acknowledge what I don't know, not be afraid to ask for help, and to ask for opportunities to learn what I didn't know, has had a huge impact.

Under the guidance of the vice president of academic affairs, Melodie experienced leadership growth through training opportunities as a new employee:

> I came to that institution, again, it was a brand new created position. She, along with the new director of assessment, really helped to mentor us. She provided us with a lot of opportunities to get additional training. [She] sent us to the Harvard leadership and management seminars, took us to conferences, and encouraged us to write and present.

Melodie was fortunate to have mentors to inspire her through her growth, especially in newly created positions. However, inspiration not only derived from management, but also from among her team. She said,

> I'm very fortunate to have what I consider a very strong group of women, who now work in my division, and they inspire me all the time. They inspire me because I can see how everyday they bring what they—the fact that they're a mother, a wife, a sister, a daughter, and then also, a leader. I think that's one of the things that inspires me is their ability to kind of look at their team, and how they approach problems with empathy, and they bring a different perspective. They force you to see the human in what we're working on.

Often in the technology realm, there may be a focus on a problem from a technical point–of–view, without much consideration for how the problem affects people. Melodie is fortunate that the women on her team bring awareness of how technology impacts people, especially during challenging times, such as today's pandemic and working from home, where the women must work and continue to care for family**.**

Overall, Melodie feels fortunate to have had supervisors who supported her and provided opportunities to advance through training, because it was important for Melodie to be the best at any role she was responsible for upholding. She said,

> Where ever that passion or curiosity led me is where I focused my professional development, education, opportunities, attending conferences, doing research, and so, I think that my experience has been positive for the most part.
>
> I set out with the intention to be the best at whatever I was in, and to develop a team and process that helped to grow the institution; that helped to make things a better learning experience and access for students.

Melodie states that she had a passion for leveraging technology to improve support and services for students.

Theme Three: Obstinate Practices

Melodie described experiences that she encountered along the way to technology leadership and how she dealt with the social deterrents she met, including salary, chauvinistic, and gender discrimination. She said,

> I had been promoted into a job that's been occupied by a male, and I was significantly underpaid, even with more experience. I would say we still have a lot of work to do in that area. Beyond just the salary, I think earlier in my career I would go to meetings with IT, so I'd be representing the learning management system and … I was dismissed often time for not knowing much, or they would try to simplify what they were talking about, because they made assumptions that I didn't know.

By Melodie being a woman among a team of men, she was made to feel technically inadequate, and her salary benefits compared to the men reflected that ill assessment, as well. However, Melodie feels that women have made progress in these areas. In fact, when she was promoted to the position of vice president of information and instructional technology, the majority of her team were men, as well as the majority of the leadership team. She said,

> I was concerned about how they may react to me, because I had those [gender discrimination] experiences in the past, and I am presently surprised that I haven't felt any direct or indirect [discrimination] in regarding my gender, so that's been really helpful.

Aside from discrimination, Melodie described other deterrents she dealt with during her journey. She is a mother and argues that her personal approaches were main deterrents or barriers for her. As a mother, she ensured the wellbeing of her children above all else. She said,

> As a mom, my kids were taken care of first. I think that I stayed in positions longer than I would have, had I hadn't had those parental responsibilities, to make sure that I had a steady income and health insurance.

After Melodie's children completed their educations and became adults, she was no longer apprehensive to taking risks concerning her career. Likewise, conversations with other staff revealed that many of them stayed in positions at college institutions, because of the flexibility they offer, especially since many of them were mothers:

> A theme I hear … is that they [staff] may stay in a position or at the college level, because [of] the flexibility—several of my team have children with special needs—and the health insurance, [and] reliable work hours. I think too, that we try to have a flexible work environment, as well; so that, if you need to work from home to attend to a child, or take them to a doctor's appointment, or something like that, that's definitely much easier to do than what I've heard from colleagues in the corporate world**.**

Melodie maintains that, although higher education is an area where women can thrive as leaders, it is not the case with information technology. She said,

> I think that higher education is an area where, at least at my institution, the majority of vice presidents are women. I think our presidents council, of the 10 or 12 people, all but two are women. In different areas of the college and in higher education, I definitely see women in leadership positions, so it's just IT, and hopefully that's [going to] change, as more women come into the field.

Melodie agrees that there is a lot of opportunity for women in technology. She also believes that that most institutions value diversity in the information technology division, "because when you're dealing with a problem, there are a million ways to look at it, and you

need diverse opinions," said Melodie. Therefore, she feels that there is a need for more women in technology, and there are many opportunities for them.

Melodie acknowledges that women are still underrepresented in IT and she seeks to support the increase of women in technolgy. Melodie said, "We're looking to provide opportunities to attract, recruit, [and] retain women in this field. I'm providing women in IT with opportunities for mentorship to help them grow." Melodie is involved with an organization that provides opportunities for her to focus on mentoring women and emerging leaders within IT. Therefore, she said,

> We started participating in a [national] women in IT group and I participate in some ListServs, and had really helped to leverage some opportunities to work with other institutions of higher education and bring together that … group of women in IT.

Melodie feels that it is imperative and beneficial to support other women, so she intentionally participates in activities to help leverage women, in general, as well as in technology.

When discussing women leaders supporting other women, especially those aspiring technology careers, she said,

> I'm trying to do that same thing for others, and … to say yes when opportunities are presented … to me. That, to not be afraid to try something, or if somebody offers you an opportunity to participate in a research or present at a conference, or to become a member of a committee that you don't really think you have an interest in, those were the times where doors opened for me.

In addition, one of Melodie's recent opportunities to be involved in the field, outside of her team, was to speak on a SANS sponsored CTO panel for an event similar to a hack–a–thon, in which she was the only woman CTO. She said,

> I'm on a panel … I was really happy to be able to be there and share my experiences, but I also acknowledged that it'd be nice someday to be on a CTO panel where we were more representative to the actual population. I think it's challenging. I think that, because of the fact that it's still a male dominated area … it is challenging.

Melodie said it is essential for women to be confident in their values and knowledge. "You have to be really comfortable in your own skin and in your confidence to be able to walk into a room with 10 men, who are very smart and know exactly what they are doing," said Melodie. She stressed the importance of women having self–confidence in admitting what they know and don't know.

One practice that Melodie uses is modeled after an administrator that she felt displayed strong leadership qualities during a time of turmoil and change at the institution. Administrative changes took place that was extremely opposed by faculty. She said,

> Faculty were really not happy with the administration's changes and … her [administrator's] house was actually shot at as a result of some of the changes. Watching how she composed herself and led through that really tense … conflict was really impactful, and how I tried to model myself when I'm faced with adverse situations or places where I'm not very popular.

Melodie was grateful to have been able to watch and learn from her leader at the institution, especially during time of change.

In addition to believing that mentors and supportive leaders played key roles in Melodie's perseverance to leadership and technology, so did the desire to support students:

> In fact, I would argue that my experience of becoming a leader in technology really didn't have a whole lot to do with technology, it really had to do with wanting to create and improve learning experiences for students, and we leverage technology to do that.

Technology is seen as a tool to help support students and people, in general.

In fact, courage was a key factor that helped Melodie in technology leadership, because it allowed her to not be afraid. She said, "I think believing that I have the ability to confront problems … has had a huge impact." In addition, being able to ask for help and learning opportunities were great influences for Melodie's confidence and leadership qualities. She realized that one cannot be an expert in every area of technology, so it is important to ensure that, as a leader, one is facilitating good relationships with individuals who may provide accurate information in areas where a leader may not be an expert.

Melodie realizes that many of her opportunities were a result of others in leadership roles who encouraged her. Therefore, she aims to do the same for women and girls through hosting technology events. Her college hosts a campus event, which is "an opportunity for us to bring middle–school girls, expose them to different STEM areas, and that's really exciting," said Melodie. She said, women need to do a better job at supporting one another, as they are facing gender challenges.

Mia

Theme One: Career Calling Experiences

Mia's background interests and education is embedded in STEM technology. She has a Bachelor's degree in electrical engineering; two Master's degrees, one in computer science and the other in electrical engineering; and she earned a Ph.D. in computer engineering, exposing her to computers early in her training. She worked in the private sector for 10 years before earning

her Ph.D. After obtaining her Ph.D., she became an associate to a professor in computer engineering at a technology institution in the northeast region. She then became a professor and department chair. Mia had not foreseen a transition from a professor to a technology leader:

> I didn't come from an IT track. I was a professor and then just happened that this CIO position opened up, and I applied, and I got the job; even though at the time, I really did not have any operation experience at all, in terms of IT.
>
> I was very good with math and science. … I think at [a] very young age I wanted to work—I wanted to focus on math and science, and this is STEM field, that's always been my interest. I was also very good at it. I actually wasn't very good at the liberal arts type of subject areas. I remember I hated geography … history and geography, those were so boring. When I was in college in [the] late '70s, early '80s … at that time computers just came out. I remember I skipped meals, just so I can save enough money, so I can run out and get an Apple computer, and get an Atari computer.

College students, especially those in STEM programs, were eager to own the new technology:

> You can't wait to get your hands on these kinds of technology, and many of my classmates, we build our own computers, so I guess it's for me, it's always just very natural, I guess.

When Mia completed her undergraduate degree, she continued to pursue her Master's degree and immediately upon earning her Master's degree, she began job hunting and gained employment with one of the largest computer companies in the world at that time. Mia was filled with confidence and was all–knowing, until her first employee review:

> I had an excellent supervisor on my very first job. I had my first meeting with my supervisor and he asked me to write a very simple program. I said, "What? This is easy."

> I wrote a very simple program and I sent it to him. He reviewed the program line by line with me, and then during the review he started telling me that there's a better way to do this. Through that, I didn't realize that what I've learned—I thought I was a pretty good programmer, but after that review, I realized that I knew absolutely nothing.

Per Mia, the technology company had an excellent environment for mentoring programs for young engineers. The program was rigorous with methodical coding standards. “They really guide you through the discipline,” she said, “and then they make sure you document and you know.” Mia was fortunate to have been involved with such a company, and to have had a supervisor who instilled standards, and hands–on experience for learning, as her first place of employment.

Although Mia had initial interests in STEM, a female college professor piqued her interest in computers. The professor informed Mia that software development and computers were excellent career paths for women. Mia agreed that women are logical and a good fit for computer programming:

> Computer programming really … fit with our nature. We're logical, and we're also more detail oriented. So, when you write programming, when you do all that, you need to be very detailed oriented and many of us can handle complexity.

All in all, Mia said the professor was the only person who really inspired her to get into programming and computers in general.

Theme Two: Leadership Development

Over a 30–year career span, Mia had multiple role models she credits with helping her learn soft–skills during her leadership career. When you advance to a leadership role, it’s no

longer about technology, but about the soft–skills, such as building relationships and understanding the culture of the institution, said Mia.

Mia's father was one of her first role models. He was a negotiator responsible for labor relations. She learned about working with human interactions and relationships from her father. "I think that really helped me, seeing how he deal with labor conflicts," said Mia. In technology, human to human relationships are the basis of the work, and seeing her father, as a great communicator, resolve conflicts between employers and the laborers helped her to grow.

Another influential person for Mia was the chancellor at a university. She switched from the private sector to higher education as a professor. As a professor, Mia didn't have to be concerned with the bureaucracy of the institution, as would an executive administrator. The chancellor offered her the CIO position, although she had no administrative experience operating a college division. Mia said,

> He took a chance on me and he offered me the position. In the first year he really guided me and helped me with the various operation details, various policy procedures; helped me guide through this kind of bureaucracy. I think everybody will need someone like that.

Needless to say, Mia had not planned on being the CIO, and says it was by accident that she entered the technology field. "So far, it's been a pretty good smooth ride for me," said Mia. Fortunately, having multiple mentors supporting Mia in her career goals helped her grow, as a leader in technology, to see that it's important to have communication skills.

Theme Three: Obstinate Practices

Mia shared experiences that she believes helped her to persist to technology leadership through social barriers and deterrents.

Mia acknowledged that engineering, in general, is a tough field. Therefore, she feels that to succeed, it is essential to love the field. She said, “You need to love it. If you love it you push on, and then I think everything else would eventually—all the barriers, eventually, would be worked out.” Consequently, loving her line of work helped her to face difficulty in the field.

Furthermore, Mia’s experiences taught her to think positively, especially during difficult times, because it helps one to keep moving forward, particularly when a field aligns with one’s principles. Mia said, “We always keep pushing. You have to keep pushing; stick with your principle. If you truly believe in the principle, truly believe in your cause … stick with it.” Also, Mia felt strongly about having passion for the work one chooses. She said, “I think [the] most important thing is find something you are very passionate about,” then you will stay with it to overcome obstacles. Mia said, if individuals are passionate, they will find ways to make an idea work. Consequently, when Mia was the only woman faculty in the entire school of engineering, her love for the field made her feel like she could be successfel in that area, despite it being dominated by males. Mia said she strives in her IT division to choose individuals who are passionate about technology, because she finds that they will be committed to staying current on new technologies and skillsets. Race and gender is not the deciding factors when looking for individuals to join her team.

However, what Mia finds challenging is the lack of role models for the younger generation in K–12 systems and college. Mia said these students are still trying to navigate various fields in search of a good career fit. Therefore, Mia believes that role models can help these individuals navigate. She said, “The more we can get female faculty, female instructors, K–12 teachers; I think it will be a lot better, because I certainly … was inspired by these female role

models when I was growing up." It is especially important to have clear pathways in the higher education sector, because it tends to have a complex dicision making matrix. She said,

> Higher ed is very complicated than private sector … in private sector you tend to have [a] very clear decision making matrix, so you know who's in charge. You know who makes the decisions, and you know all that. But higher ed cannot be as clear. So, a lot of decisions were made by [a] committee. So, the decision making matrix is not very clear. It's not very clear that who's responsible for what, who has final say of what. To navigate to understand you are always talking to the right people, that's sometimes very difficult. Sometimes I don't even know—am I talking to the right people.

Mia feels that being able to navigate the very complex bureaucracy in a state institution is important, especially for newcomers. She refers to this as having soft skills. She said, "These are your soft skills. When you get to the leadership roles, sometimes your soft skill, it matters more than your hard skill." Mia argues that once more women are in the field, they need to be in decision making and leadership roles. "I think that's something that's [going to] help with the salary differences. I think, again, it's a field that predominantly is still male and a few females are in this field; we don't have enough in the leadership role," she said. Mia feels that an increase of women in leadershsip roles in technology will help level the salary differences, because to remain competitive, one must be paid competively.

In lieu of this, Mia thinks that, since technology is a critical function for most institutions to survive, she has been fortunate that her institution favors the information technology division. She said,

> I think we've been fortunate that the college is actually—treat us pretty special. We have a separate pay scale compared to the rest of the college, so we're on a completely

different pay scale. Our pay scale gets refreshed on a regular basis … so that we can remain competitive. We can go out and recruit. The rest of the college still operate very traditionally.

In addition to the special IT pay scale, Mia said her department has improved over the years by offering a remote work policy and flex time, as well.

Mia said, when you climb to a leadership role, responsibilities shift from technology to building relationships with colleagues, and understanding the culture of the institution. By Mia having strength like her father as a negotiator, she has proven soft skills with human interaction:

> Even though we're in the technology field, but everything … boils down to a STEM field, human to human relationship, and I think that really helped me seeing how he [her father] deal with labor conflicts. He had to resolve a lot of conflicts between the employers and the laborers.

Within a 30–year span, Mia had many role models to help her along in her career, and she said they helped her to "pick up these soft skills along the way. It takes strong communication skills to be able to successfully negotiate with individuals; providing a human touch, said Mia.

Mia has a technique that she said is very common, which is to learn the decision matrix and organizational structure when you first begin in a new position. She said,

> You figure out the roles and responsibilities of each individual, each department, and get [an] idea of the landscape, the overall landscape. Spend time before you jump in [and] try to do something. Spend [a] few weeks; try to understand first, the people … understand your roles, your responsibility, and the relationships among the individuals; relationship among the team.

Mia said after the landscape is scanned, get an idea of what type of field one is playing on; in other words, assess the culture and the climate in the department and the institution, as a whole. This process helped Mia endure every time she began a new role or job.

Mia believes that, "the best thing that you can do is … find a good mentor. Somebody will help." Since scanning the culture and mentoring are important aspects of success for Mia, she requires her new employees to closely work with supervisors for the first six months in the position to guide the individuals. This will allow individuals to better navigate the work roles and responsibilities within the team and organizational matrix.

In addition, role models are highly accredited by Mia. "I think everybody needs role models. I think throughout my career [I was] very fortunate I had some excellent role models," said Mia. Key role models began at home with Mia's parents, whom she said were both hardworkers, a trait that she learned from them.

Rhonda

Theme One: Career Calling Experiences

Rhonda was on a student visa and felt that her options were limited, so she wanted to study a program that would guarantee her immediate employment after completion, because she was drowning in student debt. She was not familiar with the career tracks in information technology, especially for women, minorities, and international students, so she sought guidance from an advisor:

> Paying international tuition was almost double what a typical American citizen would pay, so I was getting buried with debt. Before I was getting close enough to graduate I asked my advisor, … once I got my 60 credits out the way at the Community College [I attended], I talked to an advisor who I told exactly what I was looking for that would

> guarantee me a job. At the time, this was in 2000; 1999 is when I graduated, so around that time '96 to 2000, IT was the hottest, I guess, career that everybody was going into. There was a lot of needs. There were so many jobs, but not enough people to fill the jobs. I honestly just went into IT just so that I can get a job. I think it was the best decision I made, because I have never been without a job since I graduated.

The first programming class for Rhonda was a new experience, but she was determined to stay in the program to complete. Her curiosity to learn new skills and information kept her interested. She said,

> What I think helped me kind of to stay there and not give up, because I was always curious about learning something new, so it's like learning a new language. So, that kept my interest going. I had no interest before—I mean, I didn't even know what an IT professional did before that.

In addition, Rhonda credits much of her success on the opportunity to obtain practical experience and being involved in the information technology "community" during her undergraduate work at a university, as a computer information systems major. She said, "I worked in the computer labs and I was fully engaged in what the actual career would look like when I left, so I had a good mentor. I think that definitely help toward my success." Per Rhonda, being an information technology student felt like being in a small association on the campus.

Theme Two: Leadership Development

As the director of IT, Rhonda gained leadership experiences, which were essential career shaping factors, as the college implemented a new $5 million enterprise system. She was afforded the opportunity to advance leadership skills through training, networking, and attending multiple conferences to better implement and communicate the status of the new project. Rhonda

was tasked to create documentation, arrange meetings among key stakeholders, and explain processes. She was exposed to a multitude of responsibilities, as the liaison for the institution and the user community. She said,

> On a typical day I was wearing many hats, as we were going through that implementation project. That's something that you'd do as the director of IT in any organization is that you can't really do one thing. You gotta be able to address all IT related issues.

As a leader, it is important to stay engaged with all levels of the institution when you have many roles of accountability. Rhonda said,

> There were times I was helping students and faculty, [supporting] the Blackboard eLearning platform; and at the same time, managing the college's website, managing the enterprise system we call Banner, which has now evolved and developed. Still, the college uses it and enhances it.

Rhonda said it doesn't matter if you're at a community college or in IT in the private sector, it is important to attend conferences, and to learn current and upcoming technologies for enhancement and growth:

> I feel like the whole IT community, especially those people that I meet at conferences were all my role models. I feel like I learned more on those conferences than I actually did on the job, believe it or not.

When Rhonda first started as a new employee, her supervisors entrusted her with projects that she feels helped her to develop faster and increase her knowledge. She said, "I was lucky to come in at the right time, where the college had multiple projects going on. I was lucky to put my hands on multiple projects and learn as much as I could."

After 20 years, Rhonda has technical skills that allows only her to address specific technology issues at the college. She said perfecting her skills helped her to add value to the college, and highlighted her knowledge among the leadership team.

Theme Three: Obstinate Practices

Rhonda shared experiences that she believes helped her to persist to technology leadership through social barriers and deterrents.

Although Rhonda loves the information technology sector, she felt that she was limited, because of her gender and being a single mother. She stated,

> If I wanted to move along the way and climb the ladder I knew that I was limited. Especially, not just about being a woman, but I am also a single mother. So, there are some opportunities that I know went right by me because of that; because I wasn't [going to] be available to do after hours work and things like that.

Rhonda feels her limitations were a huge dispartiy, but not only in the information technology sector, but in the workforce for women, in general.

Rhonda understood that there were processes that she could change, but there were others that she could not, so she said, “I guess I accepted it and the only way for me to prove that I am still an essential or current valuable contributor to the department was to, pretty much, learn on my own and polish my skillsets.” Rhonda turned to increasing her knowledge to stay competitive in the workplace, because she found it challenging at times. She said,

> It's, very hard. You just have to absolutely 100% prove yourself all the time. I think it helps, especially in our institution—it's not so much that you were an expert in IT, you also needed to be an expert in education, and how the classes are run. Your relationship with faculty and all of that come into play. You need to know the latest and greatest

> technology for faculty [and] for students; so, it is definitely [an] achievable climb, but definitely a climb.

Rhonda feels that even today, there is a lot of work needed to bring about awareness that there are skillful women interested in technology. “I feel like in 2020, still we have a lot to work on as far as recognizing women that have strong affiliation or strong affinity towards information technology, and kinda guiding them through,” said Rhonda. She feels that society automatically assumes that the IT person is a man, even though a woman may possibly do a better job. With her experiences, she said, “When I say I'm in IT I still get that look like, “Uhh, you are?” It doesn't sit very well with folks, so I feel like we need more and more women in the profession.” Often in meetings, Rhonda said,

> There's always a tendency to want to listen to a male figure saying what the actual issue is with IT, even though I had more knowledge, and I had more—I could talk intelligently about the issue. … Especially board meetings, some of those meetings—it's always the men that were chosen to kind of give a report, the men.

Rhonda believes that women will definitely need to know multiple areas of information technology to help leverage the perception of women in technology. There are many areas of the technology field, so Rhonda advices for women not to “pigeonhole” themselves in one area, but strive to grow in IT and learn. She said,

> Twenty years later there are some things that only I can do at the college, and I think that is a way for me to just make sure that I perfect my skills, and I stay—I'm valuable, and they know that.

The learning experience for Rhonda has been great, and she continues to learn daily.

However, in addition to polishing technical skills, it is essential to polish soft skills, such as being able to work with people. Rhonda said, “I think managing people is probably, across the board, the hardest thing that you have to go through.” Therefore, being able to communicate effectively with a variety of people and various teams, along with having technical skillsets is key to governing effectively.

Therefore, having people skills, staying abreast of current technology, and keeping a marketable skillset is beneficial for women, but Rhonda also notes that documenting your processes, and being organized is also key to perseverance. She said,

> I want to say documentation is very important, because things change, people move around, and so, it's important that you can go back to the drawing board and know exactly what you did two years ago. At the college, there are some things that we do every day, some things we do every year … so, those things for an organized person, it can be daunting … so it's good to stay organized.

Furthermore, part of staying abreast of current technologies include reading about trends and practices, and engaging in the technology community. Rhonda stated,

> It's always great to read and go out there. There's a lot of community; for example, the enterprise system that we use, Banner, there's a huge community where people ask questions and [use a] ListServ, so everyday, my email—I get 10 Q & A, and that, to me, is like, almost like reading the headlines.

Rhonda feels engagement with the technology community is good practice for starting her leadership day, and finding out what to expect and what challenges other schools are facing. “You'd better be out there attending conferencing and learning what's out there, what's new and upcoming, said Rhonda. Hence, it is beneficial to stay well–informed, as leaders. Rhonda feels

that the whole IT community, especially those she met at conferences, were her role models. She said, “Those people that I meet at conferences were all my role models. I feel like I learn more on those conferences than I actually did on the job, believe it or not.” At the conferences, individuals are exposed to many IT professionals of all areas of the industry, and a great aspect of being a leader in technology is that, “you’re constantly learning,” and information technology is constantly changing.

Rhonda believes that through all the challenges and learning curves she has experienced, the opportunity to increase knowledge and satisfy her inquisitive mind helped her to persevere to technology leadership. She said,

> What helped me kind of to stay there and not give up, because I was always curious about learning something new, so it's like learning a new language. So, that kept my interest going, and so, I had no interest before, I mean I didn't even know what an IT professional did before that.

Rhonda said setting personal and professional goals for herself and being excited about constant learning opportunities were motivational factors for her, but mostly she feels that she entered the college at a critical time when it had multiple projects being presented, such as implementing a new ERP system. Consequently, with multiple projects needing to be implemented, Rhonda was able to get involved and lead hands–on projects, while learning as much as she could to lead in technology.

Tameco

Theme One: Career Calling Experiences

The start of Tameco’s education was obtaining a degree in mathematics, but after graduating and seeking potential career interests, nothing in mathematics appealed to her.

Tameco claims she was short–sighted when she enrolled in the mathematics program and said, as an actuary … "being a teacher was not something I really wanted to do." She had an "inquisitive mind;" naturally, it seemed inline for her to explore technology to discover more about computers, at a time when computers were fairly new 25 years ago. She began formal training in technology, but started working in supply chain and logistics conducting forecasting and capacity planning. She said,

> I went to school for it, but … I did not work in technology until 2001. I would say it was kind of "go with the flow" approach. It wasn't necessarily a fully thought out career in technology. It just kind of happened.

Although technology was always an area of interest for Tameco, she had not thought about a career in technology. She said,

> I was thinking earlier on in my school years in the computer science stage, and computational mathematics, that's where I was dreaming to be. As we evolve, I think people have in school—we have these idealized ways that we see careers and we see the path forward, and once we actually are in a particular role, or in a particular job, we realize that the tactical day–to–day, it might be completely different than that romanticized or idealized career.

Tameco's first administrative position in higher education was at a university in the midwest in 2007 or 2008, where she conducted technology strategic planning and roadmap development. She indirectly worked with the local government on a project "to bridge the digital divide" on a broadband project. This assignment introduced Tameco to community college students and their needs. After Tameco's exposure to community college students, she said,

> I don't want to sound corny, but I wanted to do something about it. When the opportunity came about for me to work for the city and then the community college, I invested myself in that space. So, I worked on it in a volunteer basis, and it eventually rolled into leading the organization from a technology perspective, or for the community college. I think a lot of people that come to the community college come with the same passion to change and make sure that our students—frankly, every student should have that equal opportunity to education.

Tameco says community college students deserve the same tools, services, and technology capabilities as all other students.

Theme Two: Leadership Development

Tameco attributes much of her career development to her mentors. She says she owes her grandfather for her early life experiences, because he taught and cared for her. “The fact that I can speak English, the fact that I can read, the fact that I have all of my early education is thanks to him,” said Tameco. However, in the workplace, she had a former colleague and mentor early in her career, who became a close friend and a coach to Tameco, but regrettably, no mentors were women. The lack of women mentors were “possibly because there aren't that many of us. There aren't that many women in technology, and there aren't that many women in leadership in technology. There are probably more in higher education than there are in the private industry,” said Tameco. Unfortunately, Tameco is reminded of the lack of women in technology when she attends techology conferences and events and there are still very few women in attendance.

In addition, another supporter during Tameco’s growth was the college’s leader. Having a kind and honest leader was a key factor in her decision to move across the country to work at Gilbert Community College District, because she admired the leader’s similarity in values:

> Working for someone that, not only you have the deepest respect for, but actually agree with the values and the ethics, and the direction—as the organization is being moved forward—it is absolutely a gift. You don't have to feel like you are always pushing against the flow of the river. I do think that the team that he has pulled together, including myself, is becoming very close. I almost feel like he handpicked people that are actually … committed to the same values, and I think that's important.

Today, Tameco considers herself as a person who keeps the team united, and says she sees herself as the "glue" for the team, more so than the head of the team. She identifies with being a forward thinker in technology, a problem solver, and a collaborator who brings people together, and she brings these leadership skills to her team. She said,

> I do think we make a stronger team, because I don't see myself as a one–person leader, but as a bringer of a forum where ideas can come to fruition. I try to take every leadership opportunity with humility, because there are a lot of people that come to the table that may be smarter than I am. … They might have higher levels of expertise in a particular area. As a leader, the only way you can succeed is to acknowledge that, and embrace them, and make sure that you encourage those people to keep bringing that to the table.

Some days are more productive than others, but Tameco is thankful for having built allies to confer with during troubling days, whether among the team or externally. She said,

> If you have one day where you feel like you can move mountains, and the next day you get knocked over by a little boulder and you're with your nose in the dust, and sometimes you need a hand to pull you up. If you don't have that in your team, in your peers, in your extended network of collaborators, and a mentor, and a personal support network, you're not [going to] make it through, or you're [going to] make it through very painfully. So, it's

> easier with a little bit of a support group around you. Don't be afraid, because you don't have all the answers; nobody does.

During Tameco's growth, she realized that being demure wasn't effective with getting her viewpoints heard. She had ideas in meetings for solutions to problems, but would sit quietly, allowing others to voice ideas that weren't always completely accurate. Tameco said,

> Just as I was about to say something, somebody else would jump in and then say it. I'm like … that's not exactly true. That's partially right, but not fully true. I know how to fix that and I never jumped [to speak–up]. I think that hurt's us in a workplace, and technology, and everywhere else for that matter in leadership, in general.

Over the years, Tameco learned that there is no harm in speaking–up to contribute in meetings.

Also, Tameco learned that she is not fond of invitations from organizations soliciting participation from individuals to satisfy a need to have a woman on the panel for an event. She said,

> It is that role of the woman token on a panel that I absolutely resent, because I earned my spot in that particular field or in that area of subject matter expertise. If you're [going to] invite me you should invite me because of that, not because of my gender. I resent that, so I generally just decline those invitations.

Tameco wonders if she is committing a disservice to people who may want a woman's perspective on the panel, but simultaneously, she said, she will not play the role of the token woman.

Whether on STEM panels or during other occasions, Tameco intentionally tries to encourage women and young girls to be involved in technology in her volunteer work, and through recruiting and marketing efforts. However, the discrepancy in technology is apparent:

> Unfortunately, there is still a discrepancy and when you're looking at graduating rates of young girls in technology versus men in technology, I don't think the discrepancy is quite there. Then when you start with employment, and definitely by the time you go into the upper echelon of executive leadership, they [women] start disappearing.

To promote equality and limit internal bias during the hiring process, the college ensures to have a hiring panel of various people, who are all different, and this may be especially advantageous for women seeking a technology role. Tameco said,

> No matter how much we say to ourselves, "we are opened minded and [going to] make an objective decision," the internal biases are there. Inadvertently, we lean toward the people that are like us, that we resonate with, and that hurts women in technology.

Having a panel of different people is one way that Tameco says may break biased hiring cycles in technology.

Theme Three: Obstinate Practices

Tameco shared experiences that she believes helped her to persist to technology leadership through social barriers and deterrents.

Tameco said it is hard to realize that "the person that you're working for [is] not fully appreciating the work that you're doing and that's hard sometimes to take." Tameco said, this type of situation "could be a very very strong deterrent for a woman to continue to [be] put … in." She believes that role models are essential with helping one get through such difficult circumstances. She said,

> I think it's like in any other area where you have a minority. If you don't have a role—if you don't have people that you can look at and say, "These are people just like me. I can also do that job," because it's been a shown proven path, it's discouraging.

Tameco finds it disheartening when there are no role models for individuals or women to look toward, especially for women in technology.

Therefore, Tameco intentionally seeks to recruit women and girls in technology in hopes of increasing women in technology leadership roles. She said, “I try to encourage as many women and young girls in my volunteer, in STEM panels, and every opportunity I get to encourage more women, more girls.” Putting more into her recruiting efforts, she said,

> We tried to ensure that we lookout and market opportunities for other women, but unfortunately, there is still a discrepancy. When you're looking at graduating rates of … girls in technology versus men in technology, I don't think the discrepancy is quite there. Then, when you start with employment, and definitely by the time you go into the upper echelon of executive leadership, they start disappearing.

Although Tameco wants more women to be involved in technology, she is strongly against being a “token” for organizations seeking a woman’s input for their panels and; instead, wants women to persevere and take a stand to be acknowledged for the subject matter expert for that field.

Tameco believes that, as long as we continue to see “all women in technology events,” it means that “we're not there yet, because there is still a need for us to have a women in technology event.” She argues humorously that:

> When we are at the arrival point we're just [going to] have technology events where, probably 51% of them will be women, because we are 51% of the population. So, that would be to me the arrival point. How do we get there is make sure that our children have those opportunities with no stereotypes.

Opportunities for children to participate in technology classes should not be gender driven. Tameco said, “So, those robotics classes that we take and the architecture lego sessions that we do are engaging of girls, just as much as they are engaging of boys, and we don't exclude one segment of kids versus the other.” Tameco hopes that this concern improves, and that technology events and trainings will invite technology experts regardless of gender, because it will signify a more leveled field for technology.

Apprehensively, Tameco said,

> Persistence and toughening up, and not letting things get to you will eliminate some of the—there is a culture, and if you ... leave aside the culture, or break the culture, or change the culture, or just push through it, you'll make it.

Tameco believes that women should be treated with dignity in the workplace, and if that is not the case, she said, “If that's not happening, I would probably walk away from it too, and don't really care what you're [going to] pay me.” Women should not submit to demeaning roles, regardless of pay or status.

Tameco described an issue with hiring decisions in information technology. She said the people that make the decisions have a tendency to hire individuals similar to themselves, and Tameco argues that such practices need to be broken. She said,

> I think that one of the things that we do here in the Gilbert Community College District is ensure that we have [a] hiring panel that is not made up of the same type of people. It doesn't matter what that one type of person is, it just has to be different, because that's the only way you're [going to] break out of that cycle. No matter how much we say to ourselves we are opened minded and [going to] make an objective decision … the

> internal biases are there, and inadvertently, we lean toward the people that are like us … [who] we resonate with, and that hurts women in technology.

Tameco feels that women sometimes have to work twice or three times as hard to show that they are worth having the position. Unfortunately, this is a choice that women must make, said Tameco, because such choices are often tied to salaries. She said,

> Do I want this extra work and extra position, so I can prove that I can do that work, and I will do it … in addition to what I'm currently doing for the same salary, because I want to prove that I can do this. I want it to add it to my resume', and I want to be able to have that exposure in that set of work.

Men, on the other hand, "are more likely to advocate for that additional compensation for any additional scope of work that they might take on," said Tameco. However, she said, "Women are more likely to say, "Ok, I'll do it," and just leave it at that, because it's for the good of the group."

Tameco focused on the work and every single task assigned to her, regardless of how trivial or vital, she provided her best effort to complete it.

Accordingly, undesirable work tasks should not be a discouragement for women, but instead an opportunity to excel. Tameco said,

> Sometimes, when people want you out of the way they give you a work that nobody else wants to do. So, you do the best you can, and you do the highest quality of work, and you do more. Volunteer for everything, and do some of the thinkless work, and accept some of the jobs without additional pay, and you make it.

Eventually, the exhibition of hard work and team spirit will speak for itself, highlighting leadership qualities displayed for the good of the team and the institution.

Sometimes, the career decisions women make are life choices. Tameco made a choice to put her career first, deciding not to have children, but recently married a couple of years ago. All she had was her work. She said,

> A lot of the family responsibilities are pushed on women, where as men don't have the same expectations. Women are expected to deal with both the family care, as well as their job. Where as men, most part [of] our society is built on men go to work, come home, read their newspaper, and relax until the next day when they go back to work. I think in some pockets that's being changed, but as an overall society we're not there.

Tameco is not sure that many women would make that choice or such a sacrifice, as she did, to focus on their careers, especially in a male dominated field.

Accordingly, in this male dominated field, Tameco has dealt with gender discrimination over the course of working in technology. As many women in leadership positions experience similar discrimination, she describes her experiences. “I [have] been to conferences [and] events where I was asked where is my deputy, who happens to be a man,” said Tameco. In addition, it was assumed that she was the executive assistant and was often told to sit where the secretaries or executive assistants sat. Tameco said she experienced this type of behavior on several occasions.

On another occasion, Tameco was at an event concerning opportunities for youth in technology. She says that she is a great proponent for youth, and she advocates wholeheartedly for technology opportunities for girls, particularly. She said,

> I went to the [board of trade] for an event … after the event we took a group photo. … They published the photo listing everybody else's name, except for me, which it was kind

of like, ok, you have the one woman in this group of CIOs and that's the one person you forget to include the name for.

Tameco admits that sometimes such incidents “does hurt.” Yet, she avoids complaining about such occurances, because she doesn’t want to make the event about her, but wants the focus to remain on the youth and the opportunities for them. However, with such repetitive discrimination, she said,

> Particularly when it happens repetetively, it's hard to overlook. … “If it were a man, would you have done the same?” It's hard not to have that question happen. Maybe I am over sensitive to that, maybe I am over thinking it, [but] I did let it go. I didn't say anything about it, but I did wonder when we met the next time whether that was [going to] happen or not. Of course, I'm [going to] be more cognizant to any interaction I have with that group in the future.

Therefore, such gender discrimination may pose as discouragements for women involvement, but Tameco doesn’t let that stop her from continuing to promote women in technology, even if it means taking a diffident approach to persevere. “You have to be used to getting a little bit of rejection … it has not been easy,” said Tameco. She has been told “no” many times, but she said women must keep trying, “you try and try again.”

Furthermore, Tameco feels that the perception of women not being capable to handle technology jobs that were habitually filled by men is misleading. She said,

> I think traditionally, particularly in the hardware and coding, certain aspects of engineering ... men have been seen as more adept, and more practical, and more logical, and it's not true. None of that is [true]. I know perfectly well capable and skilled women

that can do those jobs, but the perception can sometimes be very misleading, and unfortunately, that carries through.

Tameco feels that many women wait to be asked to come to the leadership table and to be asked questions, before engaging and providing feedback, although they may be the most knowledgeable persons on a particular topic. On the other hand, she feels that men display differing behavior:

> Men tend to say the first thing that comes to their minds, and they'll speak up and they'll say it. ... If you have something to contribute, jump in; say it. If it's a mistake, don't worry about it. You'll grow. Don't let a failure define who you are; get over it. Dust yourself off [and] get up there.

Sitting quietly is a practice that Tameco advises women to stop exhibiting, especially those who seek technology leadership roles. She said,

> Be open to say what you do know and what you do not know, and trust yourself. I think that if somebody would have told me that when I was a little bit younger ... [it] would have saved me a lot of pain, because, I remember being in meetings, and biting my tongue and being very shy.

Do not be afraid to speak up and contribute, especially when you believe you have the knowledge on the topic of discussion. Conversely, Tameco feels that her determination was driven more from external impacts rather than self–driven. She said, “I came into this country as a 17–year old immigrant without any family, without any friends, and without any money.” She wishes that she had access then, as a young girl, to the technology tools and resources that are available today, because she believes they would have been very helpful to her during her journey. Nonetheless, Tameco is grateful for having mentors during her journey who provided

guidance and opportunities for her. Although she has leaned on individuals as mentors in her career, she said that her grandfather, a single family member who raised her, was a key mentor.

Tameco recalls an occasion, while working at a midwest university, where she was asked to present to an audience of approximately 300 top leaders from top tier universities. She prepared for nearly a month on the presentation, but embarrassingly became immobilized on stage. She said,

> I looked at all of these people and I'm thinking, “These are like the most brilliant minds from all of these very prestigious universities. What can I possibly say to these people that they don't know already?” I'm already like, completely diminished, thinking I'm nobody. Here are all these brilliant people at the top of their field, and my input is not that significant.

Tameco said she wished her perspective at that point would have been that everyone in the room was just like her. She said, “It wasn't a matter of me being smarter or less smart, and it's not a matter of intelligence. Just, I had prepared that topic, so I was the subject matter expert in that, whatever it was.” Tameco said she wished someone would have told her that back then, but said she managed to complete the presentation, although she was nervous, because not only did she temporarily fail to recall her information, she spoke into a lightstand, mistaking it for the microphone. She said,

> I did manage to get through my presentation, but it was embarrassing, because after the presentation everybody that encountered me, was like, “You gotta speak into the light again.” So, dust yourself off and move on.

Therefore, Tameco’s courage led her to continue through the difficult or discouraging moments to grow into the technology leader she has become.

Veronica

Theme One: Career Calling Experiences

Veronica's father worked in technology with computers and he introduced her to them as a child. In college, she majored in technology after experimenting with computers at a young age. Her father used to bring computers home for her:

> He brought home, what was back in the day, a 286-PC, and I just started playing with it; always found it kind of interesting. If something in my house was supposedly broken, and my parents didn't care anymore, I would take it apart just to see what was inside of it, and how it worked; and maybe try to fix it, not that it was any good—the fixing part, but that's always sort of been my area of interest, I guess you could say, even as a child. So, when it was time to go to college my major was computer science, and I stuck through it all the way; it never changed, it just was something that fascinated me.

Admittingly, Veronica said for a brief moment in high school she wanted to be a nurse, because she wanted to help people. After volunteering as a candy striper, she realized nursing was not an area she wanted to pursue, and that is when she stayed with technology:

> I've always liked to use technology to help people, so I found out rather early in my career that I was always good at being able to explain technology in a way that people could understand, and that helped propel me, sort of, through the ranks, so–to–speak, but as I take that skill into leadership … my mantra with my department has always been managing expectations.

Prior to higher education, Veronica worked in the corporate sector for several years. Although she liked her professions, she never felt that she fit. She said, "Once I got to higher ed, I knew I fit. I knew I was where I was supposed to be, and when you have that, it's so easy to

flourish…it really is." Veronica was able to find her fit in the community college, where she found it fulfilling to help people through the use of technology.

Theme Two: Leadership Development

Due to non–technical leaders,Veronica had to be resourceful and inquisitive to figure–out problems without assistance. She said,

> It's hard, because I haven't really had a lot of what I would call mentor type people. I've always had a supervisor who was pretty much, "Here's what I need you to do, go figure it out." They never gave me resources, so–to–speak. I had to find my own resources, so I had to be very creative. I had to do a lot of inquiry, so I think that helped form me into being able to strive … it's like any job in technology, you have to learn to solve the problem yourself; being a good troubleshooter.

Veronica had to conduct research for information to solve problems and troubleshoot for a multitude of individuals with various personalities, because a role in technology is not confined to working only with the technical equipment. It is necessary to be able to communicate with others and have the aptitude to relate information in a manner that others will understand. Veronica was able to strive in such an environment, because of her love for technology and the work environment:

> If you're in … a field that you love, it just happens … because you put in all the time and all the energy, because you love what you do and who you do it for, and the results that come from it.

Without the resources handed to Veronica, her efforts and diligent work prevailed, because of her love for technology and the results it delivered for people.

Therefore, Veronica learned early–on that customer service was a key aspect to providing good technical services. She adobpted a philosophy of managing expectations to be proactive with yielding projected results. For example, she said, if you want people to throw garbage in the trash, you have to provide trash cans in strategic locations. Often, students will not walk to the other end of the hallway to throw away trash, so it is important to place the cans where they are expected to be used. Veronica uses this philosophy with the services her staff provides. She said,

> IT departments get a bad rep and I want them to be very visible; they're not just those people that work behind that glass wall. I want them to be interactive and have people know them, because when people know you they trust you more. They're kinder to you... So, when you say, "I can't come fix your computer today, but I can come tomorrow," people will take that a lot better if they know who you are and you give them a deadline. Don't just say, "yeah, I'm [going to] fix it," and don't show up, because we had that problem for a long time, where people would say, "I'll just say yes to everything," but if I don't carry through … people don't want to hear that; they don't want to just hear "yes." You can say no, but [with reason].

Veronica doesn't want a disliked IT department. When the end–users, staff, and students appreciate the technology services they receive, Veronica said it motivates her team to provide high quality services for the institution.

Perhaps one of the significant lessons during leadership growth, as a technology leader, was learning that it is often necessary to leave the hands–on technical responsibilities in exchange for more administrative responsibilites. Veronica said,

> What I have found is that, every step of the way you gain something and you lose something. Every time I've ever moved up I had to consider I'm not [going to] be doing

> this piece anymore. Am I OK with that, I mean, I will be doing something different, but to sit there and say that I configure file servers or write code, I haven't done that in decades. I had to come to a realization that, “was I ok with giving that up,” because now, I'm more of a manager.

Veronica ensures that her team keeps her informed of the technical requirements, and she still understands it, but she no longer puts her hands on the technical work. That is an aspect of technology leadership that individuals will need to weigh mentally.

Theme Three: Obstinate Practices

Veronica shared experiences that she believes helped her to persist to technology leadership through social barriers and deterrents.

With technology being a male dominated field, Veronica feels that, “sometimes you have to change people's perception, because they don't really think that a woman competes with a man in this area as well.” She believes that women will need to believe in themselves, because sometimes to get noticed, they may need to take on tasks that are not included in their job descriptions. She said, “I will say being female, especially in a very male dominated field ... I always liked that saying that Sheryl Sandberg [Facebook COO and founder of LeanIn] has, which is, you have to lean in.” Veronica said that when she attends technology meetings, generally, her peers are still probably 25% women and 75% men. However, she said,

> In the non–leadership roles it may be approaching 50/50, but I'm not sure we're there quite yet. It's still a very male dominated field, but I think if you know your stuff people would—men would seem to take you seriously is what I've found.

But unfortunately, she feels that women will need to work harder than men to obtain the same status in technology. Veronica said technology leadership for women is a long and hard journey, but definitely worth it. She said,

> I'll say that it's hard, because you gotta put in a lot of time and energy for people to recognize your worth. You're not necessarily [going to] get paid for every hour that you're working, you're just [going to] do it because you're supposed to. But, I think it's easier than it used to be, because people are kind of paving the way, but it takes time; it definitely takes time and a lot of work.

Veronica recalls a time when an interim president stopped by the information technology department to be updated on the projects being implemented and he made a comment to her that she felt diminished her as a technology professional. She said,

> We were showing him [interim president] some of the things we do and some of the ways we support faculty, and he, my boss at the time, made a comment about my looks. It had nothing to do with my skill, he just talked about how I looked, and I'm like, what does that gotta to do with anything.

Veronica said that story sticks with her, because it made her feel like she was not valued for her performances, which she holds in high esteem.

Prior to working for the community college, Veronica recalls working in the IT industry during her child–rearing years. She said,

> I had a supervisor who did not really—he didn't appreciate that I was having children. I was [going to] be gone, and it was like, “Oh my gosh. What are you thinking.” I think I'm [going to] have a baby, that's what.

Veronica said her supervisor was very hostile about her having children, but she continued creating her family. She said,

> When I told him I was pregnant the second time he was not—there was no congratulations or anything like that. He was all like, "Uhg gosh, you gotta be kidden me." But, he never treated me the same after that. ... He always had something against me after that.

One interesting method that Veronica practices to deal with hostile or discouraging circumstances in the workplace is to not be easily intimidated. She said, “People always try to intimidate you. ... You might hold it inside, but ... you never let them see you sweat.” You go home and discuss your crappy day with your husband, but she said you go back the next day and you keep doing it.

Overall, Veronica realized that during each phase of her journey, as she grew in leadership, so did her perspective of her responsibilities. She said,

> What I have found is that every step of the way you gain something and you lose something. Every time I've ever moved up, I had to consider [that] I'm not [going to] be doing this piece anymore. Am I ok with that, I mean, I will be doing something different. To sit there and say that I configure file servers or write code, I haven't done that in decades. I had to come to a realization that I was ok with giving that up.

Even though Veronica knows the technical side of the work, since being in management now, she trusts her team to keep her informed, because she no longer indulges in the hands–on technical tasks, which is something that she had to heavily weigh and come to acknowledge.