Women as Chief Information Officers in Higher Education: a Mixed Methods Study of Women Executive Role Attainment in Information Technology Organizations

Author: Elizabeth Ann Clark

Persistent link: http://hdl.handle.net/2345/3216

This work is posted on eScholarship@BC, Boston College University Libraries.

Boston College Electronic Thesis or Dissertation, 2013

Copyright is held by the author, with all rights reserved, unless otherwise noted.
WOMEN AS CHIEF INFORMATION OFFICERS IN HIGHER EDUCATION: A MIXED METHODS STUDY OF WOMEN EXECUTIVE ROLE ATTAINMENT IN INFORMATION TECHNOLOGY ORGANIZATIONS

Dissertation

By

ELIZABETH ANN CLARK

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

August 2013
Abstract

The dearth of women in executive positions within the field of information technology (IT) has been studied extensively in the corporate sector. That is not the case within higher education, despite the data collected showing that women attain the top executive role – that of the Chief Information Officer (CIO) – at much better rates than their corporate counterparts. Given this discrepancy, as well as the importance of technology in today’s society, research was needed into the structural factors contributing to women’s executive attainment in higher education IT organizations.

Using a sequential explanatory mixed methods design, this dissertation study compared women and men higher education CIOs along a variety of individual and organizational characteristics, and examined elements related to women’s ability to attain the CIO role. The study combined quantitative descriptive data on higher education CIOs, gathered via a web-based questionnaire and analyzed for significant differences between women and men in the population, with women CIOs’ qualitative explanations of the quantitative findings via semi-structured interviews. 188 women and men (38 women and 150 men) participated in the questionnaire, and nine women who filled it out participated in the semi-structured interviews. All participants were higher education CIOs working at EDUCAUSE member institutions.

Integrated findings from this study suggest that though few demographic differences exist between women and men in the population, higher education IT culture is based upon masculine norms, and as such, perpetuates biases against women leaders in the profession. Despite cultural norms that potentially dissuade women from working in
Women as Chief Information Officers in Higher Education

the field, a number of environmental characteristics emerged associated with women’s ability to secure the CIO position. These included stimulating work that is connected to the mission of higher education; flexible work options available at different points in IT employees’ careers; the presence of women executives in academic institutions; and a nationally based professional development community focused on mentoring future generations of CIOs.
Women as Chief Information Officers in Higher Education

Acknowledgements

My gratitude for the many friends, family members and colleagues who helped me complete this dissertation runs quite deep. First and foremost, I want to thank Dr. Ana Martínez Alemán, the best dissertation chair I could have imagined. From the first time I took one of her classes, I knew that I not only wanted – but needed – her remarkable perspicacity overseeing my doctoral work. Her fresh insights enhanced what I produced each step of the way. Aside from what I gained from access to her keen intellect, I also benefitted much from Ana’s warmth, patience and humor. There were times when the stresses of work and family seriously made the consideration of completing this dissertation seem preposterous. In those moments, Ana always found just the right thing to say to keep me moving forward – with a smile on my face. I will miss our work together, as it has been one of the most enriching and rewarding periods of my career.

Along with Ana, I extend a hearty thanks to my other committee members: Drs. Judith Clair and Heather Rowan-Kenyon. Judy, I so appreciate how attentively you approached each piece of my writing. You were always able to zero in on places that lacked clarity and give me the feedback and perspective I needed to bring them into focus. And Heather, your insights and assurances around my quantitative methods always calmed my doubts as I grew my statistical chops.

It goes without saying that I owe much to the EDUCAUSE Center for Applied Research. Their assistance in piloting and delivering the study’s questionnaire to the higher education CIO population was invaluable. I appreciate Susan Grajek’s support of the research; the higher education IT community is far better for her commitment to it.
Women as Chief Information Officers in Higher Education

Pam Arroway was an incredible resource to me throughout the entire data collection process. I am grateful for the time and effort she took in editing the questionnaire, entering it into EDUCAUSE’s survey tool, and delivering the results to me with both speed and precision. I also want to extend my thanks to the numerous colleagues who helped pilot the quantitative and qualitative methods for this study, and to Josh Tobias, who cleaned up my data like nobody’s business! To the many CIOs who filled out the survey, and the women CIOs who volunteered their time, energy and thoughts as interviewees, I humbly thank you and hope that what I have produced is truly a tribute to your efforts and dedication to higher education IT.

I humbly thank Dr. Wayne Brown, as without his previous work on the higher education CIO population, this dissertation would not exist. It was his dutiful research on the profession that caught my eye and started me thinking (apparently, that is a dangerous thing!). Wayne remained a steadfast force throughout my process, always willing to help me in any way that he could. I am also grateful to Dr. Eileen Trauth and the research she has conducted over the years on women in the IT profession. I appreciate the interest she took in my work and the generous spirit with which she shared her own knowledge and experience. She is an academic rock star and inspiration!

Taking on doctoral work while working full-time is not for the faint of heart: without a supportive supervisor and work environment, one may as well not even bother trying it. Fortune smiled upon me in that realm, and I am forever indebted to my former boss and mentor, Rita Owens. Rita’s support of and for me throughout this process was nothing less than amazing. To call her generous is an incredible understatement – at
every turn, Rita gave me what she could to help me along. I have been lucky to work for her and know that in my career and lifetime, I will find no finer role model and mentor. To the Instructional Design and eTeaching Services team, I extend my incredible thanks for your patience and kindness. You are a phenomenal group of people whose earnestness and good humor (I will never forget “The Twelve Days of AtTask” or “EdTech Queen”) have fortified me on this journey. I also want to thank Dr. Keith Chan of Boston College’s Research Services for the many hours he spent by my side, answering the wide range of quantitative analysis questions I threw his way.

While I am at it, three cheers for the Alewives! Drs. Kimberly Hall, Sheila Mehta-Green, Tracey Leger-Hornby, Gina Siesing, and Katie Vale: you are the best cheerleading squad ever. Ever. Thank you for the many ways in which you kept me focused and motivated. Your friendship and professional support have galvanized my efforts more than you know; I look forward to many more years ahead, laughing and grousing together.

Along this road, I have also been quite blessed with a family whose love was never in short supply. My dear and talented sisters – Jen Allen and Jill Clark-Mello – graciously watched my son when I had deadlines to meet, and provided encouragement to spare, while the abiding affection of my mother and father, Janet and Alfred Damiani, nurtured me in countless ways. I also want to thank my uncle, Paul Klahn, who despite geographical distance, enthusiastically encouraged my ongoing progress.

I most want to thank my dear partner, Martin Long, for his love, sacrifice, warmth and patience. The many amazingly delicious meals he has cooked over the past several
Women as Chief Information Officers in Higher Education

years have kept me alive, frankly, as have the back rubs and small kindnesses along the way. I promise to sleep past 5 a.m. with far more frequency from this point forward. I love you so much and am glad we made it through this together. And finally, I thank my beloved son, Jim, who has grown into quite an extraordinary young man during my time in the program, and who never once complained about my many hours, weeks, and months of work. You mean everything in the world to me, sweet child, and are ma raison d’être.
Women as Chief Information Officers in Higher Education

TABLE OF CONTENTS

ABSTRACT .......................................................................................................................... ii

ACKNOWLEDGEMENTS ....................................................................................................... iv

TABLE OF CONTENTS ..................................................................................................... viii

LIST OF TABLES .............................................................................................................. xii

1. INTRODUCTION ........................................................................................................... 1
   Introduction .................................................................................................................... 1
   Theoretical Perspective ............................................................................................... 7
   Purpose of the Study .................................................................................................... 9
   Research Questions .................................................................................................. 10
   Definition of Terms ................................................................................................. 11
   Significance of the Study ......................................................................................... 14

2. REVIEW OF THE LITERATURE .............................................................................. 17
   History ........................................................................................................................... 17
      History of Computing ................................................................................................ 17
      CIO Role .................................................................................................................. 27
      Who is the CIO? ....................................................................................................... 29
      Today’s CIO ............................................................................................................ 31
      CIO Skills .............................................................................................................. 34
      Differences Between Industry and Higher Education ............................................. 36
   Culture .......................................................................................................................... 38
      Organizational Culture ............................................................................................ 38
      Sex, Gender and Leadership .................................................................................... 40
      Women in Corporate Culture .................................................................................. 46
      Women in Corporate IT Culture ............................................................................. 53
      Higher Education Culture ....................................................................................... 59
      Women in Higher Education Administrative Culture ............................................. 62
      Higher Education IT Culture .................................................................................. 65
      Women in Higher Education IT Culture ................................................................. 68
   Glass Ceiling/Labyrinth ............................................................................................. 69
      Definition and History: From Glass Ceiling to Labyrinth ........................................ 69
      IT and the Glass Ceiling: Setting the Context ....................................................... 71
      The Labyrinth ......................................................................................................... 73
      What Helps? ............................................................................................................ 93
   Summary ..................................................................................................................... 103

viii
3. METHODOLOGY AND PROCEDURE

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>105</td>
</tr>
<tr>
<td>Research Design</td>
<td>106</td>
</tr>
<tr>
<td>Sequential Explanatory Design</td>
<td>111</td>
</tr>
<tr>
<td>Target Population and Sample</td>
<td>112</td>
</tr>
<tr>
<td>Phase I: Quantitative</td>
<td>116</td>
</tr>
<tr>
<td>Research Questions</td>
<td>116</td>
</tr>
<tr>
<td>Variables in Quantitative Analysis</td>
<td>117</td>
</tr>
<tr>
<td>Data Collection</td>
<td>119</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>123</td>
</tr>
<tr>
<td>Reliability and Validity</td>
<td>127</td>
</tr>
<tr>
<td>Phase II: Qualitative</td>
<td>129</td>
</tr>
<tr>
<td>Data Collection</td>
<td>129</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>131</td>
</tr>
<tr>
<td>Establishing Qualitative Reliability, Credibility, and Dependability</td>
<td>132</td>
</tr>
<tr>
<td>The Sequential Explanatory Mixed Methods Design: Advantages/Limitations</td>
<td>134</td>
</tr>
<tr>
<td>Ethical Considerations</td>
<td>135</td>
</tr>
<tr>
<td>The Researcher’s Role</td>
<td>136</td>
</tr>
</tbody>
</table>

4. QUANTITATIVE FINDINGS

<table>
<thead>
<tr>
<th>Section One: Demographics and Pathway to CIO</th>
<th>139</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univariate Data for Section One: Demographics</td>
<td>139</td>
</tr>
<tr>
<td>Bivariate Tests for Research Question 1, Sub-question 1</td>
<td>141</td>
</tr>
<tr>
<td>Univariate Data for Section One: Pathway to CIO Role</td>
<td>144</td>
</tr>
<tr>
<td>Bivariate Tests for Research Question 1, Sub-question 2</td>
<td>148</td>
</tr>
<tr>
<td>Section Two: Workplace Norms and Climate</td>
<td>152</td>
</tr>
<tr>
<td>Univariate Data for Section 2A: Workplace Norms Descriptives</td>
<td>153</td>
</tr>
<tr>
<td>Bivariate and Multivariate Analysis for Research Question 2, Sub-question 1</td>
<td>154</td>
</tr>
<tr>
<td>Bivariate Test for Research Question 2, Sub-question 1</td>
<td>154</td>
</tr>
<tr>
<td>Multiple Regression Results for Research Question 2, Sub-question 1</td>
<td>155</td>
</tr>
<tr>
<td>Univariate Data for Section 2B: Workplace Climate Descriptives</td>
<td>159</td>
</tr>
<tr>
<td>Bivariate Tests for Research Question 2, Sub-question 2</td>
<td>160</td>
</tr>
<tr>
<td>Reliability</td>
<td>161</td>
</tr>
<tr>
<td>Factor Analysis</td>
<td>161</td>
</tr>
<tr>
<td>Section Three: Home Responsibilities</td>
<td>162</td>
</tr>
<tr>
<td>Univariate Data for Section Three: Home Responsibilities</td>
<td>162</td>
</tr>
<tr>
<td>Bivariate and Multivariate Analysis for Research Question 2, Sub-question 3</td>
<td>163</td>
</tr>
<tr>
<td>Bivariate Test for Research Question 2, Sub-question 3</td>
<td>164</td>
</tr>
<tr>
<td>Multiple Regression Results for Research Question 2, Sub-question 3</td>
<td>164</td>
</tr>
<tr>
<td>Section Four: Perceived Bias and Discrimination</td>
<td>169</td>
</tr>
<tr>
<td>Univariate Data for Section Four: Perceived Bias/Discrimination Descriptives</td>
<td>169</td>
</tr>
<tr>
<td>Bivariate Test for Research Question 2, Sub-question 4</td>
<td>171</td>
</tr>
<tr>
<td>Reliability</td>
<td>173</td>
</tr>
<tr>
<td>Factor Analysis</td>
<td>174</td>
</tr>
</tbody>
</table>
Women as Chief Information Officers in Higher Education

Section Five: Role Models and Mentors ................................................................. 175
  Univariate Data for Section Five: Role Model Descriptives ............................. 176
  Bivariate and Multivariate Analysis for Research Question 2, Sub-question 5 .... 176
  Reliability ........................................................................................................ 178
  Factor Analysis ................................................................................................. 178
  Univariate Data for Section Five: Mentor Descriptives ................................... 179
  Bivariate and Multivariate Analysis for Research Question 2, Sub-question 6 ... 180

Chapter Summary ............................................................................................... 185
  Research Question One .................................................................................... 185
  Research Question Two .................................................................................... 186
  Summary .......................................................................................................... 189

5. QUALITATIVE FINDINGS.................................................................................... 191
  Introduction ...................................................................................................... 191
  Pathways to the CIO Role ................................................................................. 194
    Demographic Trends ....................................................................................... 194
    Internal and External Opportunities as Viable Pathways to the Role .............. 195
  Longer Hours in the Office and Fewer Flexible Work Options ....................... 197
    Face Time Required ...................................................................................... 198
    Compartmentalizing Work and Home ............................................................. 203
  Household and Caretaking Duties: Women CIOs Spend More Time ............... 206
    Gender Norms and Interpersonal Relationships ............................................ 207
    Gender Norms and Changing Expectations .................................................. 210
  Women Higher Education CIOs and Bias in Hiring and Promotion Practices .... 212
    Processes are Fair .......................................................................................... 213
    Processes are Biased ...................................................................................... 215
    Bias and a Lack of Data Clarity .................................................................... 218
  Women Higher Education CIOs and Perceptions of Lower Pay ....................... 218
    Masculine Norms in Higher Education IT and Women’s Salaries .................. 219
    Women and Negotiation ............................................................................... 221
  The Importance of Mentoring for Higher Education CIOs ............................. 224
    Chief Information Officer: A Unique Role ..................................................... 225
    The CIO Job and Politics .............................................................................. 227
  Making Progress: Women CIOs in Higher Education IT .................................. 231
    Higher Education IT: A Stimulating Environment ........................................ 232
    Reasonable Hours ......................................................................................... 234
    Flexibility Throughout the Arc of a Career ................................................... 235
    More Women Executives Present in Higher Education .................................. 238
    Higher Education IT’s Culture of Professional Development and Mentoring ... 239
    The Importance of Mission and Vocation ....................................................... 240
  Summary .......................................................................................................... 242
Women as Chief Information Officers in Higher Education

6. DISCUSSION .............................................................................................................. 244
   Introduction .............................................................................................................. 244
   Summary, Integration, and Discussion of Major Findings ..................................... 245
   Population Demographics ..................................................................................... 245
      Today’s CIO Role ............................................................................................... 246
      Demographic Differences Between Women and Men ...................................... 247
   Pathways to the CIO Office in Higher Education .............................................. 248
   Higher Education IT: Masculine Discourse and Organizational Culture ............ 250
   Higher Education IT: Navigating the Labyrinth ................................................. 251
      Ideal Worker Norm ......................................................................................... 252
      Masculine Bias and IT Leadership ................................................................. 253
      Responsibilities at Home ................................................................................. 256
   What Helps? ........................................................................................................... 264
      Stimulating Work .............................................................................................. 264
      Flexible Environment ....................................................................................... 265
      Role Models and Mentors ............................................................................. 268
      The Role of Education’s Mission .................................................................. 271
   Limitations ............................................................................................................. 272
   Implications for Practice ...................................................................................... 273
      Pathway and Practice ...................................................................................... 273
      Unconscious Bias and Human Resource Practices ........................................ 275
      Flexible Work Options ................................................................................... 277
      Mentoring the Future Generation of CIOs .................................................... 280
   Implications for Policy ......................................................................................... 282
   Future Research Directions ............................................................................... 283
   Concluding Remarks ........................................................................................... 286

TABLES .................................................................................................................. 288

REFERENCES ......................................................................................................... 314

APPENDICES .......................................................................................................... 333
   A. Quantitative Questionnaire ............................................................................ 333
   B. Quantitative Survey Informed Consent Form .............................................. 347
   C. Qualitative Interview Protocol ..................................................................... 350
   D. Qualitative Interview Informed Consent Form .......................................... 354
Women as Chief Information Officers in Higher Education

LIST OF TABLES

Table 1. Theory-based Groups and Associated Survey Questions.............................. 120
Table 2. Sample Characteristics – Personal Demographics ........................................ 288
Table 3. Sample Characteristics – Organizational Demographics .............................. 290
Table 4. Sample Characteristics – Pathway Variables: Educational Background ...... 292
Table 5. Sample Characteristics – Pathway Variables: Prior Work Experience ........ 294
Table 6. Degree Major ................................................................................................ 298
Table 7. Degree Major: Five Most Popular Majors, with Other Majors Collapsed .... 299
Table 8. Organization Type for Most Recent Previous Position ............................... 300
Table 9. Organization Type for Most Recent Previous Position: Collapsed ............... 301
Table 10. Previous Position Title ................................................................................ 302
Table 11. Title for Two Positions Prior ........................................................................ 303
Table 12. IT Professional Positions in Other Areas of Higher Education .................. 304
Table 13. Non-IT Professional Positions in Other Areas of Higher Education .......... 305
Table 14. Prior Industry ............................................................................................... 306
Table 15. Number of Hours Worked by CIOs ............................................................ 153
Table 16. Regression Analysis for Gender/Number of Hours Worked in the Office . 307
Table 17. Higher Education CIOs Perceptions of Workplace Climate ........................ 159
Table 18. Factor Loadings from EFA: Workplace Climate Scale ............................... 162
Table 19. Number of Hours CIOs Spent on Home-Related Duties Each Week ........ 163
Table 20. Regression Analysis for Gender/Number of Hours Cooking .................... 308
Table 21. Regression Analysis for Gender/Number of Hours Providing Childcare ... 309
Women as Chief Information Officers in Higher Education

Table 22. Regression Analysis for Gender/Number of Hours Spent on Home Care .......... 310
Table 23. Gender Differences for Hours Spent on Household Tasks .......................... 312
Table 24. CIO Perceptions of Hiring, Salary Negotiation, and Review Processes .... 170
Table 25. Perceptions of Bias and Discrimination in Hiring/Promotion Practices ..... 313
Table 26. Factor Loadings from EFA: Bias and Discrimination Scale ...................... 175
Table 27. Perceptions of the Influence of Role Models on the CIO Role ................. 176
Table 28. Factor Loadings from EFA: Role Model Influence Scale ....................... 179
Table 29. Perceptions of the Importance of Mentoring for the CIO Role ............... 180
Table 30. Gender of Current Formal Mentors for Higher Education CIOs .......... 182
Table 31. Gender of Current Informal Mentors for Higher Education CIOs .......... 182
Table 32. Gender of Prior Formal Mentors for Higher Education CIOs ................ 183
Table 33. Gender of Prior Informal Mentors for Higher Education CIOs ............... 184
Chapter 1

Introduction

This dissertation is a sequential explanatory mixed methods study of women Chief Information Officers (CIOs) in higher education and their executive role attainment. This study emerged from a distinct lack of industry or scholarly research on women in higher education IT. Women are securing the senior-most executive positions in IT in higher education at much greater rates than their industry peers, an interesting phenomenon in a field where so few women are present or can realize executive status. In this study, I explored structural factors related to women’s CIO attainment in higher education as a way to add to the theoretical understanding of the impact that organizations have on occupational gender distributions, and to pave the road for a more gender equal future generation of IT employees and leaders.

Statement of the Problem

In our contemporary world, technology is ubiquitous and plays an increasingly important role in our everyday lives. Information technology (IT) affects and influences broad, diverse segments of society, and higher education is no more immune to its impact than any other field. At the same time, organizations that design, implement and maintain technology solutions do not necessarily reflect the diversity of the populations they serve. The Bureau of Labor statistics reported by the National Center for Women in Information Technology (NCWIT) illustrated that in 2009, women represented just 25% of the overall IT workforce in the US; White women made up a full 18% of that group, while Asian women represented 4%, African American women, 2%, and Hispanic women, 1.5%
Women as Chief Information Officers in Higher Education

(Ashcraft & Blithe, 2010). Compared to women’s overall proportional representation in the U.S. workforce, which in 2010 was 47% (U.S. DOL, 2010b), women’s presence in IT lacks population proportionality, especially for non-White women.

![Diagram showing the percentage of computing occupations held by women, 2009]

*Figure 1.* Percentage of computing occupations held by women, 2009. Adapted from *Women in IT: The Facts* (p. 15), by C. Ashcraft, and S. Blithe, 2010, Boulder, CO: National Center for Women & Information Technology. Copyright 2010 by the National Center for Women & Information Technology.

A lack of proportional representation grows even more evident when scrutinizing the upper echelons of IT organizations. Those at the top of IT organizational hierarchies, typically called Chief Information Officers (CIOs), make decisions about their organizations’ composition and culture, and yet they constitute the least diverse segment of IT’s overall population. Across industries, the position of CIO has long been the
Women as Chief Information Officers in Higher Education

domain of White men. The 2012 Harvey Nash CIO Survey reported that women constitute only 8% of the global CIO population, with 9% in the U.S. (TelicityGroup, 2012). Additionally, the 2010 NCWIT report, *Women in IT: The Facts*, included survey data showing that women still hold just 9% of IT Management positions (CEO, CIO, CTO, VP, Director, Strategist, Architect) in Fortune 500 companies, continuing a trend that has persisted for years (Ashcraft & Blithe, 2010). These data are certainly compelling and beg the question of how well homogenous IT organizations run by a dominant social group – White men – can serve far more diverse user populations. This picture of information technology organizations certainly raises some doubts about the profession’s fairness, as well as whether the needs of those using technologies can truly be understood and met. Implications for the labor force are another concern. In the decade ending in 2018, the Bureau of Labor Statistics expects a 19.9% increase in core technology occupations, compared to only 10% across the rest of the labor force (Stock, 2011). If so few women participate in the IT profession, how much will they be losing out on the major workforce growth that this field has to offer?

The lack of gender diversity in IT has seemingly been on the minds of many, as witnessed by the amount of recent research focused on this topic. Scholars and industry analysts alike have been paying attention to what is happening in the IT profession precisely because technology affects contemporary life so deeply. Higher education is no exception, a good example being the December 2011 edition of *Campus Technology* magazine, an industry focused publication, the theme of which was women in IT in higher education. IT has expanded and become a crucial component of our lives and the
workforce. That it is such a gender-biased profession worries many, as it should. Will our technologies reflect our diverse needs, and will the opportunities presented by the profession be available to all?

Most research and statistics on IT organizations and workers have either examined aggregate data or concentrated on a corporate perspective. Though in many ways, IT organizations in higher education mirror those in the business world, data collected from academic institutions suggest that women secure CIO roles at much higher rates than they do in industry. Since 2004, nation-wide surveys of higher education institutions conducted by the EDUCAUSE Center for Applied Research (ECAR) and the Center for Higher Education Chief Information Officer Studies, Inc. (CHECS) have shown that women hold the CIO position between 21.4% and 26% of the time (Arroway, Grochow, Pirani, & Regenstein, 2011; Brown, 2011b; Brown & McClure, 2010; Goldstein & Pirani, 2008; Katz et al., 2004). While still not proportional to women’s presence in the overall workforce, these data raise the question of why such a difference exists between higher education and the corporate sector. If the normative cultures of corporations, higher education and the IT profession have all been White and male, why and how have women achieved more IT leadership success in higher education? What are the cultural differences in higher education IT that have created a wider pathway to the CIO office?
In order to ask these questions, we first need to know more about the IT profession, both in industry and in higher education. What are its historical foundations, what cultural norms have developed over time, and where have women fit into that picture? Knowing the history of IT helps to make sense of how the profession’s culture developed and how it is experienced today. We look to business as a starting point because IT first established itself as a profession there and then, soon after, moved into the higher education arena.

Once the historical context has been laid out, the cultural norms associated with the profession can then be deconstructed. Understanding organizational culture is
important, as it offers us insight into how IT operates as a profession – the values, rites, and rituals associated with technology organizations, as well as who does or does not belong there (Deal & Kennedy, 1982; Schein, 2010). Where women have traditionally been underrepresented in the profession, knowledge about IT’s cultural norms gives us a key to unlocking why that is so, and why the CIO position has been such a difficult role for women to achieve. Looking at the norms of the profession inside the contexts of both business and higher education might help to further uncover why differences exist in the proportions of women who are ascending to the CIO role in those industries.

Women have had a difficult time achieving executive status everywhere, a phenomenon that has come to be known as the “glass ceiling” (Eagly & Carli, 2007; Glazer-Raymo, 1999; Powell & Graves, 2003). Literature on the glass ceiling helps to explain the effects that organizational cultures have had on women’s experiences and ambitions, and why they have had such a difficult time climbing to the top. This literature looks at issues around women’s decision to enter the IT profession and what paths within it are they choosing; whether women are staying in IT and achieving leadership roles, and how they are doing that; and how often and why women are leaving the IT profession altogether. Glass ceiling literature clarifies women’s experiences inside the contexts of the IT profession, business and higher education.

If we understand IT culture in business and higher education, as well as women’s experiences in those cultural frameworks and what happens to them on their climb to the top, only then might we isolate the factors that are creating these differences in their ascension rates in higher education IT. Extracting those factors could help us know what
higher education is doing differently and perhaps better than corporations. That information, in turn, could be used to support organizational gender equity efforts at the executive level.

This dissertation contributed to the research on what is known about women in the IT profession in higher education by identifying factors instrumental to their attainment of the CIO position, while also making meaning of their experiences in the field. Furthermore, it contributed to a body of knowledge that analyzes such phenomena from a social structural perspective, linking gender identity and organizations through themes of power and marginalization. This study used a sequential explanatory mixed methods approach, beginning with a quantitative survey to all higher education CIOs, followed by qualitative, semi-structured interviews that helped to deepen the understanding of the quantitative findings. The rationale for combining both quantitative and qualitative approaches was that quantitative data and results provide a general understanding of the research problem, i.e., what organizational factors contribute to women’s career goal attainment in higher education IT (as exemplified by the CIO position), while the qualitative portion of the study and its analysis added explanatory complexity to the statistical results by exploring women CIO’s experiences in more depth (Creswell & Plano Clark, 2011; Teddlie & Yu, 2007).

**Theoretical Perspective**

The theoretical lens for this study was one that incorporated a social structural perspective on gender and inequality. Generic structural theory looks at the social structures that shape society in its entirety. Applied to gender, structural theory presumes
“…that if women and men were to experience identical structural conditions and role expectations, empirically observable gender differences would disappear” (Risman, 2004, p. 432). What this ignores is “…the cultural interactional expectations that remain attached to women and men because of their gender category” (Risman, 2004, p. 432).

A perspective in which gender is defined as a social construct, however, acknowledges a socially-based system of defined differences between the biological sexes, where dichotomous characteristics are ascribed to each, male and female. Concepts of masculinity and femininity flow from these system-based dichotomies. Additionally, because organizations are structures that are social in nature, they too can adapt to and influence gender systems by assigning and reinforcing roles based on the same socially constructed differences, and by creating or adopting power hierarchies that favor one gender over the other. This perspective frames “…organizations as gendered, not as gender neutral…and conceptualizes…organizations as one of the locations of the inextricably intertwined production…” (Acker, 1990, p. 145) of gender relations.

In practice, one of the ways in which this theoretical perspective is applied at the organizational level is through the concept of gendered occupations. “Because of gender stereotypes, some occupations are labeled as masculine or feminine and deemed suitable only for men or women” (Ely & Padavic, 2007, p. 1129). Professions like IT, which developed during a period in history when women’s presence in the workforce was in no way proportional to men’s, built its professional norms around men’s situations and requirements. When women started to enter the IT workforce, their needs were not accounted for in the pre-existing social and organizational structures; instead, they
Women as Chief Information Officers in Higher Education

participated as outsiders. This perspective is useful as a framework for understanding the differences between the men and women in this study, as well as how the women have experienced their time working in higher education IT, and navigated its territory in such a way that has made them successful.

**Purpose of the study**

The purpose of this sequential explanatory mixed methods study was to investigate women’s experiences as higher education senior IT executives in order to understand the organizational factors that contribute to their ability to attain a senior leadership role in IT. The study began by obtaining statistical, quantitative results by surveying the population of all higher education CIOs – women and men – who were EDUCAUSE members about organizational norms, policies and practices. This quantitative data collection and analysis phase was followed by in-depth, semi-structured interviews with nine purposively selected female CIOs from the population of survey respondents, in order to explore the statistical findings in more depth. In the quantitative phase of the study, both women and men were surveyed in order to assess variance between the genders on all survey variables. The research questions were meant to address how select demographic and organizational-level factors serve as predictors to women’s presence as CIOs in higher education IT organizations. In the qualitative phase, nine in-depth, semi-structured interviews were conducted with women from the survey population in order to more extensively explore the results from the statistical tests.

---

1 EDUCAUSE is a nonprofit membership organization whose efforts are focused on professional development and research for higher education IT organizations across North America.
Research Questions

For the first, quantitative phase of this study, the two major research questions were:

- What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?
- What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?

The specific research sub-questions for Phase 1 were:

1. How do women and men CIOs in higher education differ demographically?
2. How do the pathways to the CIO office in higher education differ for women and men?
3. How do organizational work norms differ for women and men CIOs in higher education?
4. How do perceptions of workplace climate differ for women and men CIOs in higher education?
5. How do home responsibilities – housework, child, and elder care – differ for women and men higher education CIOs?
6. How do perceptions of bias and discrimination in hiring and promotion practices differ for women and men higher education CIOs?
7. How does the existence or absence of role models differ for women and men higher education CIOs?
8. How does the existence or absence of mentors differ for women and men higher education CIOs?

For the second, qualitative phase of this study, the guiding research question was:

- How do women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position?

Definition of Terms

Chief Information Officer: As William Synnott and William Gruber initially defined it in 1981, a Chief Information Officer (CIO) is the “(s)enior executive responsible for establishing corporate information policy, standards, and management control over all corporate information resources (Synnott & Gruber, 1981, p. 66). Since their definition first emerged in the 1980s, the role of the CIO has evolved over time to fit this description, which on average adequately describes the position in higher education IT today.

Gender: Gender is a social construct representing society’s perceptions of men and women. Through the lens of gender, society ascribes certain characteristics to both sexes. Rather than sex, which refers to biological differences between men and women, gender concerns itself with societal notions of masculinity and femininity. This study analyzed factors based on gender, rather than sex.

Glass Ceiling: Carol Hymowitz and Timothy Schellhardt of the Wall Street Journal first coined the term “the glass ceiling” in 1986, describing it as an invisible barrier that women run into as they aspire to top/executive spots in organizations.
Ideal Worker Norm: In his 2007 book, *Striking a Balance: Work, Family, Life*, Robert Drago described the “ideal worker norm” as a social expectation in which serious career professionals dedicate their lives to their work “24 hours a day, seven days a week, for periods of years and even decades at a stretch” (p. 8).

Information Technology: Information Technology (IT) can be defined very broadly, encompassing a variety of differing meanings. For the purposes of this study, I defined IT to mean any organization within an institution that is responsible for purchasing, implementing, maintaining, and creating strategy for technologies for that institution.

Labyrinth: The labyrinth, in contrast to the glass ceiling, is a metaphor that suggests the many twists, turns and obstacles that women encounter as they pursue their career aspirations. The image of a labyrinth also implies that both skill and persistence are required if women are to succeed.

Masculinity: The term masculinity describes someone who possesses characteristics that are stereotypically appropriate for a man. A social construct, masculinity has been portrayed as the need “for dominance, autonomy, aggression, and achievement…” (Powell & Graves, 2003, p. 45). The culture of organizations, when built on androcentric norms, can also be described as masculine.

Mentor: Mentors can be role models, but they also serve as experienced individuals who engage in an “active process of sponsorship…toward less experienced entrants or trainees” (McGrath Cohoon & Aspray, 2006, p. 158). Mentoring takes time
and energy, and establishes a grooming process for younger, less experienced individuals who show promise.

*Organizational Culture:* For the purposes of this study, I used Edgar Schein’s definition of organizational culture from his seminal work, *Organizational Culture and Leadership*. In it, he describes culture as “a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems” (2010, p. 17).

*Pathways:* In the context of this study, pathways were referred to as routes that employees can and ought to take if they seek executive office. Research into masculine organizational environments has illustrated that women and men often start off in different types of organizational roles, and those roles have different career paths. Not all paths offer equal opportunities to reach an executive role, nor are women and men equally represented in these pathways.

*Pipeline:* In this context, the pipeline was used to describe the number of people – women, specifically – who are available to participate in the IT workforce.

*Role Model:* Though often grouped together with mentors in the literature, role models are individuals who are in positions of power and represent specific career opportunities for aspirants. They serve as examples of “the values, attitudes, and behaviors associated with a role” (McGrath Cohoon & Aspray, 2006, p. 156), but are not
necessarily actively engaged in the process of grooming others for positions of leadership.

**Significance of the Study**

While considerable attention has been paid to women’s experiences in the IT profession, the bulk of the scholarship in this arena centered on women in business. Additionally, the research that had been conducted either looked at discrete factors keeping women out of top executive jobs in IT or out of IT altogether, or at distinct remedies to those situations. No study uncovered heretofore looked at the factors and remedies together, as a package. Additionally, women CIOs in higher education have been under-researched, and little has been known about their healthier showing as executives as compared to their industry peers; no prior quantitative data were available that could aid the community in understanding this phenomenon. Furthermore, very little qualitative research addressing female CIOs’ lived experiences existed at all in higher education, and none attempted to understand the organizational cultural elements that affect their careers – either positively or negatively. Without knowing more about women’s involvement in higher education IT as CIOs, and their experiences in and perceptions of the organizations in which they work, it is difficult to comprehend why women are making better strides in getting to the top of the higher education IT workforce.

All of that said, why should anyone care about gender equity in IT? Why do women’s experiences in the profession matter? To be certain, the issue of gender equity in IT has been a popular topic to study in the business world. It has also caught the
attention of those in higher education: the December 2011 issue of *Campus Technology* was dedicated to women in higher education IT. Why do so many care? Perhaps it is because IT is, in a time of employment uncertainty, a field that predicts better growth than other areas of the economy, 19.9% by 2018 according to recent predictions from the Bureau of Labor Statistics (Stock, 2011). With this growth comes opportunity, of course. Yet if IT remains a gender-biased industry, not all will have equal access to those possibilities.

Perhaps more importantly, however, is an issue that underlies the ubiquity of technology in our lives. If we presume that we are all now consumers of technology in one way, shape or form, then is it not fair to express some doubt about whether a homogeneous group of individuals can create and implement technologies that serve us all? This is true in general, and certainly in higher education, where tomorrow’s hearts, minds and souls of the workforce are shaped. And as those who work in the academic sector know, those hearts, minds and souls are becoming ever more diverse. Thus, if higher education does a superior job of recruiting and maintaining more gender-balanced IT workers and leaders, ought we not at least wonder why that is the case? I argue that we do, in fact, need to know more, so that we can urge these organizations that affect us so greatly to take more of us into consideration.

In addition to the aforementioned reasons, research of this kind is significant to the practice of higher education IT administration, and to the IT profession in general. Knowing the predictive power of select factors that help women achieve top leadership roles in androcentric environments can help organizations choose and implement more
Women as Chief Information Officers in Higher Education

effective policies and practices aimed at gender equity. This is especially important as a first wave of CIOs in higher education prepare to retire (Arroway et al., 2011); the hope for a more gender-balanced next generation of CIOs is within our grasp.

Finally, this study generated valuable results due to the mixed methods research design. Adding qualitative inquiry to the quantitative findings yielded deeper insights into the lived experiences of women who are in the CIO role in higher education. It also added to mixed methods research by exploring the strengths of the sequential explanatory design, which include connecting the quantitative and qualitative data and integrating the findings of each phase of the study.
Chapter 2

Review of the Literature

Because little is known about women as CIOs in higher education IT, understanding them as a particular category of executives involved stitching together several distinct scholarly contexts. This literature review is thus organized into the following categories: the history of computing and Chief Information Officers; organizational culture and its impact on gender; and the glass ceiling/labyrinth, or factors that impact and influence women’s presence as executives. The review now begins with a historical overview of the IT profession.

History

History of computing. When we think of information technology (IT) today, we think of a young, vibrant, creative profession. We think of Steve Jobs and Bill Gates, and all of the wonderful inventions that have been developed over the past several decades and continue to evolve at lightning speed. Yet while IT as a formal profession may be relatively youthful, its foundations are much older than many think or know. Its roots, in fact, are found in the historical developments of modern computing, which can be traced back to the early 19th century. Another erroneous assumption often made is about computers themselves. Most people think of them as the machines we use in our daily work; machines for information processing and storage. Up until World War II, however, computers were actually people – people who computed things by hand (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003; Gürer, 1995; Light, 1999). The Oxford English Dictionary used to define a computer as “‘one who computes; a calculator, reckoner;
Women as Chief Information Officers in Higher Education

*specially*, a person employed to make calculations in an observatory, in surveying, etc.’” (Campbell-Kelly & Aspray, 2004, p. 3). Up until 1945, much work that we relegate to machines today was painstakingly carried out by humans for tasks such as building nautical tables, calculating ballistic trajectories, and reconciling financial accounts. Interestingly enough, by the late 19th century, computing had come to be perceived as clerical, monotonous work, even when it involved very complex math. Thus, when women were allowed into the workforce, they were often the ones assigned to work as computers (Campbell-Kelly & Aspray, 2004; Gürer, 1995; Light, 1999).

Some of the very basic ideas for how computers operate today emerged in the early 19th century. Charles Babbage, a Cambridge University-educated mathematician born in 1791, came to be interested in large-scale data processing while supervising freelance computers constructing star tables for the *Nautical Almanac*. His interest led him to develop a concept he called the Difference Engine, which he wanted to design in order to build star tables more efficiently and without the human error involved in the printing process. Babbage received government funding to produce his Difference Engine, but he found that it was more difficult to engineer than it was to conceptualize. Though he used a good deal of government money, as well as his own, he was never able to fully produce a working model (Campbell-Kelly & Aspray, 2004).

As Babbage was trying to build the Difference Engine, he hit upon an idea for a machine that could do even more, and began to develop plans for what he called the Analytical Engine. He imagined the Analytical Engine as a machine that would be able to calculate anything that anyone could specify for it. In essence, Babbage understood the
difference between calculating and storing information and poured that knowledge into his Analytical Engine design. Those two machine-based concepts – calculation and storage – formed two foundational concepts for today’s modern computers (Campbell-Kelly & Aspray, 2004; Gürer, 1995). The Analytical Engine was never to be built either, however, as the British government became disillusioned with Babbage’s work and inability to produce what he imagined.

Though he never did deliver a fully working Difference Engine or the Analytical Engine, he did leave behind documentation that was to inspire later generations of mathematicians, engineers and inventors. It was a woman, in fact, who helped to fully articulate Babbage’s ideas on the Analytical Engine. Ada Byron Lovelace, Lord Byron’s daughter, was fascinated with mathematics and became acquainted with Babbage. She, who was far more facile with language than Babbage, translated a lecture of his on the design of the Analytical Engine. In her translation, she was able to build upon what Babbage had imagined. Though he struggled with how to organize the calculations – what we think of today as programming – Lovelace could visualize how to program the Analytical Engine to perform tasks and expressed that in her writings. She devised a method for storing sequences of operations and instructions, which were the first programming constructs to be recorded (Campbell-Kelly & Aspray, 2004; Gürer, 1995). Some say that Lovelace was the first to envision and understand the potential for a computing machine, and refer to her as the grandmother of programming. She made such a name for herself, in fact, that the United States Department of Defense named a programming language – Ada – after her in the latter part of the 20th century (Gürer,
Women as Chief Information Officers in Higher Education

1995; Gürer, 2002). Others dismiss her importance, however, and suggest that her contributions were merely interpretive and have been overblown (Campbell-Kelly & Aspray, 2004). Regardless of the perspective, Lovelace did provide a written account of what Babbage first imagined, and expressed those ideas in a way that resonated with others many years later.

Later in the 19th century, and over in the United States, another historical personality figured prominently in the development of modern computers: Herman Hollerith. A young engineer from New York, Hollerith attended Columbia University, where he worked with a professor who happened to be an advisor to the Bureau of Census in Washington, DC. This academic connection gave Hollerith insight into the process behind the census, which was incredibly tedious. For the 1870 census count, 438 clerks were employed, producing a 3,743-page report. By 1880, the Bureau needed 1,495 clerks to complete the census tallying work (Campbell-Kelly & Aspray, 2004, p. 15). In 1888, the newly appointed superintendent of the census, Robert Porter, arranged a competition to find an alternative to the tally sheet method of data collection and processing. Hollerith was one of three inventors in the competition; his Electric Tabulating System won and was adopted for the 1890 census. A key idea in his design was the punch card: the machine was meant to “record the census return for each individual as a pattern of holes on punched paper tape or a set of punched cards,” (Campbell-Kelly & Aspray, 2004, p. 16) after which the machine could count the holes and produce the tabulations. Hollerith’s design opened up a whole new way of processing information, and also laid the foundations for IBM. He commercialized his inventions by
establishing the Tabulating Machine Company, which was renamed IBM thirteen years later under the direction of Thomas Watson Sr. (Campbell-Kelly & Aspray, 2004).

At this point in time, America was in love with office machinery and Hollerith’s technological progress spurred two major industry advancements: basic small calculating machine technology developed, as did machinery for the business functions of today. Data processing, information storage, and accounting all got their start during this period. Babbage’s failures, however, meant that in the early 20th century, large-scale calculations still needed teams of human computers.

Other historical forces propelled machine development forward in the first half of the 20th century, but none so much as the war machine. The years leading up to WWII were ones of great progress for machines designed to make tables, calculate ballistics and break codes. As men went to war, women were employed in roles that in earlier years had been off limits to them. Many women were hired by the United States Army as “computers” to calculate firing tables for new artillery and older equipment that needed to be deployed. The lack of calculating technology created a bottleneck, which as the war heated up became the inspiration for the world’s first general-purpose electronic computer. In 1943, the Army funded just that: a machine to calculate artillery-firing tables for the Army’s Ballistic Research Laboratory. Using academia to serve government purposes, two researchers from the Moore School of Engineering at the University of Pennsylvania were put in charge of the project: John Mauchly and John Presper Eckert. Mauchly was a physics instructor, and responsible for the overall design,
while Eckert was a young engineering research associate tasked with putting the design
to work (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003).

In 1946, the world’s first electronic computing machine, ENIAC (Electronic
Numerical Integrator And Computer) was born. Though initially motivated by the need
for quick artillery firing table calculations, the first work tasked to the machine was for
the hydrogen bomb. Women played an important part in the launching of ENIAC, their
involvement again resulting from labor force needs. The wars not only pushed
technological advancement along, but also opened doors for women previously closed to
them. Though Eckert and Mauchly and their team of men built ENIAC, six women who
previously had run manual ballistics calculations programmed it. Those six women
included Fran Bilas, Betty Jennings, Ruth Lichterman, Kay McNulty, Betty Snyder, and
Marilyn Wescoff (Gürer, 2002; Light, 1999). This division of labor had implications.
Despite the fact that those who programmed the first computer needed to understand the
hardware better than anyone in order to make it work – and with 3,000 switches and
dozens of cables and digit tables to coordinate, this was no easy task – programming was
seen as easier to do than building hardware. This had everything to do with the gender
segregation inherent in the work: those who invented and built the machines were
honored, while those who made them functional were not. Women were not allowed to
participate in the hardware engineering at that time, and as a result, their contributions
were often understated and undervalued (Gürer, 2002; Light, 1999). This initial division
of labor should be highlighted, because as an artifact, it played a contributing role to the
culture of the IT profession.
The downfall of the ENIAC was its inability to store data. Eckert and Mauchly saw this and designed its successor, EDVAC (Electronic Discrete Variable Automatic Computer), also for the Ballistics Research Laboratory. A prestigious mathematician from Princeton, John Von Neumann wrote up notes on the EDVAC that ended up being widely distributed. The EDSAC (Electronic Delay Storage Automatic Calculator) built in 1949 by Maurice Wilkes of the University of Cambridge Mathematical Laboratory in England was a direct result of these notes. His was the world’s first practical stored-program computer and the first to run a graphical computer game (Campbell-Kelly & Aspray, 2004).

By the 1950s, computers moved beyond the sphere of academic/government invention and became business machines. Eckert and Mauchly formed the Eckert-Mauchly Computer Corporation (EMCC). Though they first developed UNIVAC (UNIVersal Automatic Computer) in 1951 for the 1952 election using government funding, they had broader designs on serving industry. Not as successful in that arena as they had hoped, Remington Rand eventually purchased the company and thus, entered the computer business. IBM, however, was the first major player in that game. As a company, it had both a solid business base and reputation for customer service; this foothold allowed them to build new computer technology and expand their business (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003). Other major corporations of the day got into the business as well – Burroughs Corporation, NCR, Control Data Corporation, General Electric, Honeywell, RCA and UNIVAC. Not all of them could sustain their
involvement in the growing computer industry, however, and by the 1970s major consolidation was underway.

The 1950s also marked the decade when software development began to play a key role for companies. Computer use in business meant that companies began to demand ways to use their expensive hardware for meeting their needs (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003). Though we think of software today as varied and plentiful, that was not at all the case in the early days of modern computers. Massive machines took countless hours – if not days – of time to program, and each program was quite limited in what it could accomplish. Rear Admiral Grace Murray Hopper set her sights on changing that all. A computer scientist and United States Navy officer, Hopper was the first programmer for the Harvard Mark I calculator in the mid-1940s, along with Richard Milton Block and Robert Campbell-Kelly (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003; Gürer, 2002). She went to work for Eckert and Mauchly’s company with a goal of easing the burden of writing machine code. Once there, she supervised the department that developed the first compiler and translator, which greatly improved the process of machine coding, as it allowed programmers to create more powerful programs more quickly (Gürer, 2002). She was also responsible for developing the programming language, FLOW-MATIC, which was later used as a model for COBOL (COmmon Business-Oriented Language) (Campbell-Kelly & Aspray, 2004; Gürer, 1995; Gürer, 2002).

These early developments in software programming set the stage for other major language progress. In 1954, John Backus assembled a team to develop the language
FORTRAN, the first general-purpose, high-level computer language. It was specifically written for IBM’s 704 computer, but became the industry standard for scientific computing for years to come (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003). Just a few years later, in 1959, the United States Department of Defense sponsored the development of COBOL. The Short Range Committee that developed the specifications for the language had three women on it: Mary K. Hawes, Frances E. Holberton, and Jean E. Sammet (Gürer, 2002). These women were pioneers, offered opportunities not available to most women of that era. In terms of the history of software, it is interesting to note that though newer languages have gained popularity and are abundant, both FORTRAN and COBOL are still in use today, more than half a century later. From this point forward, the computer industry grew exponentially; by the 1970s, information technology had infiltrated many aspects of both the corporate and academic worlds. This was such the case that those who were in charge of those organizations realized the need to manage their information systems more strategically; the Chief Information Officer (CIO) role emerged from these circumstances (Hawkins, 2004; Katz et al., 2004; Pemberton, 1992).

Before delving into the literature that describes CIOs and their role(s) in organizations today, a couple of points about modern computing’s history should be discussed as they relate to women. Up until the 1950s, when machines started being used for various business functions requiring software, the focus was on the machine and on the “genius” behind the machine. By default, machine inventors and creators were always men, as that creative space was not territory where women were welcome. In the
workforce, women were definitely the “other,” as illustrated in a 1943 guide to managers that explained, “(w)omen can be trained to do any job you’ve got – but remember ‘a woman is not a man;’ A woman is a substitute – like plastic instead of metal’” (Light, 1999, p. 482). Women primarily played a supporting role in this history. They were not the creators, but the supporters, a fact that was heavily tied to their socially ascribed roles as caretakers in the 19\textsuperscript{th} and early 20\textsuperscript{th} centuries. Even when women were present, as with programming the complex machinery of the ENIAC, their contributions were often downplayed or ignored (Gürer, 1995; Gürer, 2002; Light, 1999). Accolades focused on machinery and were mainly reserved for those involved in hardware production.

Additionally, as computers were first being developed, programming was considered easy, even when it was complex and required an intimate knowledge of the hardware and its operations. This might be seen as a carry-over from the perceptions of human computers. That work was seen as tedious menial labor, despite the great difficulty that could be involved, and so was often reserved for women. Gendered concepts of work dichotomized computing, and thus the information technology profession, from the very start. These concepts formed an association between men and computers, and laid the foundation for the stereotypical image of an IT “geek.” These very deep historical roots that paired men with computing machines must be considered as the backdrop against which cultural investigations into IT organizations take place. IT did not start out as a profession that openly welcomed women or even allowed them into all roles. It began, instead, with a gender-biased culture that prioritized men’s abilities and accomplishments over those of women.
CIO role. By the 1970s, managing information and technology in organizations had become quite complex. The advent of the microcomputer, along with the advancements in business machinery, had ushered in a new age that needed to be managed more comprehensively and efficiently. Businesses, with universities following closely behind, were beginning to realize the need for a new kind of role to manage the explosion of growth in information and technology within their organizations.

William Synnott and William Gruber first developed the concept of the Chief Information Officer (CIO) in the early 1980s. William Synnott referenced the term at an INFO ’80 conference. He followed that up with a Computerworld article in September of 1981, but then fully fleshed out an argument for the CIO role with William Gruber in their book, Information Resource Management: Opportunities and Strategies for the 1980s (Penrod, Dolence, & Douglas, 1990). Synnott and Gruber saw this emerging organizational need and advocated for a new type of role, a new breed of information managers that needed to be created. As they initially defined it, the CIO would be the “(s)enior executive responsible for establishing corporate information policy, standards, and management control over all corporate information resources” (Synnott & Gruber, 1981, p. 66). This person, as they envisioned him, would be a change agent who would find and advocate for improvements in information utilization; a planner who would identify and coordinate information resources throughout the organization; and an integrator who would learn the business and merge business and information resources (Synnott & Gruber, 1981, pp. 52-61). Theirs became the classic definition for a CIO and is still used to benchmark how IT leaders are positioned today. Much of the literature that
followed Synnott and Gruber’s lead started paying attention to CIOs around 1985, when IT leadership positions were really beginning to emerge in organizations, though the majority of the research was focused on the corporate sector (Penrod et al., 1990).

Academia followed a developmental path similar to that of its industry counterparts, with the first CIOs being established in organizations in the 1980s (Lineman, 2007). As in businesses, “(t)he need for the position in academia really began with the need to manage and coordinate computing and information technology services with the dramatic influx of microcomputers and networks in the early-to-mid 1980s” (Hawkins, 2004, p. 94). This rapid environmental change needed strategic leadership, but leadership that was focused on the educational mission (Black, 2009). The vision was for an executive who could straddle and align the academic enterprise with the world of technology, though higher education institutions did not initially figure this position, as Synnott and Gruber described it, to be universally necessary (Penrod et al., 1990).

Though Synnott and Gruber’s vision for this new role was not immediately embraced everywhere, the rapidly rising information management and technology universe did result in an expansion of CIOs’ presence. By 1989, 40 percent of Business Week’s top 1000 companies had a CIO (Gupta, 1991). By the 1990s, though the title was not always exactly Chief Information Officer, top management in industry was regularly beginning to incorporate this role into its operations (Grover, Jeong, Kettinger, & Lee, 1993). Academia saw a somewhat slower rise of the position, though the population was not initially tracked as closely as it was in the corporate sector. In 1990, Penrod et al.’s CAUSE study of higher education CIOs indicated that no more than one-third of higher
education institutions *needed* a CIO. They predicted that by the year 2000, perhaps one-half of those same institutions would need one. Had the authors of that study been able to look out just ten more years, they would have seen just how necessary and ubiquitous the CIO role had become. What a little more than 30 years ago did not exist, is now commonplace in organizations across industries.

**Who is the CIO?** Up until the 1980s, technologists and IT departments served a support role in organizations, both in industry and academia. These departments did not lead the charge around what technologies would serve institutional goals and needs best, and ought to be integrated into an organization. Information technology was not connected to institutional strategic planning efforts. IT managers existed at the departmental level and were not concerned with or connected to the executive suite (Black, 2009; Gupta, 1991; Peppard, Edwards, & Lambert, 2011). Thus, when organizations began hiring CIOs, because it was a new role not hitherto defined, there was often great confusion as to what that person ought to do, as well as how connected s/he should be to other executive roles. Though Synnott and Gruber had clearly defined what they thought a CIO should do, most organizations did not look to that definition for guidance, and so in its early days, the CIO role was quite loosely defined (Grover et al., 1993; Peppard et al., 2011).

When examining who initially filled the role of the CIO, scholars who study business noted that those who initially took the roles came straight from the ranks of IT. Regardless of whether that made good sense, because there was an assumed requirement around technical knowledge, those who played a more operational role were asked to
shift into a different way of thinking about information management (Grover et al., 1993). Demographic data from the early 1990s suggested that in the corporate sector, the average CIO was a 48-year old White male with a MBA or advanced degree in computer science, who hailed from a computer-based information systems department (Pemberton, 1992). Though the demographic make-up of CIOs in academia was similar to that in industry – the average higher education CIO was a 46-year old White male – survey data collected in the late 1980s suggested a slightly different roadmap for these CIOs (Penrod et al., 1990). Penrod et al.’s (1990) survey of academic institutions that had CIOs illustrated that only 13.8% of CIOs had technical backgrounds, while 48.3% had administrative education and experience, and a full 37.9% came from academic ranks. It is difficult to generalize these findings, as the survey population only contained 58 respondents. What we do know from these business and higher education data, however, is that from the very beginning, White men dominated the CIO role. Given the history of IT and computing, this is not at all surprising.

Over time, the role of the CIO has evolved, and interestingly that evolution has been much in keeping with what Synnott and Gruber envisioned 30 years ago. The need to manage ever more complex systems of information has required institutions to put someone in charge of doing just that (Hogue & Dodd, 2006). Drivers such as strategic business change and the ubiquity of IT and computers have very much propelled the existence of CIOs into the forefront of organizational life (Reich & Nelson, 2003). In academia, the rise and increasing importance of the CIO has been noted as a natural reaction to the “rapid spread of information technology and its integration into the fabric
of all academic operations, beginning with administrative functions, moving into the research enterprise, and now affecting teaching and learning activities” (Branin, 2009, p. 512). These environmental shifts have caused IT organizations to grow and mature, and as a field study of 45 CIOs in the early 1990s noted, IT’s maturation and centralization is consonant with a more strategic CIO role emerging (Grover et al., 1993).

**Today’s CIO.** What does the CIO role look like today, and what characteristics and skills do scholars say they need in order to be successful? If we look first at the demographics, particularly among higher education CIOs, we see that not much has changed since the 1980s. Data from between 2004 and 2011 suggest that higher education CIOs are overwhelmingly male and White, making up approximately 77% and 93% of the population, respectively (Arroway et al., 2011; Brown, 2011b; Goldstein & Pirani, 2008; Katz et al., 2004). Higher education CIOs are also a highly educated group: the 2011 CHECS report indicated that 76% of them had an advanced degree, with 18% of that group educated at the doctoral level (Brown, 2011b). The 2011 ECAR study reported similar findings, with 80% of CIOs having an advanced degree; 25% of that group had PhDs. Faculty still tend to filter into the IT executive ranks in higher education, but not as frequently as noted in Penrod et al.’s 1990 CAUSE report (Brown, 2011b).
In terms of the role they now play, scholars and industry analysts alike have watched the growth of the CIO role and documented its path since the 1980s. Though every CIO is not the same, as every organization does not have the same needs, there is considerable agreement across industries around one particular thought: today’s Chief Information Officers must be a strategic resource for their organizations (Arroway et al. 2011; Banker, Hu, Pavlou, & Luftman, 2011; Buechner, 2005; Goldstein & Pirani, 2008; Gupta, 1991; Hawkins, 2004; Hogue & Dodd, 2006; Katz et al., 2004; Kelly & Sharif, 2005; Lineman, 2007; McClure, 2000; Penrod et al., 1990; Reich & Nelson, 2003; Weaver, 1981). While not all CIOs are created equal, and each may have a different organizational focus based on various institutional factors like size, age and strategic
needs, those who have studied the role insist that CIOs must understand the business environment they work in in order to properly align technology resources and solutions with that business. Much like what Synnott and Gruber imagined in 1981, a major element of what today’s CIOs must do is bridge the gaps between the business and the technology; they must align the IT enterprise with the mission and goals of the organization (Black, 2009; Gupta, 1991; Lineman, 2007; McClure, 2000; Penrod et al., 1990; Savarese, 2004). This has only become clearer as time has gone on, and technology and information management expanded. In fact, current research suggests that before an organization hires (or replaces) a CIO, those managing the employment process ought to hire a CIO who will help them to meet the organization’s strategic needs (Banker et al., 2011; Hawkins, 2004; McClure, 2000; Peppard et al., 2011). In sum, today’s CIOs, regardless of the industry in which they work, are often skilled strategists and managers who help their organizations to best operate the technologies they presently own and use, while also envisioning future paths for information technology integration in accordance with organizational priorities and needs.

A 2004 ECAR study pointed out that a business strategist role like this requires cabinet-level presence in academia. That survey indicated that of the 330 senior IT leaders who responded, 50.6% of them held a seat on their institution’s cabinet (Katz et al., 2004). Four years later, in a follow-up study, 47.8% of the 392 senior IT leaders responded the same way (Goldstein & Pirani, 2008). Clearly, academic institutions, like their corporate counterparts, need technology strategists who work at the highest level of their institutions to strategically align technology and organizational needs.
CIO skills. In addition to the basic coalescence around that one factor, and as another way to understand the role of the CIO and those who fill it, some scholars have identified skills that are necessary for CIO success. While the position’s origins are more technical in nature, some research has indicated that a strong technical background might, in fact, not align so well with the CIO role (Carter, Grover, & Bennett, 2011; Hawkins, 2004). Though strong technological knowledge and skill may be important when working in the ranks of IT, scholars point out that those coming from that perspective do not always have the best sense of the bigger picture and broader organizational drivers (Carter et al., 2011). In fact, in earlier days of the CIO’s existence, it was pointed out that “much of the dissatisfaction with the CIO comes from their narrow background in technology, (and) that installing a computer systems specialist as CIO is like putting a carburetor specialist in charge of an automobile factory” (Pemberton, 1992, p. 5). Some found that it could also be the case that those who are strong technologists cannot always translate the IT message in a way that speaks to executives, and so their message can get lost in the shuffle (Carter et al., 2011; Hawkins, 2004; Pemberton, 1992).

It is not clear that a technical background is completely unnecessary, and some do argue that it is essential to have that knowledge in order to make informed, smart decisions about technology resources (Carter et al., 2011), but the question that comes up is exactly how central that knowledge is to being a competent CIO compared to other skills, especially in higher education. The 1990 report authored by Penrod et al. found that only 15.4% of CIOs surveyed felt that technical expertise was the top function of his or her position. A number of years later, technical knowledge still did not to top the
charts as the most important skill necessary to do well as a CIO. The 2004, 2008 and 2011 ECAR studies asked CIOs to rank skills that they felt were pivotal to their success. In all three years, technical proficiency was ranked last (Arroway et al., 2011; Goldstein & Pirani, 2008; Katz et al., 2004). Additionally, both the 2010 and 2011 CHECS reports indicated that technical knowledge was only the third most important skill needed by CIOs, with 53.8% and 49% of the respondents prioritizing it in those years, respectively (Brown, 2010; Brown, 2011b).

![Image of bar chart showing CIO perceptions of skills needed to be a successful CIO]


What was more interesting in the literature was the convergence around other skills that CIOs and those who research them deem as crucial for success. That list...
includes communication, political and negotiation skills, knowledge of the business in which they work, as well as leadership and managerial skill (Hawkins, 2004; Penrod et al., 1990; Pemberton, 1992; Reich & Nelson, 2003). In the same CHECS reports, CIOs listed communication skills as most important 88.8% and 88% of the time in 2010 and 2011, respectively, and leadership skills as second most important, at 79.4% and 80% in those two years (Brown, 2010; Brown, 2011b). The ECAR studies illustrated something similar: the ability to communicate effectively ranked as the most important skill for CIO success in all three years, while strategic thinking ranked second in 2004 and 2011, and third in 2008 (Arroway et al., 2011; Goldstein & Pirani, 2008; Katz et al., 2004). The overall message is that technical knowledge is certainly helpful for CIOs, but those in the position must bring other, more important talents to the table – ones that allow them to communicate their message within and beyond the organization. This being the case, one author did point out that these are not skills taught in computer science or engineering programs, and are often missing in MIS programs as well (Reich & Nelson, 2003). Though the position may have technical roots, it is clear that today’s CIO role is often an executive one whose skills more closely match their peers’ in other executive ranks.

**Differences between industry and higher education.** While there are similarities in the role regardless of industry, higher education scholars have pointed out that there are some important factors that differentiate higher education CIOs from their counterparts in industry. As most of the literature on CIOs is industry focused, it makes sense in the context of this review to outline what has been said about the differences between corporate and higher education CIOs. Aside from the profit motive, the first and
probably most obvious element is the organizational difference in focus. Businesses prioritize their customers and suppliers, and concentrate their attention on administration and employees (Lineman, 2007). Higher education, on the other hand, has a much broader mix of constituents, and needs to take into account the needs of many, including, “…administrators, faculty, staff, students, alumni, donors, potential students, and even the parents of potential students” (Lineman, 2007, p. 4). Higher education CIOs need to account for and pay attention to a very broad set of stakeholders with differing priorities. Additionally, where corporate CIOs must bridge the gap between IT and the business, higher education CIOs also have to bridge IT with campus constituencies; this makes clear why communication tops the list of necessary skills in the minds of higher education CIOs. Also, where industry CIOs focus on shareholder values, higher education CIOs concentrate on institutional mission, aiming to provide and improve processes and tools for teaching, learning, and scholarship, in addition to administrative systems (Black, 2009).

In addition to the above, higher education CIOs also have smaller budgets and fewer overall resources than their industry counterparts, while having to take into account an academic timeline and culture that can slow progress down. The distinct mission, culture and work environments also have to be taken into account, and as suggested earlier, these positions are far more relational than in corporations. Finally, what does not come up in any of the industry literature, but is a component of that in higher education, is that for some CIOs, higher education is a calling, and they feel driven by the mission of their institutions (Katz et al., 2004; Lineman, 2007). In the end, however, the role has
more similarities than differences between industries, and all CIOs must do their best to align technological solutions and vision with the needs of their chosen organizational environments.

Culture

**Organizational culture.** Having laid out the historical context for IT and described the CIO role, the review now turns to an examination of organizational culture, as culture helps us understand how organizations operate. It is also a basic explanatory element of the persistent low proportions of women in executive roles. The literature on organizational culture is vast, and so I chose Edgar Schein’s seminal work, *Organizational Culture and Leadership*, as it gives a clear, concise and frequently used working definition for culture. I complemented that with Terrence Deal and Allan Kennedy’s *Corporate Culture: The Rites and Rituals*, another canonical text, in order to contextualize Schein’s definition of organizational culture in a corporate setting. The IT profession originally emerged in a corporate environment, and so it made sense to understand that foundation and perspective before turning to higher education, as the profession’s culture in higher education inevitably draws on elements from the corporate sector. Also, since the organizational culture concepts developed in this literature are later reflected in the literature on women’s inability to ascend to executive positions, it makes sense to have a working knowledge of organizational culture.

As defined by Schein (2010), culture is

“a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has
worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems” (p. 17).

These formulated, shared assumptions and beliefs (Deal & Kennedy, 1982; Schein, 2010) influence the ways that individuals within organizations think about and interact with their world. Schein (2010) ties leadership to culture, noting leaders’ key role in establishing and maintaining the culture for the organization. They set the tone for organizations in a variety of ways, which include where they focus their attention; how they handle critical incidents, allocate resources and status; and how they recruit, promote and mentor others in their organizations (Schein, 2010). Leaders further embed or maintain that culture through the rites and rituals they develop (Deal & Kennedy, 1982; Schein, 2010).

The way organizations behave starts at the top. Because of leaders’ organizational role, and their responsibility in building and maintaining culture, much of the literature has noted that they also have the ability to enhance or reduce organizational diversity (Kanter, 1977; O’Connor, 2006; Powell & Graves, 2003; Schein, 2010), which is important to note as we examine gender proportionality in IT.

The organizational culture literature also points out two basic characteristics of culture. One is its resistance to change; the other, its natural tendency to create “insiders” and “outsiders” (Deal & Kennedy, 1982; Schein, 2010). Because culture defines and creates structural norms around organizations’ operations in ritualistic ways over time (Deal & Kennedy, 1982), shifting those norms can cause people great anxiety. Schein
Women as Chief Information Officers in Higher Education (2010) notes, in fact, that cultural change will not normally occur without a crisis or other motivational reason behind it. Cultures become entrenched.

The concept of “insiders” and “outsiders” flows from this; as organizations define for themselves who they are and what they do, they also define what kind of people should be – and by default, not be – part of their organizations. They also determine where certain types of individuals fit inside the organizational structure (Deal & Kennedy, 1982; Schein, 2010). Schein (2010) points out that leaders not only set the tone for an organization, but also contribute to its culture’s continuity by bringing on new employees whose “style, assumptions, values, and beliefs” (p. 261) reflect those of current employees. Those who do “fit” are socialized appropriately within the organization. However, “(w)hen a newcomer is different – a woman in a man’s world, or a black in a white managerial echelon – no rituals exist to socialize this individual” (Deal & Kennedy, 1982, p. 72). This concept is noteworthy, and takes on definitive shape in the literature describing women’s experiences in corporations, higher education and the IT profession.

**Sex, gender and leadership.** Before the literature on women in specific organizational cultural contexts is reviewed, a working knowledge of gender stereotypes is important, as those stereotypes interact with and influence organizational culture and concepts of leadership. It helps to start by explaining the difference between sex and gender, as the two terms are often conflated. Sex differences represent men and women’s distinct biological characteristics. While biological differences between the two sexes abound, research into men and women’s cognitive and leadership abilities has shown no
significant differences in those areas between the sexes (Kanter, 1977; Klenke, 1996; Powell & Graves, 2003).

Gender, on the other hand, is a social construct representing society’s perceptions of men and women (Kanter, 1977; Klenke, 1996; O’Connor, 2006; Powell & Graves, 2003). Through the lens of gender, society ascribes certain characteristics to both sexes. These gendered constructs of masculinity and femininity have historically dichotomized the two sexes, with masculinity characterized by needs “for dominance, autonomy, aggression, and achievement…” (Powell & Graves, 2003, p. 45) and femininity by “high needs for deference, nurturance and affiliation” (Powell & Graves, 2003, p. 45). These gender stereotypes, though not factually tied to biological differences, do inform societal notions behind characteristics of and appropriate roles for women and men. This literature review concerns itself with gender stereotypes, or societal notions of masculinity and femininity, and how they have affected women’s experiences and segregated the sexes in corporations, higher education, and IT. So, although significant biological differences in cognitive and leadership abilities may not exist between the sexes, gendered perceptions of men and women’s capabilities do. With that in mind, I turn to a review of the literature on leadership and gender.

**Leadership theory.** My particular research interest focuses on the CIO role – the top IT executive role – in higher education organizations. This CIO position is, by definition, a leadership role. Thus, before looking at what the literature says about the cultural ramifications of historical gender segregation in corporate life and higher education, some treatment of the literature on gender and leadership theory is necessary.
Leadership literature has a long and deep history in a variety of disciplines. Given the dramatic changes in leadership theory over the past 20 years, I focused on the most contemporary information on the topic. I also narrowed my search to literature that mostly focused on women and leadership, and leadership as a gendered social concept.

Again, my focus is on the top IT position attainable in organizations. When defined this way, leaders are often referred to as “executives” or “senior managers/administrators” in the literature (Chliwniak, 1997; Colwill & Townsend, 1999; Glass Ceiling Commission, 1995; Klenke, 1996; Lemons & Parzinger, 2001; Spurling, 1997). At the same time, some scholars make a distinction between leaders and managers, where leaders provide the vision for and oversee organizations, and managers carry out that vision (Freeman, 2001; Klenke, 1996). This review does not focus on attainment of middle management positions, but rather of a top executive role.

Much of the contemporary leadership literature assessed the type of leadership skills that today’s organizations need in order to succeed. Several authors reviewed the history of leadership models as a way to frame the changes over time to leadership theory and where women fit into that context (Chliwniak, 1997; Freeman & Bourque, 2001; Klenke, 1996).

Early on in the study of leadership, trait-based theories, or “great man/woman” theories dominated the literature. Trait-based theories assumed that leaders have inborn traits – physical, mental and personality traits – that define them as effective leaders. Stereotypical masculine characteristics were closely linked with those inborn traits effective leaders were assumed to possess. Height, weight, aggressiveness, and emotional
control were examples of characteristics often used to describe leaders from this perspective. By associating masculine traits with those of an effective leader, leaders were defined from a male perspective from the very beginning (Chliwniak, 1997; Freeman & Bourque, 2001; Klenke, 1996; Middlehurst, 1997). Where women were viewed as men’s opposite, they were often missing from the leadership literature.

As leadership theory evolved, context became more important. As scholars began to look past the individual, followers and the internal context of the organization became a central part of understanding effective leadership (Klenke, 1996). When theorists took into account external factors, leadership theory evolved even further and started to define leaders in relation to followers, organizations, and the external environment (Freeman & Bourque, 2001; Klenke, 1996). Thus, rather than early models that defined leaders according to their individual traits, contemporary theory understands leadership as happening within the context of organizations, which are affected by factors in the environment.

Two prominent environmental factors that have influenced these changes in leadership theory are globalization and technological expansion. Globalization and technology, some argue, are forcing organizations to change quickly. Old, bureaucratic models of organizations with controlled information pathways are falling to the wayside. Where consumer and employee bases have expanded with globalization, institutions must be able to understand a wide variety of needs and respond to them quickly. Technology has made information more readily available and processes more transparent, so that the
workforce is more empowered than ever before (Colwill & Townsend, 1999; Cook, 2006; Glass Ceiling Commission, 1995; Freeman, 2001; Klenke, 1996; Sarch, 1997).

Scholars indicate that the type of leaders that are needed to run these organizations must be able to deal with change, respond to a variety of needs, collaborate, communicate, work in teams, and empower their workers to assist in the leadership and transformation of the organization (Chliwniak, 1997; Colwill & Townsend, 1999; Cook, 2006; Freeman, 2001). A number of authors note that these are characteristics consonant with feminine stereotypes (Chliwniak, 1997; Freeman, 2001; Klenke, 1996), and one research study showed women exhibiting these characteristics more often than men (Cook, 2006). Thus, in the literature, a transformation is seen from leadership models that value stereotypical masculine traits to ones that incorporate and value traits stereotypically associated with women.

As a part of the historical review, some scholars make the connection that because organizations today need this type of leadership, and because women often display these leadership skills, women are well suited for today’s leadership roles and new opportunities exist for them to move into those roles (Chliwniak, 1997; Cook, 2006; Freeman, 2001; Middlehurst, 1997). Yet, because gender perceptions and stereotypes permeate conceptual understandings of leadership, and because some scholars suggest that women are well suited to lead contemporary organizations, the question gets raised in much of the literature: do men and women really lead differently? Leadership is a gendered concept, but does gender really matter?
**Men, women and leadership: Similar or different?** As leadership theory evolved, the understanding that gender perceptions play a part in who is perceived as an effective leader started to be woven into the literature. Older scholarship tended to focus on a dichotomous view of male/female leadership models, abilities and effectiveness, while most contemporary authors offer a more sophisticated analysis of how gender perceptions color our understanding of who can lead and how.

In the literature that polarizes male and female leaders, men are seen as leading in a more autocratic, hierarchical manner, while women lead in a more collaborative, communicative and people-focused way (Chliwniak, 1997; Colwill & Townsend, 1999; Cook, 2006). Scholars who go beyond this simplistic notion that men and women lead differently due to their natural tendencies posit that because leadership and gender are both social constructs, how men and women lead is viewed through those constructs (Eagly & Carli, 2007; Freeman, 2001; Klenke, 1996; Middlehurst, 1997). Some of these authors assess the impact that culture and organizational context have on perceptions of leadership. In doing so, they have found that when social and organizational cultures are accounted for, the differences in men’s and women’s leadership styles and effectiveness are negligible (Brown, 2010; Eagly & Carli, 2007; Freeman, 2001; Jones, 1987; Klenke, 1996; Powell & Graves, 2003).

The concept of the “double bind” adds further understanding to the notion that men and women lead differently. Because gender stereotypes and perceptions often dictate who can lead and how, some scholars find that women often get stuck in a catch-22 situation. If they lead in an authoritative, task-oriented (masculine) way, they are
criticized. Yet, if they lead in a more stereotypical feminine way, their leadership contributions are not valued (Aisenberg & Harrington, 1988; Chliwniak, 1997; Eagly & Carli, 2007; Freeman & Bourque, 2001; Klenke, 1996). Thus, extricating gender from concepts of leadership becomes tricky. If women, in context, are constantly having to figure out what leadership style will be accepted, determining whether they lead differently than men is a convoluted task. Analyzing behavior differences must be understood in the context of what is socially accepted for both men and women.

With the organizational culture, and leadership and gender literature as a backdrop, I turn now to scholarship that describes women’s experiences in context, beginning with corporate culture. Knowledge of gendered social constructs around women’s work roles and leadership helps to frame an understanding of their experiences in a variety of settings.

**Women in corporate culture.** Organizational culture defines the assumptions and values of organizations. These assumptions and values influence the behaviors of organizational members, and prescribe who is eligible to enter an organization and what roles they can play once inside. The literature on women in corporate culture describes how corporate environments evolved, the norms attached to them, and how gender stereotypes affect and are affected by these norms. It deepens the inquiry into culture if we can explain women’s experiences in a corporate setting and why that matters. Again, we start with this literature in a corporate setting for two reasons. First, the IT profession and the role of the CIO first emerged in industry, and so bring those values and assumptions into higher education. Second, the literature on women in corporate IT is far
more plentiful than it is in higher education, so it offers a basis for understanding phenomena in the higher education context.

The body of literature on women in corporate culture points out the White male origins of the corporate world, and how men’s early dominance continues to define business culture today (Jandeska & Kraimer, 2005; Kanter, 1977; O’Connor, 2006; Powell & Graves, 2003). In her classic text *Men and Women of the Corporation*, Rosabeth Moss Kanter (1977) wrote of women’s movement into the modern, white-collar workforce. Up until the early 20th century, when large corporations began to play a major part in the American economy, roles for men and women in the workplace and at home were quite segregated. Men ran businesses; women ran households. If women worked outside the home, they were typically employed as seamstresses or domestic help (Kanter, 1977). These segregated and stereotyped roles of leader and supporter thus largely influenced men and women’s roles as the modern corporation rose in prominence. As women moved into the white-collar workforce, they “naturally” filled the support roles that companies had to offer (Kanter, 1977). Women were presumed, at this point, to be unsuited to the stresses and strains associated with leading and managing organizations.

At that time, early management theorists like Frederick Winslow Taylor and Max Weber posited the rational nature of decision making and managing (Kanter, 1977). Where ideals of masculinity at that time favored the logical, rational, and unemotional, men were seen as more innately suited to the demands of leading organizations. Women were seen as too emotional to fit into these roles, and only suited to ones where they
would support men’s efforts (Kanter, 1977). This early gender segregation in
 corporations held firmly over time, so that even as societal notions around sex and gender
evolved, stereotyped roles for working men and women persisted (Kanter, 1977;
O’Connor, 2006; Powell & Graves, 2003). Masculine rationality earned men primacy in
business. Assumed feminine emotionality and irrationality kept women out of leadership
roles (Kanter, 1977; Powell & Graves, 2003).

Additionally, due to how male and female roles were polarized, men and women
were assumed to devote their full attention to their ascribed duties. Thus, as cultural
norms of the workplace evolved, so did the concept of the “ideal worker.” Those who
excelled on the job were understood to be, “…dedicated to their careers, 24 hours a day,
seven days a week, for periods of years and even decades at a stretch” (Drago, 2007, p.
8). In the early days of corporations, only men could achieve this ideal, a fact that over
time tied the ideal itself to concepts of masculinity.

If this historical picture is tied back to the literature describing the purpose and
strength of organizational culture, one can clearly see how these stereotypes and men’s
early dominance in the world of business informed a strong business culture favoring
men over women. The persistence that Schein (2010) and Deal and Kennedy (1982) note
as a central characteristic of organizational culture can then be linked to lingering gender
stereotypes about appropriate roles for men and women in the corporate world. The
tenacity of White, male corporate culture continues to be noted in recent research.
Jandeska and Kraimer’s (2005) quantitative study examines factors that help women
ascend the corporate ladder despite inhospitable corporate cultures; and Hawkins’ (2008)
ethnographic study looks at rituals that help women distance themselves from gendered assumptions of such cultures.

As corporations were built, segregated sex roles for men and women, as well as norms around ideal workers put power into the hands of men (Drago, 2007; Hawkins, 2008; Jandeska & Kraimer, 2005; Kanter, 1977; O’Connor, 2006; Powell & Graves, 2003). Men were the first to define and lead businesses, and thus the first to culturally define their values, rites and rituals. Where women were presumed incapable of leading in the same way, cultural definitions for women’s roles were also set by men. In the initial phases of building companies, and for a long time thereafter, women were not defining how organizations should be run. Without the power that comes with leading organizations and setting cultural norms, particular ways in which women might lead and concerns that both sexes might have around balancing work and home life did not get factored into the equation. In this way, corporate culture reinforced a dichotomized society where men worked (and could be “ideal” workers) and women maintained households and cared for families.

This gender segregation in the early days of corporate life had some distinct ramifications for women. The most widely noted and overarching implication centers on what is known in the literature as “outsider” status (Deal & Kennedy, 1982; O’Connor, 2006; Powell & Graves, 2003; Schein, 2010). Because women were not the ones creating or leading organizations, when they were let in, their differences were duly noted. Witness how the women who programmed the ENIAC in the 1940s were treated. Despite their deep knowledge of both the hardware and how to make it functional, their
contributions to the project were minimized. Another vivid example of this outsider status, described on pages 22 and 23, was the 1943 managerial manual portraying women as substitutes who could be trained for jobs, but who could never equally replace men (like plastic for metal). Scholars talk about the effects that this “outsider” status has on people. When one is not privy to the cultural norms that define “insider” status, then by default one receives fewer benefits and rewards than those on the inside (Schein, 2010).

One of the major benefits that scholars note insiders receive is access to opportunities. For women, their outsider status in corporations has historically blocked access both across the organization and up the chain of command. The nature of the outsider role, coupled with gender stereotypes, often meant that women were segregated into low-paying support roles, with no opportunity to even enter positions that might develop into a leadership rank (Jandeska & Kraimer, 2005; Kanter, 1977; Powell & Graves, 2003; Schein, 1994). A lack of opportunities horizontally across organizations, in areas that might steer individuals into leadership roles, meant that pathways to ascend the corporate ladder were shut off. This combined horizontal and vertical isolation led some scholars to refer to the ranks where women were welcome as “castes” (Aisenberg & Harrington, 1988; Kanter, 1977) or “pink collar ghettoes” (Roldan, Soe, & Yakura, 2004), two very evocative, but incisive terms.

As time shifted and women were allowed into positions that once had been open to only White men, they still remained on the outskirts of the cultural norms. Even as women were able to access positions, they still were not in control of the organization’s culture. Their lack of proportionality, along with their outsider status meant that they
became what Kanter (1977) termed “tokens” in their environment. She defines tokenism as existing in organizations where the majority represents 85% or more of the population, the minority 15% or less. The data on female CIOs in corporations fit into this definition, and so it is important to understand the impact of proportionally skewed groups on tokens.

Tokenism hurts outsiders in numerous ways. First, it gives those on the inside the illusion that proportionality issues have been addressed, thus perpetuating the lack of proportionality. It also exposes the tokens, making them more visible and ensuring that they – and all of their actions – represent everyone in their group, an immensely stressful position. Furthermore, it defines tokens within the dominant culture’s norms, measuring their worth by those norms (Kanter, 1977). In all, tokenism negatively affects those with token status, while keeping the majority’s cultural norms intact.

Because the majority sets the culture for the organization by default, those in the minority need to assimilate to the dominant culture in order to survive. The dominant culture often reinforces itself through the selection of new members, and “…in a sex-typed occupation the characteristic required for success tend to be those seen as more commonly held by the majority sex occupant” (Schein, 2010). As Schein (2010) notes, leaders tend to be most comfortable with and choose new members based on present cultural norms. Thus, in order for outsiders to be seen as acceptable choices, they have to assimilate to the cultural norms set by the insiders (Deal & Kennedy, 1982; Glazer-Raymo, 1999; Kanter, 1977; Powell & Graves, 2003; Schein, 2010). In doing so, those on the outside have to deny their unique perspective and point of view; for women, this
denial can mean a loss of their own – female – identity (Hawkins, 2008; Kanter, 1977; O’Connor, 2006; Schein, 2010). When a culture replicates itself in this way, what Kanter (1977) termed “homosocial reproduction,” those on the outside are left looking in, wondering about their own worth.

The ramifications of gender-unbalanced organizations – low-to-no access to options, exposure as tokens, required assimilation – all create an inhospitable culture for those on the outside (Jandeska & Kraimer, 2005), in this case, women. This inhospitable culture has earned itself the moniker “the chilly climate” (Aisenberg & Harrington, 1988; Roldan et al., 2004), a term used across corporate, higher education and IT literature. The corporate world has been, on the whole, difficult terrain for women to traverse over the years. Despite improvements in changing social norms around women’s abilities and roles, and Civil Rights legislation (Nidiffer, 2002) and affirmative action employment policies enacted to address structural inequities (Somers, 2002), corporate culture continues to resist change where female executives are involved.

Because my research interest focuses on an executive role in the IT sector, I now focus more narrowly on the literature that looks at women’s experiences in the corporate IT arena to see how some of the theoretical work around corporate culture plays out contextually. Since research that addresses women in higher education IT is nascent and sparse, and since many IT employees now employed in higher education began their careers or spent time in the corporate sector, insights from the women in corporate IT literature may help to bolster what is missing in the higher education literature.
Women in corporate IT culture. Like business in general, the IT profession originated and is grounded in White male culture (Roldan et al., 2004; Todd, Mardis, & Wyatt, 2005). IT emerged as a profession in the mid-20th century, a time when male and female roles were highly prescribed by gender stereotypes, and when women did not comprise a large proportion of the overall workforce. When women did participate in the emerging IT profession, these gender stereotypes strongly impacted what professional roles women were allowed to fill, as well as the level of acknowledgement they were given for their technical contributions to the field (Light, 1999; Todd et al., 2005), which was minimal.

Since women first entered the workforce, however, their situation has changed dramatically. According to the 2010 Bureau of Labor statistics, women now comprise 47% of the entire workforce (U.S. DOL, 2010b), and the National Center for Women in Information Technology reported that between 2000 and 2009, women made up between 55% and 58% of the professional workforce (NCWIT, 2011). Add to that the notion that IT has been recognized as one of the fastest growing industries in the U.S. (Ashcraft & Blithe, 2010; Freeman, 2001; Todd et al., 2005) and it would seem that there should be plenty of opportunities for women in IT.

The numbers in the IT profession, however, reflect a different story, as women remain vastly underrepresented. In 2008, only 18% of computer science and information science bachelor’s degrees awarded at colleges and universities went to women, a number that has been on the decline since the 1980s (Ashcraft & Blithe, 2010). This fact alone has implications for the future of the profession, as a strong female pipeline is
necessary for gender equity in technical positions. Scholars also note that in the workforce itself, women currently only hold between 25% and 27% of all IT-related positions in the US, another number that has been on the decline for years (Ashcraft & Blithe, 2010; Harris, Morello, & Raskino, 2007; Kaminski & Reilly, 2004; McKinney, Wilson, Brooks, O’Leary-Kelly, & Hardgrave, 2008; Todd et al., 2005; Trauth, Quesenberry, & Huang, 2009; and Wentling & Thomas, 2004).

![Percentage of Computing Occupations Held by Women, 2009](image)

*Figure 5.* Percentage of computing occupations held by women, 2009. Adapted from *Women in IT: The Facts* (p. 15), by C. Ashcraft, and S. Blithe, 2010, Boulder, CO: National Center for Women & Information Technology. Copyright 2010 by the National Center for Women & Information Technology.

Statistics on women in IT also point to a massive exodus for them at mid-career, after they have accumulated 10 to 20 years of experience: 56% of women leave IT at that
point in their careers, more than twice the percentage of men who do the same (Ashcraft & Blithe, 2010). This rate of exodus may partially explain the 6 to 1 ratio of male to female managers in the profession (McKinney et al., 2008), though research on the topic indicates that that picture is indeed complex.

Given this uninspiring picture for women in IT, what does the research say women are experiencing in the profession, and how does this compare to what we know about corporate culture in general? At a very basic level, the resistance to change that Schein (2010) spoke of as characteristic of organizational culture seems even more present in the IT profession than it is in the rest of the corporate world. Female representation is far below what it is in the rest of the professional workforce, and the numbers have been declining since the 1980’s, though NCWIT noted some stabilizing of this decline in 2008 and 2009 (Ashcraft & Blithe, 2010). Contemporary IT organizations remain dominated by White men.

At just 25%, women still fall somewhere between “token” and “minority” status in the general IT population, according to Kanter’s (1977) groupings. Additionally, female participation at the executive level of the corporate IT profession has not risen over 10%, which definitively makes women “tokens” (Kanter, 1977) in this world. Women are clearly “outsiders” (Deal & Kennedy, 1982; Schein, 2010) in IT, a White and male-centric profession. It is disconcerting that at leading technology companies like Google and Apple Inc., organizations known for their vision and innovation, female representation at the executive level is non-existent (Apple Inc., 2013; Google, 2013). Because of women’s persistent inability to break through the profession’s barriers to
more proportionate territory, scholars have tried to understand women’s perceptions of the situation and why IT culture is so resistant to change. How has women’s outsider status affected their perceptions of and experiences in the profession?

Some research has focused on perceptions that have been formed about the IT profession – and which continue to linger – and how they might keep women from even entering it. Literature that addresses this precipitating factor describes the culture as male-oriented and isolated (Bartol & Aspray, 2006; Todd et al., 2005); “difficult, boring, unattractive and solitary in nature, requiring little interaction with fellow workers or customers” (Wentling & Thomas, 2004, p. 27); and representing a hacker culture that emphasizes technological rather than social skills (Roldan et al., 2004).

That is one piece of the story, one that helps to clarify why more women may not choose to enter the profession. This and other literature also describes women’s experiences once inside the profession. The themes that emerge in the literature on women in corporate IT culture reflect those seen in the corporate culture literature. In general, women in IT confront and work in an inhospitable culture: their access to opportunities is limited, despite the explosion of IT jobs; they need to assimilate into IT culture in order to survive and succeed; and when they do ascend into leadership roles, they are very much treated like tokens.

In terms of opportunities, scholars look at both role segregation and access to leadership, which are connected. The same gender biases found in cultures that keep women out of certain positions also hinder their ascension into leadership roles. IT is a profession that has traditionally segregated men and women into jobs that reflect gender
stereotypes (Light, 1999). Todd et al. (2004) observed that as the profession developed, even though some women were exposed to technical work, they generally were not seen as competent in these areas and their technical contributions were commonly ignored. Early on in the profession, then, women were marginalized into support roles.

These historical tendencies have persisted, so that even today, scholars note how gender norms found in IT culture prescribe which jobs women can fill. They are often not seen as capable of more technical work (Bartol & Aspray, 2006; Harris et al., 2007; Lemons & Parzinger, 2001; Schein, 1994), and when they do end up in technical roles, they are viewed as less hard working or competent than men (Trauth et al., 2009). Roldan et al. (2004) called the administrative and support areas in IT where women often end up “pink collar ghettos” (p. 109), pointing out how feeder cultures in IT steer women away from more technical roles and into these isolated paths. It seems as though historical role segregation along gender lines has become a strong part of traditional IT culture, as it has in the rest of the corporate world.

The literature also points out how this division of labor affects women’s ability to climb the leadership ladder, something that will be analyzed more closely when looking at the glass ceiling scholarship, but which should be described briefly now. As a result of this role segregation, women lack access to the formal and informal networks that help individuals develop their careers (Ahuja, 2002; Bartol & Aspray, 2006; Harris et al., 2007; Wentling & Thomas, 2004). If women get stuck in lower level or non-technical positions, or are not socialized into them as adequately as men (McKinney et al., 2008), and if gender bias at the management level encourages ongoing segregation (Colwill &
Women as Chief Information Officers in Higher Education

Townsend, 1999), women will have access to fewer role models and mentors, and certainly not same-gender ones (Trauth et al., 2009). Also, if upper level jobs depend on functional expertise in technical areas as the literature suggests (Roldan et al., 2004; Wentling & Thomas, 2004), access to leadership will be shut off.

Much like what the women in corporate culture literature says, the social culture of IT seems to be one that has reinforced gendered notions and kept women away from powerful positions. When women do make it into executive leadership roles within IT, some authors note the exposure they feel as tokens (Wentling & Thomas, 2004) who are, as Kanter (1977) described, defined within the dominant (male) cultural norms (Colwill & Townsend, 1999; Roldan et al., 2004; Todd et al., 2005; Trauth et al., 2009).

Assimilation, described in the women in corporate culture literature as a necessary survival tactic for tokens and minorities in organizations with strong dominant cultures, was often noted in this literature as well. Female participants in Wentling and Thomas’ (2004) study often talked about their difficulties assimilating, or fitting into, the dominant male IT culture. Trauth et al.’s (2009) qualitative study also spoke of how hard women had to try to fit in, with one participant noting that she tried to dress like a “computer geek” (p. 17) so that she better resembled the men in her organization. Lemons and Parzinger (2001) suggested assimilating into cultural norms in order to succeed, though they made the responsibility the woman’s rather than the organization’s, which is probably not the best strategy if the goal is organizational change.

All of these factors add up to a culture widely perceived by women who participate in it as inhospitable, hostile even, given its strong male bias. These negative
perceptions of the profession beg the question of why women want to participate in it in the first place. Given everything that has been said against it, one can easily question why participation rates have risen to even 25%. It turns out, however, that those inside the profession find numerous things to like about both the work and the profession.

McKinney et al.’s 2008 survey of 815 IT professionals showed that in many ways, men and women’s motivations for working in IT are the same. They like the autonomy, task variety, opportunities, income, and prestige of the profession. Women however, more often than men, listed flexibility, job security and ease of entry as strong motivators for being in the profession. Kaminski and Reilly’s (2004) interview participants also listed flexibility and a team-based environment as positive reasons for working in IT. Teamwork and collaboration came up in Wentling and Thomas’ (2004) interviews as well, along with the intellectual stimulation associated with learning new and challenging things. Unlike the description of the isolated programmer that may dominate public perceptions of IT work, women inside the profession actually described a much different and appealing kind of environment. The work, it seems, is interesting, and often takes place in collaborative and flexible contexts. Unfortunately, the masculine culture that surrounds the work in the corporate sector seems to overshadow some of the very positive aspects the profession offers. With all of this in mind, we begin to turn our lens to higher education, to see if and how that IT culture has produced different experiences for women.

Higher education culture. So far, this section of the literature review has looked at gendered experiences of organizational culture in corporate and IT settings. This was
done because the literature on gender and IT in higher education is nascent, and while technologies were often first developed in academic settings, the IT profession itself developed in a corporate one. The questions I wanted to ask and the research I wanted to add to, however, revolved around higher education IT, so it was important to know more about the unique culture of higher education, in order to properly contextualize the research questions.

With this in mind, this review of the literature now looks at the administrative culture of higher education, in order to understand how IT organizations might have to function differently than they do in corporate environments. There are as many different types of higher education institutions as there are corporations, but higher education has its own particular culture and context. Thus, I began by looking at what higher education scholars say about academic culture and how they describe it. In “Organizational Culture in Higher Education: Defining the Essentials,” William Tierney (1988) echoed Schein, and Deal and Kennedy’s work, stating that culture is “reflected in what is done, how it is done, and who is involved doing it” (p. 3) and “grounded in shared assumptions of individuals participating in the organization” (p. 4).

Those shared assumptions in higher education are unique, however. Karl Weick (1976) describes academic institutions as “loosely coupled” ones, where coupling refers to units or elements within an organization that have some kind of exchange relationship. The units that comprise the organization are separate, but have varying levels of variables in common. The extent to which those variables overlap or intersect reflect the tightness or looseness of the coupling. Bensimon, Neumann, and Birnbaum (1989) also describe
academic institutions this way. In their monograph, *Making Sense of Administrative Leadership: The “L” Word in Higher Education*, which uses academic presidents as the unit of analysis, they stress how little power even presidents have, given the multiplicity of actors and leaders in these loosely coupled systems. They additionally point out that academic institutions do not have clear goals and outcomes that focus their work. This contrasts with most corporate environments, where the overall mission of the organization is focused on products or processes that are sold.

Dill described a number of other distinct characteristics of higher education, including: “lifetime employment, collective decision making, individual responsibility, infrequent promotion, and implicit, informal evaluation” (as cited in Tierney, 1988, p. 7). Bensimon et al. (1989) also stress the essential part that collective decision making plays in academia’s loosely coupled atmosphere, while Burton Clark talks about the prioritized role given to loyalty and belief in institutional mission (as cited in Tierney, 1988, p. 7).

These factors and characteristics are ones that IT organizations in academia – and their leaders – might need to consider in order to be effective. Long-term employment, collectivity and loosely coupled units that serve unclear organizational goals all sound very different from the traditional top-down, production oriented model of American corporations. In order to be effective, then, IT organizations and leaders need to understand that context.

Bensimon et al. (1989) work on administrative leadership in higher education provides various frameworks for looking at leadership in context in higher education, which shed further light on the varying contexts there. They list the bureaucratic, human
resource, political, and symbolic as frameworks individuals might use as they lead organizations. The bureaucratic framework focuses on making decisions and coordinating the work of others; in this one, leaders make decisions. In the human resource frame, leaders are part of a community of equals, and facilitate rather than command. The political frame prioritizes controlling information, and building support to meet jointly held objectives; diplomacy and persuasion are necessary for success. The symbolic frame sees leaders as facilitators of ongoing processes. Bensimon et al. (1989) argue that leaders in higher education must be flexible enough to understand all of these frameworks and know when to use each of them. They indicate that academic institutions need (and often operate with) bureaucratic structures, and also have collegial social systems, but that both are mediated by political power and cultural elements. In essence, none of the frameworks exist in a vacuum or are dominant all the time.

This scholarship focuses on higher education in general, and in particular on how academic administrators might lead effectively. Missing, however, is an analysis of how IT organizations within academic institutions contribute and respond to that culture. One can obtain a generic understanding of academic culture and frameworks for effective leadership, but how does the work of IT fit into that? How are the cultural elements of the academy aligned with IT organizations and vice versa? Additionally, this literature does not take gender into account, so before looking at IT organizations within higher education, a nuanced understanding of women’s experiences in academia is necessary.

**Women in higher education administrative culture.** Very little research and scholarship exists on women in higher education IT. It is necessary, however, to
Women as Chief Information Officers in Higher Education

generally understand women’s experiences in higher education, given its history and particular cultural context. As the CIO is an administrative position, I looked at female administrators’ experiences in higher education, though some literature on female faculty members augmented what was said about administration.

This literature echoed the themes that emerged in the women in corporate IT literature. Higher education is, and traditionally has been, the domain of White men (Aisenberg & Harrington, 1988; Chliwniak, 1997; Glazer-Raymo, 1999; Hornig, 2003; Spurling, 1997). Current statistics show that only 26% of full professors are women (AHE, 2009), and 23% of female presidents (Brown, 2009). When you look at type of institutions, the picture gets grimmer: in 2006, only 13.8% of doctorate granting institutions had female presidents (ACE 2007 Report, 2007; RIWL, 2010).

What does the literature say about women’s experiences in higher education? Authors who talk about those experiences, whether faculty or administrators’, reflect what Schein (2010) points out about organizational culture’s stickiness. Aisenberg and Harrington (1988), Glazer-Raymo (1999), Hornig (2003), and Spurling (1997) all note how difficult it has been for women to gain equal footing in academe, as men have set academia’s dominant culture. Paula Young’s (2004) case study on leadership styles in a college during a period of change indicated, as Schein (2010) did, that organizations need crises, management changes or both in order to shift institutional culture. Interestingly, Chliwniak (1997) ignores what others say about entrenched organizational cultures, suggesting that since institutions are only systems, that policy and procedural changes should be able to alter them. Glazer-Raymo (1999), on the other hand, though she
advocates for the use of policy-level changes, smartly points out that policy and procedural changes alone cannot change things, as the equity women may want to achieve “is largely dependent on the indulgence of males in positions of power, influence, and authority” (p. 185).

As in corporate IT, women are “outsiders” (Deal & Kennedy, 1982; Schein, 2010) as both faculty and administrators, and so experience academic institutions from that perspective (Aisenberg & Harrington, 1988; Chliwniak, 1997; Glazer-Raymo, 1999; Spurling, 1997). This is seen across the organization, where women, depending on the type of institution and discipline they are in, fall somewhere between “token” and “minority” status (Kanter, 1977). Even in fields where women dominate the ranks, their overall standing at the institutional level falls below the areas where men dominate (Glazer-Raymo, 1999). Aisenberg and Harrington (1988) note that women who are in male dominated fields do not necessarily gain power and, in fact, can easily lose themselves – a high price to pay for pursuing a passion. To this second point, Glazer-Raymo (1999) also speaks about the lack of acceptance of women’s voices.

A number of the authors in this literature also discussed how women, as outsiders, needed to assimilate to the dominant culture, working on men’s shared assumptions and not their own (Aisenberg & Harrington, 1988; Chliwniak, 1997; Glazer-Raymo, 1999; Young, 2004). Young’s (2004) study, which looked at the presence of transformational and transactional leadership styles among managers assisting with organizational change, speculated that the higher percentage of women exhibiting a transactional leadership style
– one stereotypically associated with masculine characteristics – was because women had to assimilate and prove themselves in a male-dominated environment.

What was missing from this literature was the notion of particular pathway issues for women, an important component of the IT literature. Perhaps the road to the top for academic administrators, though similarly paved with various obstacles and detours, is not riddled with IT’s pathway issues? Women are undeniably segregated into certain areas among the faculty, but this was not highlighted as a factor that hinders access to top administrative posts. Pathway segregation may be a more pressing issue for women in IT than in higher education administration in general, and something worth noting in the review of the glass ceiling literature.

**Higher education IT culture.** As previously mentioned, scholarship on IT organizations in higher education is scant: the topic just has not been widely studied. Gendered experiences inside of that culture have been given even less attention. One major study of IT in higher education was published in 2004 by ECAR, entitled *Information Technology Leadership in Higher Education: The Condition of the Community* (Katz et al., 2004). This mixed method study surveyed the higher education IT community widely, while also using interviews and case studies to ground some of the quantitative findings.

Like Weick (1976), and Bensimon et al. (1989), the authors spoke of higher education organizations as loosely coupled ones with unclear overall goals and objectives. Operating in this environment does distinguish higher education IT organizations from their industry counterparts. Their study also looked at characteristics
of these IT organizations, and described them in the following ways: they are mission
driven, with employees being drawn to higher education as a calling; the environments
are generally appealing, and employees tend to be loyal, both to their institutions and to
higher education; management is rated more positively than in industry; leadership styles
tend to be effective, with transformational and transactional ones being regularly
combined and used; and innovation, especially at doctoral institutions, tends to be low
(Katz, et al., 2004).

A follow-up ECAR study in 2008, Leading the IT Workforce in Higher
Education, had similar findings. Higher education IT employees tend to be loyal to
academia, though this survey indicated that this loyalty was tied to age. Employees
between the ages of 41 and 50 planned to stay in higher education for at least five years
84.5% of the time, while those between the ages of 31 and 40 said they would stay this
long 78.6% of the time. Respondents who were either under thirty or over fifty exhibited
much less loyalty than that, as measured by the number of years they planned to stay
working in higher education (Goldstein & Pirani, 2008). Respondents also indicated that
they found the higher education IT culture appealing, and its leaders, effective.
Transformational and transactional leadership styles were once again mentioned as the
two styles most often used by those managing higher education IT organizations
(Goldstein & Pirani, 2008).

When comparing these research findings to the literature on the culture of higher
education, some similarities can be seen, but differences emerge as well. Dill’s notion of
longevity, and Clark’s of loyalty and belief in mission (as cited in Tierney, 1988, p. 7),
Women as Chief Information Officers in Higher Education

seem to be reflected in these contemporary studies. Higher education IT employees seem to believe in higher education, enjoy their jobs, and stay at their institutions for a long time. Collective decision making, while not as clearly aligned with the studies’ findings, might partially explain why IT employees rated their managers higher than their industry counterparts’ in 2004; higher education IT employees often said that they could speak openly in their environments (Katz, et al., 2004).

On the other hand, the individual responsibility and infrequent promotion noted by higher education scholars are not reflected in these ECAR studies. In fact, the authors talk about the teamwork involved, and employees’ ability to flexibly move around within their institutions and the profession (Goldstein & Pirani, 2008; Katz et al., 2004). The difference may be in the unit of analysis. Whereas higher education culture literature focuses on academic departments and leaders, IT falls on the administrative side of the house. Longevity is a characteristic of faculty employment by necessity; the same is not true of IT employees anywhere. In this way, higher education IT employees more closely match their industry peers.

The two studies also reflect Bensimon et al.’s (1989) advocacy for flexible leadership styles in higher education. Both Katz et al. (2004) and Goldstein and Pirani (2008) focus on a combination of transformational and transactional leadership styles as most effective for higher education IT organizations. Bensimon et al. (1989) indicate that transformational leadership is not necessarily a style suited to the shared governance involved in academic administration, but Young (2004) points out that during times of change, its use is helpful, if not necessary. Perhaps the facts that IT is a more bureaucratic
Women as Chief Information Officers in Higher Education

part of an academic institution, and one constantly dealing with technological change, make leadership styles that seem unsuitable to academic administrators fit well in IT.

**Women in higher education IT culture.** While the ECAR studies offer insights into the higher education IT community, not much is known about women’s experiences inside it. The two studies do offer some helpful basic demographic information on higher education IT, however. Their survey respondents were primarily White (92.9% and 86.7% in 2004 and 2008, respectively) and male (62.7% and 64.2%, in the same years). At over 35%, the female proportion of the higher education IT community is much higher than in industry, where it falls in the range of 25% and 27%, and has been on the decline (Ashcraft & Blithe, 2010; Harris et al., 2007; Kaminski & Reilly, 2004; McKinney et al., 2008; Todd et al., 2005; Trauth et al., 2009; and Wentling & Thomas, 2004). In the 2004 ECAR study, 21.4% of their female respondents were in CIO/equivalent positions (Katz, et al., 2004), and survey data since then has shown women occupying the top IT leadership spot in higher education 23% to 26% of the time (Arroway et al., 2011; Brown, 2011b; Brown & McClure, 2010). This compares to industry’s lower numbers of around 9% to 10% (Ashcraft & Blithe, 2010; King, 2011; TelicityGroup, 2012). Thus, women represent significantly larger proportions of the IT community in higher education than they do in the corporate world.

No research yet exists to explain the variance of female representation noted between business and higher education IT, but many scholars have attempted to explain the reasons behind women’s underrepresentation in both IT and executive roles. Thus, the review now turns to that literature in order to examine the various factors scholars have
enumerated in trying to interpret these phenomena. In order to eventually understand the
organizational differences that might contribute to higher percentages of female CIOs in
higher education, we need to know first what keeps women out of IT and executive roles,
as well as what sort of factors help to recruit and retain them.

**Glass Ceiling/Labyrinth**

**Definition and history: From glass ceiling to labyrinth.** As was illustrated early on in this review, women’s path to equity in the IT workplace was historically laden with obstacles, both implicit (societal norms) and explicit (rules about what work roles women could fill). The challenges that women faced in IT reflected those in greater society. Through the 1960s, rules of the workplace reinforced a division of labor by sex: men were breadwinners, women, homemakers. If women worked, the positions they took (or were allowed to take) mirrored these social mores. Women were unambiguously kept out of executive positions. These rules were simple, clear, and supported by the majority of Americans.

As times changed, so did people’s acceptance of women in the work place. By the 1970s, women were no longer excluded from all positions of power; it became more common for women to obtain managerial roles. Even with this progress, however, they were still refused entry into top leadership – or executive – positions. Carol Hymowitz and Timothy Schellhardt of the *Wall Street Journal* labeled this phenomenon “the glass ceiling” in 1986. As they described it, “(e)ven those women who rose steadily through the ranks eventually crashed into an invisible barrier” (as cited in Eagly & Carli, 2007, p. 4). This barrier took the shape of both policies and practices that deliberately
Women as Chief Information Officers in Higher Education

discriminated against women when it came to executive positions. A seemingly adequate metaphor for women’s experiences, the term “the glass ceiling” stuck.

After it was named and acknowledged, its presence began to be challenged. Public attention to the problem, including a congressional commission tasked with reporting on the status of the glass ceiling in 1995, prodded the social transformation around gender roles in the workplace along. More women began to attain higher positions, and some even started to reach the executive suite. Some women were finding a way to the top, breaking their way right through that glass ceiling. The emphasis here is on the word “some.” Though the media has often enthusiastically applauded women’s progress, the reality remains that most women still do not – for one reason or another – make it to a corner office in any industry. Recall again that in the IT industry alone, women reported holding only 9% of all management positions in 2008 (Ashcraft & Blithe, 2010). This, at a time when women represent almost half of the entire workforce, and the largest percentage of women – 41% – work in “management, professional, and related occupations” (U.S. DOL, 2010a). Clearly, the proportion of women who might attain executive status generally does not. Though some do secure these positions, more experience the persistent barriers that block executive suite access.

Perhaps the glass ceiling metaphor is not adequate in describing women’s experiences today, however, as it implies that they make easy progress in their careers until they reach the executive level and then are stopped. Scholars who have studied women’s leadership attainment efforts have illustrated just that: that women’s situations are far more nuanced than the glass ceiling metaphor suggests. In their book Through the
Labyrinth: The Truth About How Women Become Leaders, Alice Eagly and Linda Carli (2007) point out how misleading this metaphor can be, and instead offer a new one – the labyrinth – aimed at a more accurate, and less linear, portrayal of women’s realities throughout their careers. Rather than a straight shot, the picture of a labyrinth suggests that women encounter and must handle twists and turns along their career path, and that advancement requires a measure of skill and persistence (not to mention a touch of luck). It is with that picture in mind that I will review what the literature has to say about the various factors that women encounter and must address throughout their careers.

**IT and the glass ceiling: Setting the context.** This literature review incorporates a broad range of glass ceiling/labyrinth scholarship, as the phenomena investigated around barriers to executive status affect women universally, regardless of industry or discipline. Before delving into the obstacles directly, however, it does help to situate the literature in the context of the IT profession, as IT’s norms may influence and/or exaggerate the experiences noted in the aggregate. IT is a profession and industry that cannot be uncoupled from its deep historical associations with a gender-biased workforce. Despite women’s presence and contributions in the very early days of the profession, IT developed as a male-dominated line of work. Because of that, its cultural norms are heavily steeped in androcentric values (Drury, 2011; Light, 1999). Such exaggerated cultures resist change and must be taken into account when trying to understand how to do so.

Some scholars have expressed great hope about the possibilities for women in IT, mainly for two reasons: expanding job opportunities and the newness of the industry.
That IT business units have expanded in organizations and need people to lead them is clear. In the decade ending in 2018, the Bureau of Labor Statistics expects a 19.9% increase in core technology occupations, compared to only 10% across the rest of the labor force (Stock, 2011). Clearly, new opportunities exist. Because of this, some authors assume that this technological expansion equals new leadership opportunities for women (Colwill & Townsend, 1999; Freeman, 2001). Eagly and Carli (2007) also note that the agile, innovative nature of the technology industry should make things easier for women to attain executive positions.

That opportunities are expanding in a new industry does not necessarily equate to abundant possibilities for men and women alike; the good news needs to be tempered by a scholarly understanding of how masculine IT cultures affect organizational practices. A 2009 literature review by Susan Eisner and Mary Ellen O’Grady Harvey noted that women’s rise to top positions corresponded to industries with higher overall percentages of women working in them. Conversely, industries employing fewer women had fewer female executives. Additionally, other research has shown that a masculine organizational ethos acts to appropriate roles along gender lines. In such cultures, women are frequently seen as incompetent, and devalued when they occupy traditionally male roles. Gendered norms also prescribe how women can act; those who violate expectations are often treated poorly (Heilman, 2001; Powell & Graves, 2003).

Thus, despite the opportunities that the IT profession has to offer, the cultural artifacts attached to it lead to a more sobering conclusion: IT is not the warm, welcoming place for women it ought to be and by its nature is shutting women out. It is no surprise
then, that studies looking at female CIOs in industry find that it is harder for women to become a CIO than any other type of executive (Locher, 2006). With this in mind, the review will now focus on the variety of situations and factors that women encounter as they aspire to and pursue leadership roles. Scholars have examined the glass ceiling/labyrinth extensively, and so in order to get a full picture of what has made things so difficult for women to achieve proportionate representation in executive ranks, we review what they have to say. What comprises this complex web of factors that contribute to women’s difficulties achieving executive status, and what parts do gender stereotypes and discrimination play in maintaining the existing barriers and obstacles?

**The labyrinth.**

**The pipeline.** We begin with what is referred to as the “pipeline,” a term used to describe the flow of something that is expected, but has not yet arrived at its destination. In this context, it is used to describe the number of people – women, specifically – who are available to participate in the IT workforce. The IT pipeline has been investigated all the way back to childhood, where scholars have explored the different ways that boys and girls are socialized with computers and technology. For the purposes of this review, there are more pressing pipeline topics to cover, but it is still interesting to note what Jane Margolis and Allan Fisher say about young girls and boys in their book, *Unlocking the Clubhouse: Women in Computing* (2003), as it provides a backdrop for the pipeline question. Margolis and Fisher (2003) considered that:

> Despite the rapid changes in technology and some fifteen years of literature covering the era of the ubiquitous personal computer, a remarkably
consistent picture emerges: more boys than girls experience an early passionate attachment to computers, whereas for most girls attachment is muted and is one “interest among many.” These attachment differences help to shape students’, parents’, and teachers’ expectations that boys and men, not girls and women, will excel in and enjoy computing (p. 16).

Knowing that gender-biased socialization around computing begins very early on helps to provide context for what research has illustrated around sex-balanced participation in computing at the postsecondary level. These early social patterns expand to generalizations as children grow. By high school, computer labs tend to be dominated by boys, and girls feel unwelcome. High school computer science classes become “all boys clubs.” Everything from who is encouraged to take computer science to the pedagogy is geared toward boys. The high school years are important, too; if girls take programming classes in high school, they are more likely to pursue computer science in college (Margolis & Fisher, 2003). Thus, environments that shut girls out at younger ages can and do have a devastating effect on their participation in the discipline, and ultimately, women’s presence in the profession.

By the time young women get to college and then graduate school, the culture of computing seems to be turning many of them away. Female students have never had a strong standing in college and university computer science departments, and recent data indicate that despite understanding this for years now, the numbers are not dramatically improving. In their review of women’s participation in postsecondary computing education, J. McGrath Cohoon and William Aspray (2006) examined IPEDS data for
women earning computer science degrees between 1992 and 2002. The data showed declines over the decade for both female associate and bachelor degree earners. The percentage of women earning masters or doctoral degrees in computer science did rise, from 26% to 34%, and 15% to 19%, respectively. While these latter numbers do not nearly match women’s availability for these programs, the rise in advanced degrees looked hopeful. In spite of that potential for growth, 2010 data from the Council of Graduate Schools illustrated that change is not happening too rapidly: women represented 31% of all masters degree earners in math or computer science, and doctoral degree earners 27% of the time (Bell, 2010). Overall, despite some progress among advanced degree holders, it is clear that the proportions of women and men choosing computer science are not shifting markedly or quickly toward a more balanced situation.

This lack of balance between the sexes in the educational system certainly has implications for women’s representation in the IT workforce. While a computer science degree is not necessary for working in the IT industry, those with more technical degrees often go that route. As was discussed earlier in this review, educational background is also tied to the CIO position. Though a technical education is not a necessity for the role, the data show that those with technical degrees often fill these positions, both in industry and academia, so it is helpful to know how many women are academically prepared for technical jobs in IT.

In looking at the transition from the academic world to the IT workplace, women’s representation does not improve. Much research has looked at the number of women working in corporate IT, and what has been found there mirrors what has been
seen in academia: women are not proportionally represented in the IT profession. Between 2000 and 2007, data showed women representing about a quarter of all IT workers (Cone, 2007; D’agostino, 2003; Vowler, 2003). That remained unchanged more recently, as The National Center for Women in Information Technology reported Bureau of Labor Statistics data that held that number steady: women made up 25% of the computing workforce in 2009 (Ashcraft & Blithe, 2010). Women do not have any better representation on the whole as IT employees than they do as computer science students, really; this fact is important to keep in mind when understanding the lack of presence women have as technology executives. Three times as many men work in IT, so women’s chances for getting to the top do not nearly match men’s.

The pipeline in higher education IT. Interestingly, the data on women’s participation in IT workforce that have been collected in the academic sector show more proportionality than in industry. As with the CIO data noted early on in this review, women have better overall representation in higher education IT departments than they do in corporate ones. A 2004 ECAR study on information technology leadership in higher education found that 37.3% of IT workers were women (Katz et al., 2004). Four years later, a follow-up survey reported 35.8% (Goldstein & Pirani, 2008). Additionally, 2011 data from the CHECS survey of technology leaders in higher education has shown that women represent about 37% of all technology leaders, where technology leader is defined as the next position down from CIO (Brown, 2011a).

That higher education’s CIO pipeline for women is more robust than it is in the corporate sector is noteworthy. In any case, more women entering IT in higher education
improves their opportunities for rising to the top rank in the organization. Not every IT worker wants to be a CIO, but since many do, it makes good sense to review what the literature has to say about what pathway IT workers take in getting there.

Pathway issues. If one wants to be a CIO, it makes sense to know something about the profile of those who are already in the position, and how they got there. It is a very particular executive role, one not easily filled by other executives. The role itself was described earlier in this review, so we know that in general, CIOs are executives who make strategic and long-term decisions about an organization’s technological direction, while taking into account the company’s overall strategic plans. Where not much is known about the pathway to the higher education CIO slot, it helps to look to what literature from the corporate sector says about how pathways affect a person’s ability to achieve executive status, and whether or not women are affected by that.

Scholars who have looked at corporate practices that create barriers to obtaining senior positions often focus on ways in which men and women are segregated as they enter organizations. In particular, workers who aspire to top management slots need “line” experience – knowledge and skills related to the day-to-day operations of the organization (Eagly & Carli, 2007). “Staff” positions serve the organization more indirectly, as they support the line functions. Those who have analyzed line and staff positions in corporations along gender lines have found that they are, in fact, highly gendered, with more men occupying line positions and women, staff ones (Goodman, Fields & Blum, 2003; Helfat, Harris, & Wolfson, 2000; Oakley, 2000). This division of labor leads to gender segregation in leadership, as the most powerful executive positions
require line experience. Thus, this *pathway* issue, where women are hired into roles with less potential for achieving the most powerful positions, creates a *pipeline* issue by diverting women from the paths that might lead to the top.

How does this corporate research correlate to IT organizations? As with line-and-staff organizations, technology organizations need both technical and support roles. While this oversimplifies the matter, as IT is a very diverse profession with numerous specialties defined within it, those who have researched IT organizations have noted that as with other corporate organizations, roles are often divided along gender lines, which is not surprising given IT’s historical roots. A literature review conducted by Kathryn Bartol and William Aspray (2006) identified numerous studies illustrating gendered patterns for IT workers. They found that women were more likely to fill less technical and managerial roles than men. Where the positions and work for men and women were reported as similar, gender differences still existed: women spent less of their time on high-end work, were given less complex assignments, and had less autonomy in the work they were carrying out (Bartol & Aspray, 2006). For those who seek the CIO office, being given more complex, high-end assignments and the autonomy to complete them are necessary pre-requisites for proving oneself. If women are not being offered opportunities to do that at the same rate as men and are seen as less capable, this segregation will naturally affect their chances for promotion.

Little is known about the CIO pathway in higher education, though as in industry, IT organizations require both technical and support roles. No analysis has been done, however, on any gendered aspects of the various types of positions in higher education
IT. The 2011 CHECS study has tried to understand the CIO pathway by asking current CIOs about their prior two positions. In doing this, it has tried to define the routes in higher education that lead to CIO, so that aspirants to that role might better assess their own chances of reaching it. When looking at current CIOs’ previous positions, 80% of the respondents reported being in jobs requiring some sort of technical knowledge. Responses included the following type of job titles: CIO or senior IT position, Administrative Technology Director/Manager, Academic Technology Director/Manager, Deputy CIO, Systems Director/Manager, and Network Director/Manager, among others. These positions reflect pathways one might expect for aspiring CIOs. On the other hand, a full 20% of respondents indicated that just one position prior to being CIO, they were in a position that was not necessarily technical by nature. These responses included roles such as Faculty, Associate/Assistant VP, Dean/Associate Dean, Didn’t work in the IT Department, Library, and Executive Outside IT. Similarly, current higher education CIOs reported that 28% of the time, they were in a role not necessarily connected to IT two positions prior to their current role. Interestingly, Faculty was the seventh highest response reported for one position prior to CIO and the third highest response for two positions prior (Brown, 2011b). It appears that in higher education, varying routes can and do lead to the CIO role, though a technical background is still highly correlated with it.

Coupled with the data on prior positions, the same report also collected survey responses from CIOs about their educational major. The majority of CIOs, 73%, fell into four educational major categories: Technology, Business, Education or Administration.
The other 27%, however, had a wide variety of backgrounds, including Engineering, Psychology, Library and Information Science, English, Sociology and Philosophy. When asked what type of degree a CIO should have, 34% of the time, respondents answered that the “Major is not important.” Just below that, at 23% each, were Business and Technology majors (Brown, 2011b). These data are consistent with what had been found in an early study published by CAUSE on the newly emerging CIO position: some sort of technical or management degree is a likely background for a CIO in academia, though others can and do fill the position (Penrod et al., 1990).

While not much more is known about how aspiring CIOs reach that position in higher education, the variation seen in the types of positions individuals are in before becoming a CIO, and the variety of educational backgrounds they possess suggest that the pathway to that role may be more diverse than it is in industry. That higher education institutions are mission driven, loosely coupled organizations with diverse functional areas and diffuse goals, rather than profit driven organizations with more homogenous, tightly structured, and bureaucratic organizational configurations may mean that individuals in higher education have more varied opportunities for reaching the senior-most IT post. This area is ripe for further investigation and inquiry, especially as it relates to women.

**Responsibilities at home.** One of the most salient factors that scholars of the glass ceiling/labyrinth have paid attention to is how society and organizations have handled women’s presence in the workforce as it relates to family responsibilities. Women have been working outside of the home for many years, a fact that has much to do with
feminist efforts between the 1960s and 1990s encouraging principles of gender equality (Gilbert, 2008). Their entry into the workforce, however, did not force a sudden shift in societal views around what role they played at home, nor did organizations automatically (or rapidly) change their practices to accommodate their presence either. Workforce norms, in fact, have traditionally emphasized early entry with continuous labor-force participation, or as Neil Gilbert (2008) put it, “…you hit the ground running upon leaving school and stay in the race until retirement…” (p. 100). Women’s working experiences have been different than men’s, and those differences have had implications for how women approach their careers and aspirations for leadership, as well as how organizations perceive and treat them. Assumptions about the bifurcation of roles – men at work, women at home – have deeply affected women’s experiences as employees in paid labor.

Researchers looking into this issue have noted the persistence of these assumptions. In their 2001 survey, Carolyn Hewlett and Norma Vite-León found that “(h)ighly qualified women continue to carry the lion’s share of the domestic responsibilities” (as cited in Hewlett, Luce, Shiller, & Southwell, 2005, p.18). Working women regularly make sure that they clean the house, prepare meals, grocery shop, pay bills and do laundry far more often than their husbands/partners. This lack of proportionality was echoed in Bureau of Labor Statistics trend data captured between 1965 and 2006. Though men’s contributions to housekeeping have increased over the years, women still put in about 1.7 hours for every hour that men do (Eagly & Carli, 2007, p. 50). Other scholars have noted the same thing: women still perform more of the
core household duties, even when they are working the same number of hours outside of the home (Gilbert, 2008; Lewis, 1994; Powell & Graves, 2003; Yasin & Helms, 2007).

In addition to the basic housework, the same – and more – has been said about childcare. A traditional division of labor is often established when children are born, despite substantial changes in men’s attitudes about caring for their offspring. Hewlett et al. found that the discrepancies that exist between the sexes around household duties are also attached to the variety of responsibilities linked to childcare (2005, p. 18). Eagly and Carli noted the same: married women provide 2.1 hours of childcare for every hour their husbands do (2007, p. 51). Family duties, especially caring for children, are noted as issues for women to overcome throughout the glass ceiling/labyrinth literature, whether focusing on IT in industry or in higher education. It is universally acknowledged that women’s careers are deeply affected when they have children; these assumptions differ for men despite years of progress around gender equality (Ahuja, 2002; Helfat et al., 2000; Lewis, 1994). Efforts that encouraged women’s increased participation in the workforce were not immediately accompanied by parallel cultural changes on the home front; shifts in those norms have notably lagged behind (Gilbert, 2008).

Some scholars who have studied Generation Y’s responses to questions about work-family balance have found that this younger cohort, the youngest currently in the workforce, seem more gender balanced than their predecessors in their expectations. Both Generation Y women and men want to be able to balance work and family, and want the organizations they work for to respond to that desire (Bartol & Aspray, 2006; Eisner & O’Grady Harvey, 2009). This reflects what gender feminists have been seeking: “…a
new pattern of socialization for men and women that raises expectations for equal participation at all levels in the labor force and in every facet of domestic work and childrearing activities” (Gilbert, 2008, p. 99). Whether these desires will equate to improved realities for women remains to be seen. Despite cultural evolution, what we currently know is that when it comes to work and family, presumptions about who belongs where still have a long way to go.

The socially ascribed assumptions around housework and childcare have implications for women’s careers. For high-achieving women, their career clocks and biological clocks are often in conflict: prime work years conflict with prime child rearing ones (Ahuja, 2002; Eagly & Carli, 2007). Just as they are hitting their stride career-wise, the question around children frequently comes up. Social assumptions in place, the burden is then on women to figure out how to manage their desires for both. When children first come into the picture, some women decide to keep working, others take time off. Some men do as well, but it is far more common for women to struggle with whether they should keep their jobs or not when they enter these conflict-ridden years (Eagly & Carli, 2007; Hewlett et al., 2005; Lewis, 1994; Powell & Graves, 2003).

If women keep their jobs, the struggle to maintain both roles can be overwhelming. Neil Gilbert (2008) points out that even if men did assume “…a full 50 percent of the domestic chores and childrearing duties, family life would still be no picnic” (p. 152). Women, however, are the ones more likely to take time off for children’s sick days and school events than men. They are also more likely than men to look for more flexible or part-time employment, so that they can successfully meet the
varying demands of both work and family (Eagly & Carli, 2007; Hewlett et al., 2005). If women disrupt their careers by taking time off, it disadvantages them in a variety of ways. First of all, they take a financial hit, both in terms of salary and social security earnings. Women lose out in the short term because they eliminate their wages. They also affect their long-term earnings, however. Research has shown that the longer women are out of the workforce, the less they earn when they return (Eagly & Carli, 2007; Hewlett et al., 2005). For IT professionals in particular, returning to work after time away can be harder than in other professions due to the rapid pace of technological change (Cone, 2007). Overall, however, the largest disadvantage for women is the assumption that they are the ones having to make the choice between work and family, or figure out how to balance both. As has been illustrated, these expectations can permeate women’s experiences throughout their careers. Household responsibilities play a distinctive role in women’s decisions about the type of jobs and careers to pursue, and is a salient factor for understanding women’s experiences in higher education IT.

Women’s leadership: Acceptance or rejection. Social norms affect women’s experiences in organizations in another important way. Women not only have to worry about their work-family balance in ways that men do not, they also have to concern themselves with their acceptance or rejection as leaders within organizations. Scholars who study the glass ceiling/labyrinth have looked at how gendered expectations around leadership affect women’s presence in the upper tiers of management. As was referenced earlier on in this review, research on women and leadership has pointed out that actual differences in male and female leadership styles and effectiveness are negligible.
However, gendered sociocultural notions of who can and should be in charge still cloud our perceptions about leaders. If we look at the glass ceiling/labyrinth literature, we see reflections of these notions and how strongly perceptions shape our concepts of leadership.

Scholars have examined gender stereotypes as they relate to women’s ability to attain executive leadership positions, and have found that these stereotypes are strongly connected to leadership discrimination and bias in the workplace (Eagly & Carli, 2007; Heilman, 2001; Johnson, Murphy, Zewdie, & Reichard, 2008; Oakley, 2000). Stereotypes describe how women “are” and “should act,” which leads to prescriptions for what roles they can fill. In a four-part study, Johnson et al. (2008) tested notions of whether gender stereotypes influenced perceptions of male and female leaders for business students and in the general population. What they found confirmed that these stereotypes play a role in defining individuals’ perceptions of their leaders. Male leaders were both liked and seen as effective when they were “strong” or “agentic.” Women had to be both strong/agentic and “sensitive” or “communal” in order to be seen in the same light.

This research supported the role congruity theory posited by Alice H. Eagly and Steven J. Karau (2002), which poses that gender stereotypes lead to a “perceived incongruity between the female gender role and leadership roles” (p. 573). That women seem out of place in leadership roles leads to prejudicial treatment, where they are both perceived and evaluated less favorably than men in the same situations (Eagly & Carli, 2007; Eagly & Karau, 2002; Heilman, 2001; Johnson et al., 2008; Oakley, 2000). The
difference, scholars note, is not in women’s behaviors, but in the *perceptions* of their behaviors. Women feel this difference too, and in studies have reported that as executives they experience gender bias as a barrier they need to manage as a part of their work and careers (Eagly & Carli, 2007; Eisner & O’Grady Harvey, 2009; Heilman, 2001).

Female leaders are thus defined within a gendered paradigm that does not allow too much for individual difference. It also, because it polarizes leaders on a masculine/feminine scale where strength (masculine) is good and sensitivity (feminine), bad, leaves women in an inferior position regardless of how they lead. If they are sensitive, they are not seen as leaders. If they are strong and sensitive, they are accepted and liked as leaders, but not as much as men. What happens, however, when women lead in a masculine way – strong and agentic – without the socially ascribed femininities of communalism and sensitivity? Research has shown that female leaders who buck gender conventions are often punished for doing so. Women who lead in purely masculine ways are liked and accepted less than either men who do the same, or women who use both masculine and feminine styles of leadership (Heilman, 2001; Johnson et al., 2008; Oakley, 2000). This is particularly true in masculine domains and leadership roles, “where the contrast is most apparent between expectations of female communion and of masculine agency” (Eagly & Carli, 2007, p. 105). Given IT’s strong association as a masculine profession, this – women’s leadership double bind – cannot be overlooked when examining and understanding the dearth of women leading IT organizations.

**Organizational practices.** Having reviewed reasons related to the obstacles women encounter as they aspire to leadership roles that are connected to more external,
social forces, we shift now more internally to look at organizational practices. What do women experience inside organizations, and what are the organizational level barriers that help to maintain the glass ceiling?

Discrimination: assignments, promotion and wages. Numerous authors look at the types of assignments that women are given as a way of assessing their advancement opportunities, as obtaining desirable assignments is a prerequisite to advancing to upper management (Eagly & Carli, 2007). Without high-profile work that exposes individuals to upper management and sharpens their skills, careers can stagnate. It is often the case, however, that women in a variety of settings lack the opportunities and exposure that will grow their careers (Goodman et al., 2003; Oakley, 2000). Women can have a difficult time moving from more supportive roles into technical or managerial ones that will aid in their development, especially when men are given and have access to more training in these realms (Drury, 2011). If women are assigned or find high-profile work, it is often the product of a high-risk situation, and is work that others – men – do not necessarily want (Eisner & O’Grady Harvey, 2009).

Scholars have also looked at gender bias and discrimination in promotion practices as a way to explain the scarcity of women in executive roles. Not only do women have a harder time than men in obtaining substantial assignments that will raise their profile within the organization, they are also often evaluated more harshly than men. Researchers note that gendered perceptions affect the work women are given and the rates at which they are promoted (Alimo-Metcalfe, 1994; Bartol & Aspray, 2006; Drury, 2011). Where leadership is defined in masculine terms, there is a negative predisposition
toward women that precludes recognition of their competence. This undervaluing of
women’s performance is then linked directly to differences in promotion rates between
men and women (Heilman, 2001). A recent Catalyst report illustrated how this plays out
empirically, detailing how high-achieving women performing as stereotypical “ideal
workers” do not make the same strides as their male peers. Gender bias and
discrimination gets in the way.

Why does this happen? Powell and Graves (2003) helped to explain why the
structure of decision-making in organizations is so biased against women, using a term
first coined by feminist scholar Rosabeth Moss Kanter: homosocial reproduction.
Because decision-makers hold mental models of who should occupy particular positions
and do certain work, they are more likely to choose and evaluate positively others like
themselves. This discourse of masculinity naturally puts women in the position of being
the “other,” the one who is not like those in charge and thus subject to less positive
reviews of their work and status. Understanding how homosocial reproduction works
helps to elucidate why policies alone cannot increase women’s proportionality in
executive ranks, even in professions where women dominate in all but the top levels of
management (Alimo-Metcalfe, 1994; Drury, 2011; Goodman et al., 2003; Oakley, 2000).

These tendencies also help to explain why, despite attention to gender-based wage
inequality in both legislative and organizational realms, women still earn less than men
(Oakley, 2000). Unfortunately, wage discrimination seems to be alive and well. Though
difficult to assess directly, when researchers account for “education, employment
patterns, type of occupation, and other characteristics” (Eagly & Carli, p. 71), full-time
working women still earned only .77 on the male dollar in 2011 (AAUW, 2013b; National Committee on Pay Equity [NCPE], 2012).

*Social capital.* Homosocial reproduction has other consequences for women working in male-dominated fields and trying to grow their careers: it makes it difficult for them to build social capital. In organizations, building social capital – trusted connections within and between networks of individuals – happens in both formal and informal ways. More formally, people build capital by performing well in their jobs, and earning the trust of their colleagues and superiors. Informally, they do so by becoming known and liked; the by-products of informal social capital building are key components to career success.

For women, the process of building informal social capital has been noted in the literature as one of the major barriers to their ability to succeed as executives. This is the case not because women lack the capacity to do this, but rather because of the cultural arenas in which they work. Building social capital is not as simple as performing the duties of one’s job well; it involves conforming to cultural expectations and networking with colleagues. How do these factors contribute to women’s struggles building the social capital that would help them succeed in their quests for and attainment of executive roles?

As has been noted previously in this review, the cultural expectations associated with IT organizations are often built on outdated notions of male and female roles at work and home, and those expectations still favor men (Glazer-Raymo, 1999). Good – or ideal – employees work long hours and make other personal sacrifices for their organizations; the organization comes first (Carter & Silva, 2011; Drago, 2007). These
types of demands are difficult for women who have family obligations; there often exists a constant tension between the two and that tension affects women more acutely than it does men (Eagly & Carli, 2007).

Another component of the social capital building process that women struggle with is that of informal networks. Masculine cultures in organizations leave women on the periphery when it comes to networking. The networking opportunities themselves are often centered around male activities (e.g. golf, fishing, football, strip clubs), and happen outside of the workday, making it difficult, undesirable, and/or uncomfortable for women to participate, and contributing to “the labyrinth that women negotiate” (Eagly & Carli, 2007, p. 148). These “old boy networks” exist as social systems that stretch across organizations and make it awkward, troublesome and just plain hard for those with minority status to penetrate the social networks and gain the social capital they need to get ahead (Dreher, 2003; Eisner & O’Grady Harvey, 2009; Oakley, 2000). Some authors note that in order to make things better for women in this arena, both managerial and human resources practices must change (Dreher, 2003; Liedtke, 1995).

*Role models and mentors.* Yet another obstacle examined in the literature that is strongly associated with women’s trouble navigating the labyrinth of masculine organizational culture is the absence of mentors and female role models. Role models and mentors are often grouped together by those who research the glass ceiling, but they are defined differently. Role models are individuals who are in positions of power and represent specific career opportunities for aspirants. They serve as examples of “the values, attitudes, and behaviors associated with a role” (McGrath Cohoon & Aspray,
Role models do not need to interact closely with the individuals they inspire. Mentors, on the other hand, are not only role models, but are experienced individuals who engage in an “active process of sponsorship…toward less experienced entrants or trainees” (McGrath Cohoon & Aspray, 2006, p. 158). Mentoring takes time and energy, and establishes a grooming process for younger, less experienced individuals who show promise.

Role models are important, as we all need to see others like ourselves in positions we covet, so that we believe we can attain them. When particular groups are conspicuously absent from jobs, disciplines or professions, it makes it harder to imagine that those groups belong there. As Bartol and Aspray (2006) put it, a person “is not likely to give consideration to a career in which there is little or no indication that they could participate” (p. 391). When women are seldom present in executive roles like the CIO, it is difficult for others who might aspire to such positions to imagine that they can play that role. Mentors are important, as they play an active part in ensuring that the individuals they mentor have the skills and knowledge to succeed. By working closely with mentees, mentors help to build a next generation of leaders.

Unfortunately, numerous scholars who study the glass ceiling/labyrinth have noted that a lack of role models and mentors in organizations deters women’s participation (Ahuja, 2002; Drury, 2011; Glazer-Raymo, 1999; Goodman et al., 2003). It is often the case that role models and mentors do not exist in organizations with inhospitable cultures for women (Jandeska & Kraimer, 2005). Their absence helps to
preserve the very cultural elements that keep women out and have been associated with the decline of women in IT (Cone, 2007).

*Opting out.* All of these sociocultural assumptions – who belongs in IT and in executive roles, and the masculinities and femininities assigned to work and home, respectively – along with organizational practices – work assignments, promotion bias and wage discrimination, informal networks, and a lack of role models and mentors – all act together to maintain a fabric of androcentrism in the workplace, especially in male-dominated professions like IT. These cultural elements and organizational practices, because they happen to be so present in IT, also work together to discourage high-achieving women from staying in that profession.

Research that has analyzed the reasons why highly motivated women leave their careers reflect what has already been mentioned here. In a study produced for the Harvard Business Review in 2005, Hewlett et al. surveyed and interviewed women and men between the ages of 28 and 55 who either had a college degree with honors or a graduate degree to investigate the reasons why women leave their careers. Of all of the variables they studied, family demands topped the list for women. Rigid workplace conventions, practices, policies and attitudes also turned women away, as did the perceptions that their careers were stymied. While this was a general study that looked at motivated women across various professions, a literature review conducted by Kathryn Bartol and William Aspray (2006) echoed those findings in the IT profession. They found evidence in the literature that women in IT are more focused on lifestyle integration than men, are more likely to feel discriminated against in their jobs, and are often working in
what they consider to be hostile environments. They also found that women in IT are
generally found in lower-level positions, paid less and underrepresented in management.

Taken together, the literature that examines the reasons why women leave their
careers, even when highly motivated, reflects back the various factors encapsulated in the
glass ceiling/labyrinth literature overall. There are no mysteries here, but when looked at in
their entirety, it is clear that there is not just one glass ceiling that women run into
when approaching the point in their careers when they are ready for an executive role.
Rather, the situation is much more labyrinth like, and consistent across the duration of
women’s careers.

What helps? Until this point, elements in the literature identified as obstacles or
barriers to women’s advancement to senior organizational positions have been examined.
Researchers who study the glass ceiling/labyrinth, however, have also looked at what
types of remedies assist women with executive aspirations. Remedies vary by level –
legislative, organizational and cultural – and in ease of implementation. The most
difficult change comes, as Schein (2010) tells us, at the cultural level. When achieved,
however, cultural change leaves the most lasting imprint on organizations and society.
We turn now to what the literature says about what helps women attain senior
management positions. Knowing more about what both hinders and helps women in their
careers will help shape the investigation into women’s experiences as CIOs in higher
education institutions.

Legislation. What legal remedies have assisted women as they have pursued
executive organizational roles? The civil rights era brought about some major federal
legislative changes aimed at fixing discrimination for women. Title VII, Title IX and the Equal Pay Act were all authored in the 1960s and 1970s, and offered women protection against discriminatory practices at work. The most comprehensive among them is Title VII; it prevents institutions from discriminating against women (and others) in hiring and compensation. The Equal Pay Act of 1963 focuses on compensation equality, and is often paired with Title VII in discrimination claims (Evans, 2002). Title IX prevents educational institutions that receive federal money from discriminating on the basis of sex in a variety of areas including employment (Somers, 2002). I include Title IX explicitly because of the focus in this literature review on higher education institutions.

Despite this cadre of legislation aimed at protecting women from discriminatory practices, scholars have found that legislative effects have fallen short of their intent. Legislation is a necessary strategy for achieving gender equality, but it alone cannot change organizational norms and cultural practices. It also often feeds notions that women are getting ahead because of the legislation rather than their own talent (Eagly & Carli, 2007; Glazer-Raymo; 1999, Glazer-Raymo, 2007; Renning, 2000). Women have also found that legal remedies often disappoint. The legal history has not been an overwhelmingly positive one for women, as the courts have often been reticent to help. It is not uncommon for judges to defer to institutions around personnel decisions (Glazer-Raymo, 1999). Additionally, many practices that disproportionately hurt women – long work hours, extensive travel, informal social networks – do not hold up as discriminatory in court (Eagly & Carli, 2007). Furthermore, women must weigh the courts’ unresponsiveness with the financial and psychological costs of bringing cases to trial. It
takes time, energy and money to stand up to an institution; without more confidence in the system, it makes little sense for individual women to stand tall against institutional Goliaths.

**Organizational Practices.**

*Flexible work.* Legislation that protects women against workplace discrimination is necessary and helps women at a very basic level, but remedies at the organizational level have been found to be more effective at helping to counteract what is known to hinder women in their career aspirations. One of the most frequently mentioned categories of organizational practices that women find helpful, career-wise, is flexible work. As was mentioned earlier in this review, the pressure that women feel around balancing their working lives with their home lives can be immense, especially when they are working in organizations whose policies and practices are built upon outdated notions that place men at work and women at home. Decades later, many institutions have still not updated their policies to reflect the realities of today’s working families; norms around “ideal workers,” in fact, are still very much intact (Carter & Silva, 2011; Drago, 2007). In such circumstances, the burden of juggling both work and family still tends to fall more on women, who assume a larger share of the household and childcare responsibilities (Eagly & Carli, 2007; Hewlett et al., 2005; Lewis, 1994; Powell & Graves, 2003).

Scholars have operationalized flexible work to include a variety of different type of practices. The most common of these is flexible scheduling or flextime, which allows employees some versatility beyond the standard, rigid 9 to 5 working day. Flexible
scheduling can mean many things, from working different hours on different days, to working a full-time schedule in four days rather than five. Many permutations are possible, but what this offers to working women is a concrete strategy for managing the work that they do in the office with their work at home (Dreher, 2003; Eagly & Carli, 2007; Helfat et al., 2000; Hewlett et al., 2005; Lewis, 1994; Trauth et al., 2009; Wilkof & Schneer, 1995). Others include job-sharing, a concept that allows two individuals to share a work-role, both while working part-time (Dreher, 2003; Trauth et al., 2009), or reduced-hour, part-time jobs (Hewlett et al., 2005). Closely related to these strategies, and one that is more and more common in today’s technology-driven environments is telecommuting, or working from home (Dreher, 2003). All of these strategies provide women (and all employees) with ways to manage the variety of stressors that go along with the oft-overlapping career and family obligations and aspirations, and directly counteract the cultural norms associated with “ideal workers” (Drago, 2007).

Because family responsibilities often conflict with work ones, organizational researchers have noted additional supportive practices that acknowledge this conflict and help employees handle it: childcare and eldercare benefits are the supporting actors of flexible work policies. Organizations that give their workers options such as paid temporary leaves when children are born or adopted help them weather the transition at home while providing them security in the workplace. On-site daycare, childcare benefits and eldercare benefits also function in ways that assist employees in managing their work day, and support other flexibility options (Dreher, 2003; Helfat et al., 2000; Lewis, 1994; Trauth et al., 2009; Wilkof & Schneer, 1995).
All of these types of policies offer women what Hewlett et al. (2005) describe as flexibility in the arc of their careers; they assist employees in managing the ebbs and flows of their work and family demands in ways that make logical sense. Breaking away from traditional norms that plot high-octane careers as ascending along a linear path, flexible work policies and practices still allow workers to pursue their career goals without ignoring – and actively helping to care for – the other (often joyful) responsibilities in their lives. Research emphasizes the importance of these policies in retaining women in the workforce, and improving their chances for attaining executive status. In their qualitative study that analyzed 92 face-to-face interviews with women in the North American workforce, Trauth et al. (2009) identified flexibility policies that encouraged work-life balance as a chief element in women’s retention in the IT sector. Additionally, Dreher’s 2003 quantitative study examining 72 large US corporations found a higher number of work-life human resources policies in organizations to be positively correlated with the percentage of women in senior management. As he sees it, “(a)n abundance of work-life HRPs (human resource policies) probably signals that a firm sees the pool of female managerial talent as a valuable resource and that it is taking other steps to fully utilize this resource” (Dreher, 2003, p. 557) Clearly, if organizations want to promote more gender balance in their organizations, including at the top, flexible work policies can be implemented as one very important strategy toward reaching that goal.

While important, however, some authors also point out a large caveat: policies alone will not work in a context that dismisses them. If flexible arrangements are
stigmatized and/or only utilized by women, they will not change the underlying culture of
the organization. If seen as women-only solutions, or if employees are looked down upon
or passed over for promotions because they take advantage of them, the policies
themselves lose effect (Helfat et al., 2000; Hewlett et al., 2005; Wilkof & Schneer, 1995).
Flexible work is important, but the real advantage for women is when organizations take
the policies seriously and make them part of their practice for all workers and at all levels
of the hierarchy.

Reforms in recruitment and evaluation. Another organizational-level area that
researchers have identified as important to address if more gender balanced institutions
and leadership are desired, is that of recruitment and evaluation practices. Numerous
scholars have noted that recruitment and evaluation practices need to be assessed and
adjusted in order to counteract the unconscious prototypes that form ideas around who
ought to be hired and promoted (Eagly & Carli, 2007; Heilman, 2001; Johnson et al.,
2008; Liedtke, 1995; Powell & Graves, 2003). Descriptive and prescriptive-based biases
have consequences for women in organizations; they tend not to be hired into certain
positions and their work is undervalued. The more they are seen in stereotypic terms, the
more common it is for women to be treated this way. Organizations contribute to and
actively facilitate these biases when they have ambiguous hiring and promotion
procedures that lack proper structure (Heilman, 2001).

George Dreher’s 2003 study suggested that inductive change alters organizational
practices. He found that the presence of low- to mid-level female managers in
organizations was correlated with stronger work-life family policies and a higher
percentage of women in senior management. His work connects female-friendly recruitment practices at lower levels with women’s presence at the top. The Society for Human Resource Management identified some concrete practices for organizations to address subtle discrimination in hiring and promotion; they offer that structured hiring and promotion policies with built-in accountability measures are the best way to address these inequities. Such practices include, “incorporating the advancement of women into performance goals for line management; training line management to raise awareness and understanding of barriers to the advancement of women; identifying best practices that support the advancement of women; tracking the advancement of women in the organization; and developing a list of women for succession planning” (Helfat et al., 2000, p. 60).

Because the processes of recruitment and evaluation are filled with so much subjectivity, and exist as places where bias and discrimination can propagate, structured, explicit policies and procedures can serve to lessen perception-based partiality and level the playing field for those, like women, who have been traditionally kept on the margins. Practices that bring those on the margin closer to the center help to develop cultural norms that diversity is good for an organization (Eagly & Carli, 2007).

**Mentoring.** A lack of mentors has been written about extensively in the literature as a barrier to women’s career success. At the same time, researchers have looked at the process of mentoring in positive terms, as something that contributes to both women’s retention and their ability to attain top executive jobs. Mentors can teach protégés about organizations or professions, and help them to get good assignments. The best mentors
Women as Chief Information Officers in Higher Education

offer both professional and personal support to those they identify as having leadership potential (Eagly & Carli, 2007). Numerous scholars note that mentoring is a helpful strategy for developing top management (Eagly & Carli, 2007; Helfat et al., 2000; Locher, 2006). In the IT profession, Ahuja (2006) points out that “women who had one or more mentors experienced greater job success…” (p. 29), and in higher education, both the 2008 and 2011 ECAR studies identified mentors as important for CIO aspirants, indicating the need to be groomed for the CIO role (Arroway et al., 2011; Goldstein & Pirani, 2008).

Though mentoring gets a good deal of positive press for its success as a strategy for retaining and advancing women, Trauth et al. (2009) caution that mentoring can be a negative experience too. A mentor can be too controlling, may not understand their protégé’s strengths, or may manipulate them for their own, self-serving political goals. They suggest that organizations develop formal programs and implement them with care. They, and others, also suggest that internal women’s networks and/or support groups can also serve as positive sources of mentoring, offering women opportunities to communicate with one another in a safe setting (Helfat et al., 2000; Trauth et al., 2009; Wilde, 1997). Positive mentoring is encouraged and can nurture productive growth; negative experiences can be devastating.

It should be mentioned that a similar concept, role models, is frequently paired with mentoring in the literature, but the difference between the two should be pointed out. Female role models provide women with passive support, as they give them opportunities to witness other women in coveted roles. With role models, women can actively imagine
themselves achieving like others before them. Mentoring, on the other hand, involves actively providing women with support, with the goal of grooming them for higher levels of organizational responsibility. The two concepts should not be conflated, and organizations should consider the fact that active involvement in women’s careers is an important component of their success, as well as an institution’s ability to increase its diversity.

*Cultural norms for leadership.* While adjustments at the legislative and organizational level both contribute to improvements for women in the workplace, the glass ceiling can be altered best when change happens at the cultural level. The literature notes that for women, reshaping organizations’ cultural norms for leadership would provide more lasting change, as a shift in culture would translate into transformations in overall policies, procedures and practices (Eagly & Carli, 2007; Liedtke, 1995; Oakley, 2000; Wentling & Thomas, 2004). If “women in executive roles are judged as are all workers against a norm or average that continues to favour men” (Ross-Smith & Chesterman, 2009, p. 591), then institutions can continue to function in ways that hamper them. When expectations shift, however, so do operations.

Cultural change can feel intangible, however, and so often, that type of evolution relies on the pragmatic nature of operational level adjustments. The legislation and organizational practices – flexible work, hiring and promotion reformation, and mentoring – previously mentioned are strategies aimed directly at the goal of cultural change. Such tangibles are important when trying to attack something so elusive, acting as catalysts that shift organizational norms. Numerical representation is another method
used by institutions to try to assess cultural progress. In 1977, Rosabeth Moss Kanter introduced an idea about how growth in a minority group’s proportionality in an organization could cause the overall norms in that organization to shift. George Dreher (2003) illustrated this empirically when he tested the correlation between the percentage of women in low- to mid-management and that of women in senior management; he found that the two were positively related. Which came first is not known, but his research provides indirect support for the notion that cultural changes in leadership norms may come about as proportions of women increase in organizations.

In addition to what has already been discussed, Eagly and Carli (2007) talk about social forces that are influencing standards for who ought to lead organizations, indicating that today, “qualities that constitute good leadership have changed in ways that lessen this role incongruity for women” (p. 158). They indicate that technological change, faster social change, and increasingly complex organizational missions are forcing organizations to adjust. So too, they write, must those who lead those institutions. While I found no conclusive empirical evidence in the literature that tested and supported what Eagly and Carli presuppose, external forces have an effect on us all and should at the very least be given mention in this review. Cultural change happens slowly and is, conceptually, more abstract and complex than either legislation or organizational courses of action. What is clear and concrete to those who study the glass ceiling/labyrinth, however, is that without it, women cannot make progress in achieving proportionality at all levels of an organization.
Summary

Because very little is known about female CIOs in higher education, this literature review examined a variety of bodies of knowledge as a way to stitch together an informed picture of female executives in IT and higher education organizations. An historical overview of modern computing and the emergence of the CIO position laid the foundation for the investigation, while an understanding of culture and gendered organizational norms helped to illustrate the strength of the historical core. These set the stage for understanding women’s experiences inside IT organizations, as well as what helps them attain or keeps them out of executive roles. This review illustrated that there are some well documented areas in the literature, but also exposed some gaps, particularly around women in higher education IT, and certainly female CIOs in higher education.

What we do know is that IT is a gendered profession, and that in it, women are the “other.” We also know that the proportions of women participating in higher education IT are greater than in industry, both overall and at the CIO level; this is both helpful and hopeful information. What the literature did not reveal is why that is the case; I proposed that some clues could be found at the organizational level. Much industry research has been done around what keeps women out of IT. What scholars have found is that the gendered nature of the profession starts at a very young age and routes boys and girls, and then men and women, in different directions. The profession’s segregation continues right up to the top executive level, and affects practices that prescribe different roles and experiences for the two sexes. Ways in which family responsibilities are
treated, perceptions about who can and cannot lead, how work-related factors such as assignments and promotions are handled, the types of social networks that are formed, and who becomes role models and mentors all exist in a gendered framework.

Additionally, those researching the senior-most IT role have found that certain organizational practices help women to achieve their executive attainment goals. Addressing some of the organizational level practices that are biased against women have been shown to encourage their progression in IT. Effective practices include making work more flexible, reforming recruitment and evaluation procedures, and implementing mentoring programs. As noted previously, however, most of the scholarship that has been conducted for the IT profession and contributed to our knowledge of what women experience has come from the corporate sector. Little has been discovered about women occupying the ranks of higher education IT in general, and more specifically, the CIO position. The population of higher education CIOs is ripe for investigation and ought to be studied if organizations aim to diversify their ranks. This study intended to partially fill the knowledge gaps of the issues related to women as CIOs in higher education IT, while contributing to the overall research on women as executives in the IT profession in higher education and beyond.
Women as Chief Information Officers in Higher Education

Chapter 3
Methodology and Procedure

Introduction

Relatively little is known about women as Chief Information Officers (CIOs) in higher education. Data collected from academic institutions since 2004, however, indicate that women fill between 21.4% and 26% of those positions (Arroway et al., 2011; Brown, 2011b; Brown & McClure, 2010; Goldstein & Pirani, 2008; Katz et al., 2004). This stands in stark contrast to reports since 2010 finding that only nine to 10% of corporate sector organizations have women in that role (King, 2011; TelicityGroup, 2012). What organizationally based differences might be involved in this distinction? Given the apparent discrepancy, and that so little is known about higher education CIOs, it seemed a worthwhile area to explore. This study aimed to investigate gender equity at the executive level in higher education IT by asking the following questions:

- What individual and organizational-level factors describe higher education CIOs and their work environments, and how do they differ for women and men?
- What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?
- How do women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position?
A mixed methods design was utilized to help answer these questions, beginning with a quantitative questionnaire administered to women and men higher education CIOs, and followed by qualitative interviews with women CIOs.

This chapter provides an overview of the quantitative and qualitative methods used for this study, including design, sampling design, sample characteristics, data collection and analysis procedures, and the statistical analysis plan.

**Research Design**

In order to explore the factors related to the organizational culture of higher education IT and women’s presence as CIOs in the profession, a mixed methods research design was used for this dissertation study. Mixed methods designs are ones in which both quantitative and qualitative procedures are used across the stages of a study: collecting, analyzing, and/or mixing the data (Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009). Frequently, the rationale for using a mixed methods design is that quantitative plus qualitative approaches together allow researchers to answer their questions more thoroughly. These designs can also allow for more complete data analysis when used together, offsetting the disadvantages or limitations of each type of research (Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009). Furthermore, the functions of triangulation and complementarity in mixed methods studies help to strengthen research inferences (Teddlie & Tashakkori, 2009).

Quantitative research uses numerical data. The basic paradigm that guides most quantitative research is postpositivism. In this, researchers value objectivity, but understand that absolute truth can never be found. Thus, they set out to empirically test
Women as Chief Information Officers in Higher Education

the viability of theories; they do so by reducing their inquiries to a series of specific variables, questions and hypotheses (Creswell & Plano Clark, 2011; Malina, Norreklit, & Selto, 2011). While objectivity is a goal of quantitative research, those conducting it acknowledge that research is inherently value-laden, and so methods and conclusions must be examined, and biases discussed. Quantitative researchers conduct their investigations in controlled environments, using data collection instruments of their choosing. They do this in order to isolate variables and measure the strength of the relationships between them. Overall, this process echoes and emulates the scientific tradition (Creswell, 2009; Teddlie & Tashakkori, 2009).

Qualitative research, on the other hand, allows researchers to explore and understand how individuals make meaning of their social world. Qualitative researchers do this by conducting research in natural settings, using textual analysis to inductively and deductively draw their conclusions (Creswell, 2009; Hesse-Biber, 2010; Teddlie & Tashakkori, 2009). As opposed to the postpositivistic worldview of quantitative research, qualitative researchers embrace a constructivist approach, in which they “individually and collectively construct the meaning of the phenomena under investigation…” (Teddlie & Tashakkori, 2009, p. 331). The qualitative researcher seeks to understand social phenomena by examining data found in context, in the every day life settings they are examining. They look at multiple situational factors in conducting their analyses in order to produce a nuanced appreciation of the problem at hand (Creswell, 2009; Hesse-Biber, 2010).
In mixed methods research, pragmatism is the central worldview, focusing on strategies that work best, and using “all approaches available to understand the problem” (Creswell, 2009, p. 10). These methods give researchers more freedom of choice in determining the procedures, techniques and emphases that will serve their investigative needs. Mixed methods researchers can use a variety of approaches that help them to best answer their research question. In this pragmatic worldview, quantitative and qualitative methods are not opposed, but rather supportive of one another, serving congruous goals. Where quantitative data give form and shape to a qualitative approach, qualitative data collection and analysis help build understanding of the research question; the two together, whether collected at the same time or sequentially, can create stronger outcomes (Malina et al., 2011; Teddlie & Tashakkori, 2009).

Creswell and Plano Clark (2011) make note of four different criteria in choosing a design for a mixed methods study: level of interaction, priority, timing and mixing. The level of interaction refers to how much or little the researcher chooses to connect the research questions, data collection and data analysis. Priority relates to which method, quantitative or qualitative, is more prominent in the study. With timing, researchers need to make decisions about whether the data will be collected concurrently or in sequence, and mixing refers to when and how a researcher decides to connect the qualitative and quantitative processes. Mixing can occur during data collection, analysis or interpretation, or as a part of all three study components (Creswell, 2009; Creswell & Plano Clark, 2011). Though Creswell and Plano Clark (2011) note priority as a criterion to be examined before designing a study, Teddlie and Tashakkori (2009) point out that
though it is crucial to consider which component – quantitative or qualitative – is more important, that may not be feasible to do before a study begins.

In this particular case, where so little was known about women CIOs in higher education IT, combining quantitative and qualitative approaches offered an increased opportunity for understanding the research problem than using either approach alone (Creswell & Plano Clark, 2011). The combination of methods also helped lend weight to the validity and reliability of the findings (Hesse-Biber, 2011). Given those benefits, a sequential explanatory design was used for this study. This design was best suited to the research questions outlined above, which aimed to make sense of women’s better proportional standing as CIOs in higher education, relative to their corporate counterparts. The sequential explanatory design allowed for quantitative data collection first, followed by qualitative inquiry into statistical findings (Creswell & Plano Clark, 2011). The quantitative findings helped to build general explanations for relationships between variables, and the qualitative data supported a deeper understanding of the statistical results (Creswell & Plano Clark, 2011; Malina, et al., 2011). In the first phase of the study, quantitative demographic and numeric data were collected from women and men higher education CIOs using a web-based survey distributed through the EDUCAUSE Center for Applied Research². This was done in order to assess the relationship between the factors enumerated in the literature that affect women’s attainment of executive roles, and women and men’s presence as CIOs in higher education.

² The EDUCAUSE Center for Applied Research is the research arm of EDUCAUSE, a national non-profit membership organization focused on advancing IT in higher education.
education. The data were subject to descriptive analyses, as well as the following other tests: independent means t-test for assessing the differences between women and men CIOs on interval or ratio dependent variables; chi-square goodness-of-fit to test frequency differences between men and women in the population on categorical dependent variables; Mann-Whitney U to test for differences between the medians of the two groups on scale-based dependent variables; and OLS regression to test whether gender was a significant predictor of certain identified continuous dependent variables.

The first goal of these analyses was to develop a descriptive picture of the work environment/culture for higher education CIOs, while also understanding the differences between women and men’s experiences of the identified environmental/cultural elements. Another goal of the quantitative phase was to help guide the purposive sampling for the subsequent, qualitative segment of the study. The qualitative stage of this study was designed to collect narrative data from women higher education CIOs through semi-structured interviews. The aims of this second phase were to explain why the factors from the first phase were significant, how they impacted women’s lives, and how they related to women’s presence as CIOs in higher education, thereby complementing the quantitative findings (Creswell & Plano Clark, 2011). The narrative descriptions from the qualitative phase helped develop a rich understanding of women’s experiences as higher education CIOs, rounding out and augmenting the overall discovery process. The qualitative research questions, sampling and data collection were all informed and influenced by the statistical findings of the study’s first stage.
Overall, the justification for this approach was that triangulating quantitative data with qualitative findings would validate and confirm what was found through both aspects of the study (Teddlie & Tashakkori, 2009). The quantitative outcomes offered a general understanding of higher education IT culture and women’s presence in the CIO role. The qualitative interview data helped to refine and advance insights about the quantitative findings. Using both together in the fashion described added weight and credibility to what was discovered. Figure 6 below illustrates the procedures for the sequential explanatory mixed methods design.

**Sequential Explanatory Design**

![Sequential Explanatory Design Diagram]


As is typical for studies that employ the sequential explanatory strategy, emphasis in the design was given to the quantitative data (Creswell, 2009). The quantitative data collected gave the researcher – and essentially the higher education IT community – a baseline of information with which to work; the importance of that cannot be underestimated. Quantitative data only offered one perspective on the research questions,
however, and so the qualitative work with individual women was critical to developing a better appreciation of their experiences within the milieu of higher education IT.

In terms of the mixing criterion noted by Creswell and Plano Clark (2011), the quantitative and qualitative methods were first connected at the beginning of the qualitative phase when selecting the female participants for interviews. Their selection was based on some of the results of the statistical tests, and designed to best answer the qualitative research question of how women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position. This meant sampling for women who represented particular findings of interest, but who also portrayed a range of individual and organizational characteristics, in order to look for commonalities in themes among a relatively diverse group of individuals. Further mixing of the research phases occurred during the analysis and discussion of the full study. Quantitative and qualitative findings were compared and contrasted as a way to understand the phenomena uncovered.

Target Population and Sample

The target population in this study consisted of EDUCAUSE members in higher education institutions who were CIOs – or Senior-most IT Leaders – during the 2012-2013 academic year. EDUCAUSE is a nonprofit membership organization “whose mission is to advance higher education by promoting the intelligent use of information technology” (EDUCAUSE, 2012b, para. 1). Their current membership includes more than 2,200 colleges, universities, and educational organizations, with more than 17,000 active members. EDUCAUSE is a unique resource, as its membership base includes the
majority of academic institutions in the United States, as well as some international colleges and universities. EDUCAUSE collects information from individuals at each of its member institutions, which allowed them to easily identify those in the CIO role at each school. EDUCAUSE also has a research arm – the EDUCAUSE Center for Applied Research (ECAR) – that conducts research on the “role and implications of information technology in higher education” (EDUCAUSE, 2012a, para. 1). ECAR has tools for collecting data and vehicles for disseminating results; they have played a central role in generating research on higher education CIOs since 1990. EDUCAUSE’s large membership base and experience in educational research made it an ideal site and partner for this study. The leadership of EDUCAUSE and ECAR supported this research; they provided access to their member database and data collection tools, and assisted with member recruitment for the survey through their membership listserv.

Different criteria were used for participant selection in the quantitative and qualitative phases of this study. In both stages, however, each participant had to be in the CIO position at their higher education institution during the data collection period of the study, September 2012 through November 2012. The quantitative questionnaire was sent to a proportional stratified random sample of 1,000 women and men higher education CIOs from the EDUCAUSE database. The qualitative interviews, on the other hand, were conducted solely with women CIOs who participated in the quantitative phase of the study.

For the first, quantitative phase, the random sample of EDUCAUSE higher education CIOs was again, comprised of both male and female respondents. A randomly
selected group of 1,000 EDUCAUSE members who were actively in higher education CIO positions, stratified proportionally by Carnegie Classification, were invited to participate in the web-based, quantitative survey. In a proportional stratified random sample, the population is first divided into subgroups representative of their proportions in the population; once the group has been divided, a random sample is then chosen from each of the groups. Because being able to generalize across type of institution was important to the outcomes of this study, dividing the groups into their respective Carnegie Classifications before sampling made the most sense. One major advantage of this type of sampling is that researchers can generate highly representative, unbiased samples for their research fairly easily. Because the sample is random rather than purposive, another advantage is the ability to generalize the results to the population within a calculated margin of error (Fink, 1995; Teddlie & Tashakkori, 2009). This study aimed for a total sample of 135 based on the sampling frame of 1,000 higher education CIOs in order to run the regression models proposed. The number of cases in the target sample \( n = 188 \), an 18.8% response rate, exceeded the recommended sample size for achieving 95% accuracy in the regression results (Soper, 2012).

For the second, qualitative phase of the study, a purposive sample of women CIOs who filled out the quantitative questionnaire was chosen in order to better understand the phenomena uncovered during the first portion of the study. Purposive samples are chosen for particular reasons, as they can generate a good deal of in-depth information with just a few cases, and aim to best answer the research question(s) at hand (Creswell, 2009; Rossman & Rallis, 2012; Teddlie & Tashakkori, 2009). Two main goals of purposive
sampling techniques are to achieve either representativeness or comparability. With representativeness, researchers look for cases that typify a certain focal point or area of interest; comparability, on the other hand, allows researchers to compare and/or contrast unique types of cases based on their differences (Teddlie & Tashakkori, 2009; Teddlie & Yu, 2009). For this study’s qualitative stage, nine women respondents who filled out the questionnaire were chosen to meet both of these objectives. Potential participants were initially selected if their survey responses indicated that they felt bias present in hiring, pay and promotion practices in higher education IT. These particular measurements of bias were chosen because of their significant showing within the quantitative results. Beyond that, the individuals selected for interviews reflected a diverse range of individual and organizational characteristics: age, ethnicity, presence and number of children, geographic region, institution type, and salary level. These types of differences were desired in the participants in order to look for commonalities in themes across a relatively diverse group of individuals.

Again, women participants in the qualitative stage were selected based on certain findings from the statistical analyses. In that examination, men and women were compared on a variety of demographic, work and home-related variables. Certain gender-based differences that were identified in the questionnaire were then investigated further in the qualitative interview component of the study. Due to the fact that this was exploratory rather than confirmatory research, a sequential design that allowed first for quantitative data collection and then for qualitative investigation made sense. This also meant that the participant selection in the second phase of the study relied on the findings
Phase I: Quantitative

Research questions. This study first addressed the quantitative research question, “What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?” with the associated sub-questions:

1. How do women and men CIOs in higher education differ demographically?
2. How do the pathways to the CIO office in higher education differ for women and men?

The study also addressed the quantitative research question, “What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?” with the associated sub-questions:

1. How do organizational work norms differ for women and men CIOs in higher education?
2. How do perceptions of workplace climate differ for women and men CIOs in higher education?
3. How do home responsibilities – housework and child care – differ for women and men higher education CIOs?
4. How do perceptions of bias and discrimination in hiring and promotion practices differ for women and men higher education CIOs?
5. How does the existence or absence of role models differ for women and men higher education CIOs?

6. How does the existence or absence of mentors differ for women and men higher education CIOs?

**Variables in quantitative analysis.** For the first, quantitative phase of this study, the overarching research questions were, “What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?” and “What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?” The questions flowed from the vast glass ceiling/labyrinth literature that discusses elements that encourage and discourage women in IT and as executives, and predetermined a set of variables.

A number of organizational-level, theoretically-based groupings that classify prospective contributions to women’s presence in the CIO role organized the categorical and continuous variables used in the study. These groupings were identified in the literature review as ones that impede women’s access to or assist women in their quest for executive office; this conceptual framework gave direction to the survey question/variable development. The groupings and their related question areas are as follows (see Appendix A):

- The pathway group included questions on academic and career history, or individuals’ pathways to executive IT office;
The organizational work norm group included questions on the number of hours (weekly) and where CIOs work, as well as any flexibility built into work practices;

The work climate group included questions on the type of support CIOs feel on the job and the strength of their career networks;

The home responsibility group covered questions on time spent on housework, and child and elder care;

The perceived bias and discrimination related group included questions on hiring and promotion practices, and salary equality;

The role model related group included questions on the perceived influence and significance of role models for these executives; and

The mentor related group included questions on types of mentors (informal or formal, female or male) and their perceived importance to executive career development.

Categorical and continuous variables were shaped from these question areas, and data collected to assess both the characteristics of the population, as well as differences between women and men. Demographic data were also collected and analyzed in similar ways in order to develop an overall picture of the higher education CIO population. In this study, gender of higher education CIOs was a categorical independent variable that was used in two ways. First, gender comparisons were done with numerous variables to look at differences between women and men in the population. Second, its value in predicting certain population characteristics was evaluated. For all of the analyses, women CIOs were coded as ‘1’ and men ‘0,’ the referent category.
Data collection. The first, quantitative phase of the study focused on identifying factors that describe the higher education IT work environment, and understanding how those factors differ for women and men CIOs. In order to do this, a cross-sectional survey, where data are collected at one point in time, was delivered to women and men higher education CIOs in the EDUCAUSE member database (Babbie, 1973). The 75-item self-developed questionnaire (Appendix A) consisted of four different types of closed-ended questions: categorical questions, to sort answers into one of two or more categories (e.g. male/female); multiple choice questions that ask respondents to choose either one or all items that apply (e.g. marital status); 5-point Likert scales to pose self-assessment rankings (e.g. perception of salary equality); and numeric items (e.g. age). The questionnaire was organized into five distinct sections: demographic and career pathway information, workplace norms and climate, managing life outside of work, hiring and promotion practices, and role models and mentors. Listed below in Table 1 are the theory-based groups that comprise the sections, and their associated variables and survey items.
### Table 1

Theory-based Groups and Associated Survey Questions

<table>
<thead>
<tr>
<th>Group</th>
<th>Variables</th>
<th>Survey Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic Factors</strong></td>
<td>Gender, age, ethnicity, marital status, number of children, age of children, institutional Carnegie Classification, employment status, years in position, years at institution, annual salary, cabinet membership, number of FTEs, IT organizational structure</td>
<td>Q 1.3 – 1.8, 1.12 – 1.16, 1.19 – 1.21</td>
</tr>
<tr>
<td><strong>Career pathway</strong></td>
<td>Highest earned degree, degree major, type of organization, internal academic appointment, external academic appointment, prior organization type, prior position, two positions prior, prior IT position location, prior non-IT position location, prior non-higher ed IT position, importance of higher education</td>
<td>Q 1.9 – 1.11, 1.17 – 1.18, 1.22 – 1.28</td>
</tr>
<tr>
<td><strong>Working norms</strong></td>
<td>Number of weekly hours, number of hours in office, number of hours at home, number of hours on week nights, number of hours on weekends, flexible work options, flexible work option use</td>
<td>Q 2.1 – 2.7</td>
</tr>
<tr>
<td><strong>Work climate</strong></td>
<td>Supportive executive group, supported by institutional peers, strong internal network, strong external network</td>
<td>Q 2.8 – 2.11</td>
</tr>
<tr>
<td><strong>Home responsibilities</strong></td>
<td>Number of weekly hours spent cleaning, number of weekly hours spent grocery shopping, number of weekly hours spent cooking, number of weekly hours spent on child care, number of weekly hours spent on elder care, hired assistance (for each activity)</td>
<td>Q 3.1 – 3.10</td>
</tr>
<tr>
<td><strong>Perceived bias and discrimination</strong></td>
<td>Fair hiring practices, fair salary negotiations, institutional peer salary comparison, external peer salary comparison, fair rating practices, prior fair rating practices, hired (and not) because of gender, promoted (and not) because of gender, paid more/less because of gender</td>
<td>Q 4.1 – 4.12</td>
</tr>
<tr>
<td><strong>Role models</strong></td>
<td>Institutional executive role model influence, external executive role model influence, male role model influence, female role model influence, role model importance</td>
<td>Q 5.1 – 5.5</td>
</tr>
<tr>
<td><strong>Mentors</strong></td>
<td>Formal mentor, formal mentor gender, informal mentor, informal mentor gender, formal IT mentor, prior formal IT mentor gender, informal IT mentor, prior informal IT mentor gender, formal mentoring program, formal mentoring importance, informal mentoring importance</td>
<td>Q 5.6 – 5.16</td>
</tr>
</tbody>
</table>
The first section of the survey asked 26 questions about participants’ background and career experience. It included categorical items to collect information about gender, age and ethnicity; marital status, children, and educational background; and current and former positions. Numeric questions were included to measure longevity in the CIO role and salary. The second section measured the number of hours women and men CIOs work each week, as well as where they work (in the office or at home). It also assessed types of flexible work options and how often they are utilized. Four 5-point Likert scale questions in this section were designed to measure the climate of the higher education IT workplace, using a rating scale from “strongly agree” to “strongly disagree.” Ten questions constituted the third section about managing life outside of work. The questions collected numeric information on the number of hours spent on housework and family care, as well as paid assistance to help with that work.

Section four consisted of six Likert scale questions that used a 5-point scale, from “strongly agree” to “strongly disagree,” and six dichotomous questions that all addressed perceived bias and discrimination in institutional hiring and promotion practices. The fifth section used the same Likert scale in its first five questions for self-evaluating the influence of role models, and in two questions about the importance of mentors. The remaining nine dichotomous questions asked participants about the presence and gender of mentors in their careers.

The survey was accessed online through a web-based tool. The web address (URL) was sent to a random sample of 1,000 CIOs – women and men – in the EDUCAUSE database. The EDUCAUSE Center for Applied Research (ECAR) was
interested in this research and thus extremely responsive to and supportive of its developments. They provided access to their database and used their data collection tool, Inquisitive, to administer the survey. Advantages of administering the survey this way included adequate access to a broad population of higher education CIOs, and the ability to capture the data electronically, allowing for easy transfer into an SPSS format. An informed consent form was the first screen that participants saw before beginning the survey; clicking through an agreement to the study and proceeding to the survey questions indicated compliant participation by the individuals who chose to complete the survey.

Because the population of higher education CIOs is relatively small, the survey was pilot tested on a group of 18 higher education IT leaders at the Associate Director, Director, and Executive Director levels. Individuals who work in these types of roles represent a portion of CIO aspirants; their responses were meant to parallel those of CIOs to some extent. The main goals of the pilot study were to validate the survey instrument and test the reliability of scale-based items that were grouped into several categories. Given the length of the survey, pilot participants were asked to time their responses, in an effort to determine the feasibility of delivering a questionnaire of such length to IT executives. Additionally, question clarity and format were evaluated; all information from the pilot was used to identify survey items that needed revision (Babbie, 1973). These efforts helped establish the survey’s face and content validity, while the reliability analyses conducted on each of the scale groupings demonstrated their level of internal consistency (Fink, 1995).
The survey was ready for distribution in September 2012. Alongside its release, a research bulletin was written for and distributed to the EDUCAUSE membership describing the forthcoming research. This was done as a way to build interest in, and describe the importance of the research for higher education. ECAR sent an email to the EDUCAUSE membership announcing the survey in late September, and was also responsible for sending out phased reminders. Having the sponsorship of ECAR, a trusted organization in higher education IT, helped to deter the low response rates typical for online surveys. Because CIOs were assumed to use technology heavily and as a way to garner the highest response rate possible, three reminders, each spaced seven days apart, were sent to subjects who had not responded before mid-October 2012 (Umbach, 2004).

**Data analysis.** The research questions, “What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?” and “What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?” along with the type of questions used in the questionnaire, determined the statistical analysis to be used in this study. The purpose of the data analysis in Phase I was twofold. First, it aimed to construct a baseline impression of higher education IT executive culture through assessing the elements that describe the work environment for CIOs. Second, it addressed how the individual, environmental and cultural factors differed for women and men, and whether gender significantly predicted certain ones. Given the research questions to be answered, and the array of variables that were used in the survey, four different statistical tests were
indicated. To evaluate the difference between women and men CIOs for interval or ratio
dependent variables, an independent means t-test was employed; to test the differences in
medians between the two groups for scale-based dependent variables, the Mann-Whitney
U test was used; and when frequencies between the groups were assessed on categorical
dependent variables, the chi-square goodness-of-fit test was utilized. Evaluating the
predictive value of gender with a number of continuous dependent variables necessitated
OLS regression analysis.

Prior to any statistical analysis of the quantitative survey results, univariate and
multivariate data screening were conducted. As a first step, a missing data analysis was
conducted. Frequencies were run on each of the variables, revealing that several of them
had missing values: ethnicity, marital status, number of children, and annual salary. As
these were all demographic variables, it was assumed that there was a good reason
respondents wanted to keep them private. Thus, the data were determined to be missing
not at random (MNAR). Because it had the highest number of cases missing (13), annual
average salary (for the total population) was imputed before the regression models were
run. The imputation resulted in a sample size of 170, which was above the minimum
needed given the 14 predictors entered into the model (Shavelson, 1996). After
imputation, each regression model used listwise deletion to handle missing data.

Descriptive statistics for each of the survey items were then summarized and
reported in table format, and frequency analyses conducted to analyze the percentage of
valid responses for each survey question. Outliers were also identified and assessed, and
two outlying cases eliminated from the data set as appropriate, in order to reduce any bias
to the estimates. Data were checked for potential multicollinearity among the independent variables, in order to avoid reducing the stability of the parameters, increasing standard errors, and reducing power (Smolkowski, 2004). Additionally, factor analysis was performed to confirm construct groupings, with the goals of building potential scales and reducing terms in preparation for the final statistical analysis.

The screening also tested for assumption violations for the four tests employed in the analyses. For the chi-square test, each observation could only be in one category, and at least 80% of the cells required at counts of at least five. For the independent means t-test, scores in the population had to be normally distributed, and the variance in scores for each population, equal (Shavelson, 1996). In the non-parametric alternative to the independent means t-test, the Mann-Whitney U test, distributions from both of the populations had to assume the same shape. This assumption presumed a certain amount of symmetry between the populations in terms of randomly drawing observations from each group (Lund & Lund, 2012). Finally, with multiple regression analysis, as with the other tests, each subject had to be independent of all others. The relationship between the independent and dependent variables had to be linear, and the residuals needed to be both independent and normally distributed. Additionally, equal error variance in the distribution of the dependent variables was required, and each analysis needed between 10 and 20 cases per variable. Fewer cases than that would have led to unstable, non-replicable results (Shavelson, 1996; Statsoft, Inc., 2012). The assumptions for each of these tests were checked in order to reduce bias in the final results.
The statistical analysis of the quantitative results was conducted using SPSS predictive analytics software, version 20. The results of the analysis are reported in the findings section of this dissertation using the standard reporting components for each of the four tests. With the chi-square goodness-of-fit test, Pearson’s chi-square ($\chi^2$) illustrates whether the observed frequencies in the population vary significantly from those expected. With significant results, the strength of the association between the variables is shown using Phi ($\phi$) or Cramer’s V, depending on the number of variables in the analysis. For the Mann-Whitney U test, a significant U score demonstrates differences in means on scale-based items for women and men. The independent means t-test first shows findings for Levene’s test, which evaluates the equality of variance in the samples. The mean difference in scores is also reported with its associated confidence intervals, as is the t-statistic and its significance, which convey how likely it would be to have gotten the reported results by chance. In multiple regression, several items are presented. First, there is the F-ratio, which expresses whether the regression model is a good fit for the data. Next, the $R^2$ illustrates the relationship between the predictors and the prediction, and can be interpreted as the proportion of variance in the dependent variable that can be accounted for by the independent variables. The estimated model coefficients ($\beta$) indicate how much the dependent variable would change with each independent variable, holding all other variables constant. Beta values ($\beta$) are reported as the regression coefficients and used to create predictive equations.
Reliability and validity. An important component of quantitative survey research is the reliability and validity of the survey instrument. Reliability refers to the accuracy of a survey instrument or measurement procedure; reliable instruments are reasonably free of error (Creswell, 2009; Fink, 1995). A pilot test of the survey instrument assisted in determining its reliability. Feedback on the questionnaire’s ease of use was solicited from pilot participants to determine whether the instructions were straightforward and the questions simple to interpret and answer, as well as that the online survey tool functioned without error. Responses from pilot participants were aggregated and adjustments made to the instrument prior to releasing it to the survey population.

As was appropriate for each section of the survey, internal consistency reliability was measured for both the pilot and real data to assess whether items designed to evaluate the same construct produced similar scores (Fink, 1995). Cronbach’s alpha statistic was used to look at the pairwise correlations between Likert-scale scores. In section 2B, the construct of workplace climate was assessed; in section 4, perceptions of bias and discrimination measured; and in section 5, the importance of role models evaluated. The alpha is not robust against missing data, so those items were removed from the analysis.

In the pilot, the workplace climate scale consisted of four items and showed low to moderate internal consistency ($\alpha = .665$). Most items appeared to be worthy of retention. Eliminating item 2.10 would only increase the alpha by .003, but removing item 2.11 would increase the alpha to .787, a much better rate of internal consistency between items in the scale. The scale measuring perceptions of bias and discrimination
had six items that also exhibited low to moderate internal consistency ($\alpha = .691$). Most items appeared to be worthy of retention, with the exception of item 4.6. Removing that item would increase the alpha to .786, indicating good internal consistency among items 4.1 through 4.5. Finally, the role model scale included five items and appeared to have acceptable internal consistency ($\alpha = .744$). All items appeared to be worthy of retention: the greatest increase in alpha would come from deleting item 5.3, but removal of this item would increase alpha only by .06. These scales were all reassessed with the study data, with results reported out in the findings section.

Validity relates to the degree to which a survey instrument accurately reflects the concepts or constructs it attempts to measure. A valid measurement tool allows for the ability to make useful inferences about the study’s data (Creswell, 2009; Fink, 1995). Face validity assesses whether a test appears to be a good measurement tool. It is a starting point for establishing validity, but is not sufficient, as it is the weakest form of validity. Content validity, which is related to face validity but more exacting in its demands, evidences the degree to which constructs match what they attempt to measure. Carefully selecting each item for a construct (e.g. workplace climate or perceptions of bias), and connecting each construct to a conceptual framework helped establish content validity. Expert review of the survey instrument by both the dissertation committee and ECAR staff further assisted in substantiating content validity.

Construct validity measures how well a test operationalizes a theoretical construct. In order to establish construct validity, evidence must be presented that the data support the theoretical structure (Fink, 1995). There were three general constructs
embedded in the developed survey that were related to the literature: workplace climate (questions 2.8 to 2.11), perceptions of gender bias (questions 4.1 to 4.6), and the value of role models (questions 5.1 to 5.5). Factor analysis was performed on the Likert scale items associated with these constructs to assess the questionnaire’s construct validity. A statistical method that clusters survey items into groups, or factors, factor analysis aims to uncover correlations between variables – or factor loadings – and helps to determine which variables can or should be eliminated (DeCoster, 1998).

**Phase II: Qualitative**

**Data collection.** The second, qualitative phase of the study was undertaken as a way to explain and deepen the findings of the statistical findings of the first phase. In this phase, qualitative interviews were conducted with women CIOs who filled out the survey. The research question driving Phase II was, “How do women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position?”

The quantitative questionnaire, qualitative interview research design is one of the most popular designs in the mixed methods literature. In this design, the strengths of each type of analysis – quantitative and qualitative – combine in a complementary way to strengthen the overall research findings (Teddlie & Tashakkori, 2009). The quantitative survey generates a large number of responses that can be analyzed; the qualitative

---

3 The pilot study did not contain a large enough sample size to conduct a meaningful factor analysis. Because larger sample sizes tend to minimize the possibility of error, sample sizes of at least 50 are suggested for factor analysis (Osborne & Costello, 2004).
interviews provide a small number of in-depth interview responses based on the survey findings.

For this second phase of the study, in-depth, semi-structured interviews were conducted with nine women CIOs who participated in the quantitative phase as the primary technique for data collection. The subjects were purposively sampled based on certain statistical findings from the survey, while also accounting for demographic diversity among the participants. The sampling method for the qualitative phase was the first place in the study where the two phases were intentionally connected, or mixed. The process focused on achieving two goals: first, sampling for cases representing particular findings of interest; and second, sampling for demographic diversity to allow for comparison between cases (Teddlie & Tashakkori, 2009; Teddlie & Yu, 2009). The sampling technique used ensured a close connection between the quantitative and qualitative phases of the study, allowing for triangulation of data sources, and justifying the use of a mixed methods design (Creswell & Plano Clark, 2011).

The interview protocol included fifteen open-ended questions, with interviews lasting an average of 60 minutes (Appendix C). The protocol covered a variety of topics that are noted throughout the literature and were included in the quantitative questionnaire: career pathway, working norms, home responsibilities, mentors, and bias and discrimination in hiring and promotion practices. Some of the protocol questions for this study were framed to explore the statistically significant findings from the survey; they were designed to rigorously investigate those findings so that solid inferences could be drawn from the combination of collected data.
Before each interview, protocol questions were sent to the participants. As a part of the consent process, each was informed that the audio from the interview would be recorded and precisely transcribed. After each interview, debriefings were conducted with participants by sending a follow-up email to solicit feedback on the protocol questions and how they related to the study’s goals. They were given an opportunity for further debriefing over the phone at that point, though no one requested that. Once transcribed, all participants were also able to review and, if necessary, provide corrections for their own interview transcripts, which were sent via email.

**Data analysis.** Qualitative data analysis is an iterative process, and occurs throughout data gathering, interpretation and report writing (Creswell, 2009). Data analysis for Phase II of this study involved coding textual data and analyzing them for themes. The qualitative data analysis software – HyperResearch – assisted with this process.

While not as linear as quantitative analysis, qualitative analysis includes the following steps: organizing and preparing the data through transcription and memo writing; reading through the data to get a general sense of their meaning; coding the data by organizing them into chunks; developing themes or categories from the codes; developing narrative passages to describe the themes; and interpreting the meaning of the data (Creswell, 2009; Rossman & Rallis, 2012). The coding process for data analysis of these interviews involved carefully reading each transcript, taking notes, and writing thoughts in the transcript margins as they came to mind. After the transcripts were coded, topics were generated for all of the interviews and cross-referenced in order to arrange
them into idea clusters. The data were then re-visited with the codes to check for consistency, identify potential new codes, and winnow down redundant ones. Topics from the interviews were further distilled into categories and linked where relationships existed. Data were then arranged into categories, organized and analyzed. This process was repeated until the most essential themes were captured from the data (Creswell, 2009; Rossman & Rallis, 2012).

Interpretation of the data involved the process of making sense of the findings, and drew upon the study’s conceptual framework. Thick description was a necessary component of interpretation, as it provided supporting evidence for the inferences; the goal was to illuminate the story behind the interview details. Lessons learned from the analysis and interpretation processes substantiated previous research on women in IT leadership, while also suggesting new questions to explore (Creswell, 2009; Rossman & Rallis, 2012).

Establishing qualitative reliability, credibility and dependability. Validity and reliability in qualitative studies are different than in quantitative research. Qualitative researchers strive to make their research credible and trustworthy, and verification procedures differ from the quantitative measures used to assess validity and reliability. A number of strategies were utilized in this study to assure the believability of the findings. First, transcripts were checked for mistakes, and codes assessed for drift. A qualitative codebook with code definitions was created to help verify that the meaning of the codes remained uniform during the coding process (Creswell, 2009). Next, interview write-ups and descriptions of the themes were shared with participants; this member checking
technique ensured that the themes raised during the interviews accurately portrayed participants’ perspectives. Methodological triangulation, an important part of the sequential explanatory design, was also used. By connecting the quantitative and qualitative aspects of the study, evidence from the different data sources was examined and used to justify themes (Teddlie & Tashakkori, 2009). Thick description helped to build the validity and transferability of the study’s findings, as this type of detail makes the research come alive for readers. Two Boston College doctoral students provided an external audit of interview codes to confirm the fidelity of the findings. Finally, a reflexive journal was kept to document information about the researcher’s values, biases, and methodological decisions. Used together, this combination of techniques was meant to establish the overall trustworthiness of the study (Anfara, Brown, & Mangione, 2002; Creswell, 2009; Teddlie & Tashakkori, 2009). Figure 7 below offers a graphical representation of the overall study design.

*Figure 7.* Women as chief information officers in higher education: Study design.
The Sequential Explanatory Mixed Methods Design: Advantages and Limitations

The sequential explanatory mixed methods design offers researchers some significant advantages, but is not without weaknesses. The major strengths of the design include the following:

- As it proceeds sequentially, it is easy for an individual researcher to implement (Teddlie & Tashakkori, 2009);
- Because it allows researchers to explore quantitative findings in more detail and from a different angle, it allows for triangulation, which is important when trying to confirm findings (Creswell & Plano Clark, 2011; Hesse-Biber, 2010);
- The different types of data exploration can give researchers better insights into complex aspects of the social world, and lead to new empirical insights (Malina et al., 2011); and
- It can be very useful when unexpected results arise in the quantitative stage of the research (Creswell, 2009).

Some of the major limitations of the sequential explanatory mixed methods design include these:

- By design, it is lengthier than a single method, and so the researcher’s time needs to be taken into account (Creswell, 2009; Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009);
- The feasibility of data collection and analysis both need to be assessed before deciding on this method (Creswell & Plano Clark, 2011); and
The overall purpose of this design is to use the qualitative phase to explain the quantitative findings, but there is a chance that nothing quantitatively significant will be found (Creswell, 2009; Creswell & Plano Clark, 2011).

**Ethical Considerations**

Throughout the course of the study, ethical issues were addressed. Once the research proposal had dissertation committee approval, Boston College Institutional Review Board (IRB) approval had to be obtained. The Initial IRB Application Form was filed, containing the following information: the study’s title, information about the principal investigator, source of funding, and the study’s participants. A research summary that incorporated introductory information and the objectives of the study, along with its methods and procedures for providing informed consent and confidentiality were included. This study was conducted with participants over the age of eighteen who were not part of a vulnerable population. Given those particulars, it was accorded expedited review status.

Informed consent forms were developed for both the quantitative and qualitative portions of this study. Both forms guaranteed participant rights and explained how those rights would be protected, as well as acknowledged voluntary participation in the study, and the ability to withdraw from it at any time. The informed consent for the web-based survey was the first item encountered by questionnaire respondents after a brief description of the study. An acknowledgement that a participant had read the consent form and proceeded to the survey reflected their voluntary participation in the study.
Because the population of higher education CIOs is relatively small, anonymity in both stages of the project was crucial. Survey participants were protected both by keeping the responses confidential, and by coding each one numerically. For those who were interviewed, both individual and institutional pseudonyms were assigned for any descriptions and reports developed from their data. The survey data were collected using instruments owned and managed by the EDUCAUSE Center for Applied Research (ECAR). Thus, all survey data were kept secure by ECAR staff and standards, and was available only to ECAR staff, the researcher, and her dissertation committee members. Interviews were recorded electronically, and those files and all associated transcripts and notes were kept on an external hard drive, which was secured in a locked metal file cabinet in the researcher’s office. All files from the study will be destroyed after a reasonable period of time. Participants were informed that summary data would be disseminated to the professional community, but that responses would not be traceable back to individuals.

**The Researcher’s Role**

In this mixed methods study, the researcher’s role varied in each of the two phases being conducted. In the initial quantitative phase, the researcher administered the survey to a random sample of the EDUCAUSE CIO population with the assistance of the ECAR staff. The data were collected using proportional stratified random sampling, grouped by Carnegie Classification to account for appropriate proportions of types of institutions in the population (Lund & Lund, 2010). Data analysis was conducted using established, rigorous, statistical analysis techniques; results were interpreted in
accordance with the assessed statistically significant values for the independent means t-test, chi-square and Mann-Whitney U analyses, and OLS regression.

In the qualitative stage of the study, I was more personally involved, interacting with study participants. As opposed to the web-based survey, the qualitative investigation took me “…into the field, into complex and varied interactions with the participants” (Rossman & Rallis, 2012, p. 33). I was a doctoral student at an academic institution who also worked as the director of an academic technology unit at the same institution. With almost fourteen years of experience in higher education IT, my understanding of both the profession and general setting was nuanced and complex. I was also active in the EDUCAUSE community, with a well-established professional network through that organization. Thus, it was likely that I knew some of the participants who filled out the web-based survey. Because of my professional network, it was also the case that I had some knowledge of one of the interview participants. It is worth noting, however, that my own participation in a technical profession had always been through an academic, rather than administrative, unit. Additionally, I was not in a CIO role and had no plans to seek one out during the course of the study.

While qualitative researchers acknowledge that bias is impossible to completely eliminate, the reflexivity illustrated above was crucial to ensuring the study’s systematic and rigorous inquiry (Rossman & Rallis, 2012). Other strategies used to establish the study’s credibility included member checking, methodological triangulation, thick description, and code auditing. Additionally, a careful assessment of all proposed and implemented procedures, as well as of the data analysis processes, was performed by the
Women as Chief Information Officers in Higher Education

researcher’s academic advisor and dissertation committee (Creswell, 2009; Rossman & Rallis, 2012).
Chapter Four

Quantitative Findings

The following chapter outlines the study’s quantitative results with accounts of statistical findings for each research question. The chapter is broken down into five sections, each corresponding to a segment of the questionnaire. In each section, univariate data for all variables are presented, followed by bivariate and multivariate analyses. Tests for the bivariate analyses include the independent means t-test, chi-square goodness of fit, and Mann-Whitney U; with each of those, the sample is compared by gender. Next, the linear regression models for testing gender as a predictor of variables in sections two and three are recorded. For sections two, four, and five, each which contained scale-based variables, reliability findings from Cronbach’s alpha and an exploratory factor analysis are summarized. All statistics were tested at a .05 level of significance.

Section One: Demographics and Pathway to CIO

This section discusses the findings related to the first research question, which asked, “What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?” The two related sub-questions, “How do women and men CIOs in higher education differ demographically?” and “How do the pathways to the CIO office in higher education differ for women and men?” helped to answer the overarching inquiry.

Univariate data for section one: Demographics. Results from the preliminary univariate analysis of the demographic data are presented in Tables 2 and 3.
**Personal demographics.** One hundred and eighty-eight higher education Chief Information Officers (CIOs) completed the survey instrument, including 138 men (73.4%) and 50 women (26.6%). Their combined average age was 51.76 years old. A large majority of participants – 83.5% – were White, while the remaining 16.5% of the population was comprised of Asian (6.4%), African American (2.1%), Hispanic (2.1%), American Indian/Alaska Native (0.5%) and Middle Eastern (0.5%) respondents. In terms of marital status, 90.4% of participants were married or living with a domestic partner, while 7.4% reported that they were single or divorced. A majority of respondents (80.8%) reported having children, with 13.3% having one, 38.3% two, 17% three, 9% four, and 3.2% more than four. The remainder either answered that they had no children (14.9%) or left the question blank (4.3%). Of those who had children, the children’s ages ranged from very young to fully grown: 5.9% of children were between the ages of zero and two, 8% between three and five, 14.4% between nine and 11, 15.4% between 12 and 14, 17.5% between 15 and 17, and 55.3% were 18 or older.

**Organizational demographics.** Demographics relating to participants’ employment were also captured in the survey. The Carnegie Classification breakdown for the population was as follows: Associate’s Colleges, 16%; Doctorate-granting Universities, 20.2%; Master’s Colleges and Universities, 25.5%; Baccalaureate Colleges, 20.2%; and Special Focus Institutions, 3.2%. Only two respondents (1.1%) indicated that they worked part-time, with the great majority of the population (98.4%) working a full-time schedule. On average, participants had been in their current CIO role for 6.14 years, and at their institution for 11.3 years, earning a mean salary of $147,642. Just under half
of the population (47.9%) reported that they held a spot on their institution’s cabinet, while 51.1% did not. A majority of the population supervised 50 or fewer full-time employees (59%); 19.1% supervised between 50 and 100, and 21.8%, over 100. Respondents’ IT organizations tended to be more centralized than not, with 73.9% of the population noting that their organizations were either highly centralized (38.8%) or centralized (35.1%), while 17.6% listed theirs as balanced, 5.3% as decentralized and only 3.2% as highly decentralized.

**Demographic summary.** Overall, the sample of higher education CIOs was heavily White and male, though gender proportions reflected data that have been collected since 2004 by the EDUCAUSE Center for Applied Research and the Center for Higher Education CIO Studies (Arroway, Growchow, Pirani, & Regenstein, 2011; Brown, 2011b; Brown & McClure, 2010; Goldstein & Pirani, 2008; Katz et al., 2004). On average in their 50s, most CIOs in this population were married or partnered, had two children or fewer, with the majority of those children over the age of 18. Almost all CIOs worked full-time, and most of them oversaw centralized organizations that have fewer than 100 employees, while earning an average salary of just under $150,000.

**Bivariate tests for research question 1, sub-question 1.** The first quantitative research question asked, “What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?” The first related sub-question inquired, “How do women and men CIOs in higher education differ demographically?” The variables described above were utilized to help answer this sub-question. Bivariate analysis of the demographic variables included the
following two tests: a chi-square goodness of fit test, along with the Fisher’s exact test, to investigate whether the actual distribution of women and men CIOs deviated from their expected values for a variety of categorical variables; and an independent means t-test to examine differences by gender along key continuous variables.

**Personal demographics.** There were a number of demographic variables that, because the survey options were too granular to produce the necessary cell counts for a chi-square analysis on a sample of this size, were recoded into new variables. These included marital status (from four categories to single/not single); ethnicity (from six categories into White/non-White); number of children (from six categories to has children/does not have children); age of children (from seven categories to only children under 12, only children under 18, and only children over 18); number of FTEs (from 12 categories to fewer than 50, 50 to 100, and over 100); and IT organizational structure (from five categories to centralized, balanced and decentralized).

In assessing whether there were significant demographic differences in the distributions of women and men CIOs, the chi-square analyses illustrated that the proportions of women and men for the following variables did not statistically differ from what was expected by chance: ethnicity, $\chi^2 (1, N = 180) = 0.01, p = 1.00$; marital status, $\chi^2 (1, N = 184) = 1.88, p = .17$; only children under 12, $\chi^2 (1, N = 182) = 1.08, p = .30$; only children under 18, $\chi^2 (1, N = 182) = 0.55, p = .46$; and only children over 18, $\chi^2 (1, N = 182) = 3.50, p = .06$. In testing the association between gender and whether

---

4 The way in which data on the age of respondents’ children were collected meant that they could list children in multiple categories. Because some people had children ages 12 and under, as well as children ages 13 to 18, no clean way existed to measure those groups discretely. Thus, age of children was grouped into the three categories listed here.
participants did or did not have children, men were more likely to have children, and
women more likely to be childless than what was expected by chance, $\chi^2 (1, N = 184) = 8.70, p < 0.01; \Phi = .22, p < .01$. In this sample, 120 men and 36 women reporting having children, where 14 men and 14 women had none.

**Organizational demographics.** For the categorical variables that related to participants’ organizations and employment – institutional Carnegie Classification, $\chi^2(4, N = 160) = 4.45, p = .35$; employment status, $p = 1.00$, Fisher’s exact test, 2-tailed (1, 187); cabinet membership, $\chi^2(1, N = 186) = 0.53, p = .47$; fewer than 50 FTEs, $\chi^2(1, N = 188) = 0.69, p = .41$; 50 to 100 FTEs, $\chi^2(1, N = 188) = 0.03, p = .86$; more than 100 FTEs, $\chi^2(1, N = 188) = 1.35, p = .25$; balanced IT organizational structure, $\chi^2(1, N = 188) = 0.28, p = .60$; decentralized IT organizational structure, $\chi^2(1, N = 188) = 0.55, p = .46$; and centralized IT organizational structure, $\chi^2(1, N = 188) = < 0.001, p = .99$ – none of the proportions of women and men in the population were statistically significantly different from those anticipated.

**Continuous variables.** An independent means t-test was conducted to compare means between women and men on the following four continuous variables: age, years in position, years at institution, and annual salary. The t-test for age was non-significant, $t (176) = .35, p = .72$. The same was the case for years in position, $t (186) = -.63, p = .53$; years at institution, $t (186) = -1.37, p = .17$; and annual salary, $t (173) = 1.47, p = .15$.

With annual salary, though the difference did not reach the level of statistical significance, it should be noted that women’s mean salary was $13,976.38 less than men’s. The difference demonstrates practical, if not statistical, significance. Given the
findings from section five, where women’s perceptions of being paid less because of gender were statistically significant, it was appropriate to highlight the mean difference in annual salary here.

**Research sub-question 1 summary.** Research sub-question one asked how women and men higher education CIOs differed demographically. The 13 variables used to address this question demonstrated that for the most part, the two groups were not demographically very different. Though in most ways, women and men CIOs resembled one another demographically, whether or not they had children distinguished the two groups from one another, with men being more likely, and women less likely, to have children. Salary differences between women and men were also highlighted, despite the lack of statistical significance. The reported mean differences, while practically significant, also connect to findings in section five on women’s perceptions about being paid less because of their gender.

**Univariate data for section one: Pathway to CIO role.** Results from the preliminary univariate analysis of the pathway data are presented in Tables 4 and 5. The variables that related to the CIO pathway included highest earned degree, degree major, type of organization, internal academic appointment, external academic appointment, prior organization type, prior position, two positions prior, prior IT position location, prior non-IT position location, prior non-higher education IT position, and the importance of higher education. These variables were developed as a way to understand the routes that current higher education CIOs took in order to attain their executive role.
Educational background and IT location. The population of higher education CIOs filling out this survey was highly educated by higher education’s own standards, as evidenced by the 78.3% of the population who had a master’s degree or higher. For the question asking about major for highest earned degree, 16 options were listed, and there was at least one response for each of those. In the category of “other,” 31 respondents provided alternative answers to the choices listed. Frequencies and percentages for this variable are listed in Table 4, with the top five degree majors reported here. The 188 participants responded that business was their degree major 25.5% of the time. Education was the chosen answer 12.8% of the time, while IT and computer science each had 11.2% of the population, and administration, 4.3 percent. In response to where IT organizations are situated in institutions, 89.4% of respondents answered that they were located in central IT organizations. Other places where IT organizations resided included the provost’s office (4.8%), the president or chancellor’s office (1.6%), an academic department (1.1%), or a business/financial affairs unit (1.1%). There were three responses for the “other” category, which included merged organizations that coupled IT with libraries or finance.

Prior work experience. Seven variables were examined to understand the types of positions and organizations current higher education CIOs had worked in before they became CIOs. In response to where their previous positions were situated, 41.5% of the population indicated they had been at their current institution, while an additional 40.4% were at another higher education institution, representing almost 82% of all respondents. A full accounting of where CIOs were working before they were in their current role is
listed in Table 5, but the next most popular answers included both private industry (9.6%) and consulting organizations (3.2%). The most common answers to the question about CIOs’ previous title included CIO (22.3%), administrative technology director/manager (11.2%), academic technology director/manager (8.0%), deputy CIO (6.9%), executive director (6.4%), associate vice president (5.9%), or faculty (3.2%). Thirty-one alternative responses were given in the category of “other.” At two positions prior to becoming CIO, were CIO (12.2%), administrative technology director/manager (10.1%), academic technology director/manager (8.5%), executive director (7.4%), systems director (6.9%), IT consultant (4.8%), network director (4.8%), vice president (4.8%), and faculty (4.3%). Thirty-three responses were given in the category of “other.”

Participants were also asked where their prior IT positions were located. The top five responses, representing 133 individuals, included central IT (54.3%), academic department (11.7%), libraries (7.4%), business/financial affairs (4.8%), and the provost’s office or president/chancellor’s office, tied at 4.3% each. In the sample, 81 individuals had previously worked in non-IT positions in higher education. The top areas where they were employed included an academic department (9.6%), business/financial affairs unit (7.4%), libraries (5.9%), the provost’s office (5.3%), and research administration (2.7%). The majority of the sample, 56.4%, had never worked in a non-IT position in higher education. For participants who had worked in industries other than higher education, 42% indicated they had been in private industry, while another 26.6% had spent time in the field of consulting. Government, non-profits and the military came in at 9.6%, 5.9%
and 5.3%, respectively. A full 31.9% of respondents had never worked outside of higher education.

To see what part current CIOs play as academics, individuals were asked if they currently had academic appointments at their or other institutions. While most participants did not have an academic appointment, 15.4% did report having them at their own institution, while 4.3% had appointments at other institutions. The final question in this section asked participants to rank how important working in higher education was for them. Of the 188 responses, a solid majority of individuals either agreed or strongly agreed (73.9%) with that statement, while 18.6% were neutral, and 7.5% disagreed or strongly disagreed.

**Demographic summary.** Higher education values educational attainment. This was strongly reflected in the education level of the CIOs in this population. The educational focus of CIOs leaned heavily toward technical and business domains, though there was tremendous diversity in their response to degree major. Prior roles, which helped delineate the pathway to the CIO job were also concentrated in a few types of positions, namely CIO, and administrative or academic technology directorships. When prior experience was gained outside the IT department, it was most likely to have been obtained in an academic department or business unit within the academy, while those with experience outside of higher education tended to come from private industry or consulting. Regardless of their path, CIOs in this sample placed high value on working in higher education.
Bivariate tests for research question 1, sub-question 2. The second sub-question for research question one asked, “How do the pathways to the CIO office in higher education differ for women and men?” The pathway variables above were developed as a way to answer this sub-question. Bivariate analysis of the categorical pathway variables included two tests. For the 11 categorical variables in this section, a chi-square goodness of fit test, along with Fisher’s exact test, was used to investigate whether the distribution of women and men CIOs deviated significantly from what was predicted. For the one scale-based variable that remained, a Mann-Whitney U test was conducted to test whether men and women differed significantly across the variable’s distribution.

Educational background. The first two variables looked at participants’ educational degrees. For the highest earned degree variable, due to the associate’s degree category, there were too many cells with low counts to make the chi-square results a stable one, though the result was not significant, $\chi^2(4, N = 186) = 6.04, p = .20$. Examining the differences between actual and expected counts showed minimal differences between the two. Because there was only one response for associate’s degree, the test was run again with that data point removed, which produced stable estimates for the test; the results, however, remained non-significant at the .05 level, $\chi^2(3, N = 185) = 3.26, p = .35$. The next variable, degree major, was difficult to analyze using the chi-square goodness of fit test: with 16 categories, not including “other,” the sample size was not large enough to produce cell counts high enough for a stable test. Thus, a new variable was created that kept the most popular degree majors (computer science,
information technology, business, administration, and education), while collapsing the “other” responses into a sixth category. The result was not significant, $\chi^2(5, N = 183) = 8.01$, $p = .16$, but all categories were also examined to assess differences between expected and observed counts for women and men. No major differences existed for the two groups in the business category. For education and computer science, there were slightly more men than anticipated, while for IT and administration, slightly more women were observed. Tables 6 and 7 shows the full results.

**CIOs’ current situation.** In addressing CIOs’ current situation, participants were asked where in the academic institution their organization existed. Because the overwhelming majority of respondents answered central IT, almost all remaining cells had counts below five. The chi-square results were both unstable and not significant, $\chi^2(5, N = 187) = 5.13$, $p = .40$. An examination of the central IT cells for women and men showed only very small differences between expected and observed counts. Responses to the question of whether CIOs had an academic appointment at their present institution showed that the proportions of women and men who did have such posts did not vary significantly from what was expected, $\chi^2(1, N = 186) = 0.30$, $p = .58$. The same was true for academic appointments at other institutions: the numbers of women and men did not vary significantly from what was expected in the population, $p = .68$, Fisher’s exact test, 2-tailed ($1, N = 188$).

**Prior work experience.** The first three work experience variables (prior organization type, previous position, and two positions prior) encountered the same difficulty as the one for degree major: the sample size of 188 was too small to provide
sufficient cell counts for the chi-square test to produce stable results, given the high number of options available for each. Prior organization type lent itself to re-coding, and so a new variable with three categories (current institution, another higher education institution, and other) was developed. The results, however, were not significant, $\chi^2(2, N = 185) = 1.30, p = .52$. An examination of the responses revealed that slightly more women had previously worked at the same institution, while slightly more men had worked at another institution. Looking at all of the expanded categories showed only minor differences between expected and observed counts for the two groups with regards to the private industry and consulting options. Full results are shown in Tables 8 and 9.

The other two variables related to prior work experience did not lend themselves to easily to re-grouping, but results were not significant for either previous position or two positions prior. For previous position, $\chi^2(18, N = 181) = 28.53, p = .05$, investigating women and men’s responses to the options illustrated that there were some discrepancies between expected and observed cell counts. Most notable positions where there were proportionally more men (and fewer women) included: CIO, network director/manager, and systems director/manager. The two position types where proportionally more women were represented included administrative technology director/manager and academic technology manager/director. For two positions prior, $\chi^2(18, N = 172) = 19.55, p = .36$, slightly more men than expected were listed for CIO, associate VP, and systems director/manager, while slightly more women were listed for project manager. Tables 10 and 11 list the results for these two variables.
The next variable looked at whether participants previously had IT positions in other areas of academia. For the 11 options listed, no cases showed reported counts of women and men as significantly different from what was expected. The same was mostly true for the variable that explored whether respondents previously had any non-IT positions in higher education. The same 11 options were listed, and all but one produced results that were not significant. The one exception was business and financial affairs, where significantly more women than expected had had a non-IT related job in that area of higher education prior to becoming a CIO, $p = .05$, Fisher’s exact test, 2-tailed ($1, N = 166$); $\Phi = .17, p = .03$. Finally, in assessing prior industries where higher education CIOs have worked, only consulting proved significant, $\chi^2(1, N = 180) = 6.11, p = .01; \Phi = -.18, p = .01$, where significantly more men than expected had previously worked in this industry. While not quite significant, $p = .06$, Fisher’s exact test, 2-tailed ($1, N = 180$), it was also interesting to note that 10 men responded that they had previously worked in the military, yet no women reported the same. A full accounting of these three variables can be found in Tables 12, 13, and 14.

**Higher education importance.** For the question relating to the importance of working in higher education, the Mann-Whitney U analysis revealed no significant differences between women and men in their commitment to the industry. The sum of average ranks for women CIOs ($M$ rank $= 98.55, n = 50$) was not significantly higher than the sum of average ranks for men CIOs ($M$ rank $= 93.03, n = 138$), $z(188) = .65, p = .52$. 
Research question 1, sub-question 2 summary. The second sub-question for research question one investigated whether the pathway to the CIO role differed for women and men in higher education IT. As with the demographic variables, there was not much that was significantly different between the two groups when plotting out their pathway to that role. Education, degree major, location of their organization and academic appointments did not uncover notably different proportions of women and men beyond what was expected. The same was true for prior organization types, prior positions, and prior IT roles in other areas within higher education. What was different was life outside of higher education IT. Women were more likely to have worked within a business unit in a non-IT role in higher education than were men, and men were more likely to have previously worked outside of higher education in consulting than were women. Though prior employment in the military did not quite reach the threshold for statistical significance in this sample, it was worth noting that while no women had attained the CIO position through that path, 10 of the 138 men had done so.

Section Two: Workplace Norms and Climate

The remainder of the findings in this chapter relate to the second of two major research questions from the quantitative phase of the study. This second question, which contains six sub-questions, was, “What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?” Section two examines the findings on workplace norms and climate, which were related to the following two sub-questions: “How do organizational work norms differ for women and men CIOs in
higher education?” and “How do perceptions of workplace climate differ for women and men CIOs in higher education?”

Univariate data for section 2A: Workplace norms descriptives. Section 2A of the questionnaire, which covered cultural norms in the workplace, was comprised of seven questions/variables. For the first five questions, respondents were asked to report the number of hours they worked each week and where those working hours occurred. Results are summarized in the following table.

Table 15

<table>
<thead>
<tr>
<th>Category</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of weekly hours (N = 188)</td>
<td>53.59</td>
<td>7.45</td>
</tr>
<tr>
<td>Number of hours in the office (N = 188)</td>
<td>42.74</td>
<td>8.04</td>
</tr>
<tr>
<td>Number of hours at home (N = 184)</td>
<td>11.32</td>
<td>5.51</td>
</tr>
<tr>
<td>Number of hours on week nights (N = 187)</td>
<td>6.57</td>
<td>3.25</td>
</tr>
<tr>
<td>Number of hours on weekend (N = 187)</td>
<td>5.09</td>
<td>2.25</td>
</tr>
</tbody>
</table>

The next two questions asked participants about the presence of flexible job options in their organizations, as well as whether they use those alternatives. A compressed workweek was an option for 15.4% (n = 29) of the 188 respondents. Others included flex time (51.1%; n = 96), job share (0.5%; n = 1), and the distributed office (33%; n = 62). Of the options available, 8.5% of respondents (n = 16) reported using a

---

5 Compressed workweek was defined as the ability to work a compressed workweek at least some of the time. Flex time was defined as the ability to choose your own starting and quitting times within a range of hours. Job share was defined as sharing responsibilities of your position with another individual, in order to accommodate a more flexible schedule. Distributed office was defined as the ability to work some of your regular paid hours at home/remotely.
compressed workweek, while 40.4% ($n = 76$) said they used flex time, and 23.4% ($n = 44$), a distributed office model. No CIOs utilized the job share option.

**Bivariate and multivariate analysis for research question 2, sub-question 1.**
The second quantitative research question asked, “What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?” Under that was the first related sub-question, “How do organizational work norms differ for women and men CIOs in higher education IT?” The five continuous and two categorical variables in this section were formulated as a way to investigate this question; the number of hours worked each week and flexibility built into the work environment to help individuals manage all aspects of their lives were constant themes in the glass ceiling literature, so it made sense to operationalize them here.

Statistical analysis of these seven variables included two tests. First, a chi-square goodness of fit test, coupled with Fisher’s exact test, was used to look at whether the proportions of women and men CIOs deviated from what was expected by chance for the categorical variables. Second, hierarchical regression models were run on the continuous variables, in order to assess gender’s strength as a predictor of them.

**Bivariate test for research question 2, sub-question 1.** The chi-square goodness of fit test and Fisher’s exact test were run on the last two variables in the survey’s section on workplace norms. They were first used to test whether there were significant differences in the proportions of women and men higher education CIOs who had flexible work options at their institutions. The analyses showed no significant differences
for the two groups, with the following findings: compressed workweek, $\chi^2(1, N = 188) = 1.54, p = .22$; flex time, $\chi^2(1, N = 188) = 2.24, p = .14$; job share, $p = 1.00$, Fisher’s exact test, 2-tailed ($1, N = 188$); and distributed office, $\chi^2(1, N = 188) = 0.76, p = .38$.

The next question related to whether CIOs used these options produced somewhat different results. There was no statistically significant difference between what was expected and observed for women and men who used flex time, $\chi^2(1, N = 188) = 3.07, p = .08$; or a distributed office option, $\chi^2(1, N = 188) = 3.36, p = .07$), but both tests came much closer to the level of significance than for the question of whether the options were available to use. Job share could not be tested because no one answered that question. Use of a compressed workweek, however, illustrated that men were statistically more likely, and women less likely, to use that option than what was expected by chance, $p = .007$, Fisher’s exact test, 2-tailed ($1, N = 188$); $\Phi = -.18, p = .01$. What was interesting about flex time and the distributed office options was that the analysis done on each one of them, though not quite statistically significant, illustrated that men were more likely to use those options than women. In conjunction with the compressed workweek option, this highlighted an interesting pattern, with men CIOs using flex options at the workplace more often than women CIOs.

**Multiple regression results for research question 2, sub-question 1.**

**Preliminary regression analysis.** Before proceeding to the hierarchical regression model for the five continuous variables that measured the number of hours and locations where CIOs work each week, a simple linear regression was first run for each variable. Number of weekly hours worked, number of hours in the office, number of hours at
home, number of hours on weeknights, and number of hours on weekends were each regressed on gender to determine if gender was a significant predictor of any of the variables. Results from these preliminary tests showed that the only variable for which gender was a significant predictor was the one addressing the number of hours worked in the office each week. That being the case, the hierarchical regression model was run on this variable alone. The regression model was used to test whether gender would significantly predict the number of hours higher education CIOs spend working in the office while controlling for ethnicity, marital status, number of children, years spent in current position, years spent at current institution, annual salary, number of FTEs, and organizational structure.

**Regression models.** After ensuring that assumptions for multiple regression were met, number of hours in the office was entered as the dependent variable. Independent variables were entered into three blocks. First, the demographic control variables of ethnicity, marital status, and number of children (represented by the two dummy variables have/do not have children and have more or fewer than two children) were entered into the first block to produce regression Model 1. Next, the organizational control variables of years in position, years at institution, annual salary, number of FTEs (represented by the three dummy variables under 50 FTEs, 50 to 100 FTEs, and over 100 FTEs), and IT organizational structure (represented by the three dummy variables centralized, balanced and decentralized) were entered into the second block to produce regression Model 2. Finally, the main independent variable – gender – was entered into the third block to produce the third regression model, Model 3. Scaffoldings the variables
in this way allowed for an examination of gender’s effect in Model 3 above and beyond the demographic and organizational control variables.

**Testing models and assumptions.** Regression model testing included adjusted $R^2$, the F test (ANOVA) and changes in F. Testing the individual independent variables included the standardized beta, t-test, and significance level. Multiple regression assumptions were tested in the following ways. The Durbin-Watson test checked for non-independence of errors; partial regression plots looked at whether there was a linear relationship between the independent and dependent variables, as did studentized residuals plotted against predicted values, which also tested for homogeneity of variance; and tolerance levels were examined for issues of multicollinearity. The data were also inspected for outliers and influential points. Scatter plots and an examination of the studentized deleted residuals resulted in the removal of two cases. Checking leverage values and Cook’s D resulted in no further deletions.

**Regression Model Results.** The regression models tested whether gender was a significant predictor of working in the office after controlling for the demographic variables of ethnicity, marital status, and number of children, and the organizational variables of years spent in current position, years spent at current institution, annual salary, number of FTEs, and organizational structure.

Model 1 produced from the first block with four demographic control variables was not significant ($F = 0.69, df = 4/165, p = .60$) with an adjusted $R^2 = -.007$. Model 2 produced from the second block that included nine organizational control variables was also not significant ($F = 1.50, df = 11/158, p = .14$) with an adjusted $R^2 = .03$. Model 3
produced from the third block that introduced the key independent variable of gender resulted in a $R^2$ change of .03 with an $F$ change of 5.29, which was significant ($p = .02$). The overall model was significant as well ($F = 1.85, df = 12/157, p = .04$), with an adjusted $R^2 = .06$. Thus, the amount of unique variance in the number of hours worked in the office by higher education CIOs that was explained by gender exceeded the explanatory power of the other individual control factors in the model by three percent.

None of the predictors in Models 1 or 2 were significant, but with the addition of gender in Model 3, annual salary became significant ($p = .03$) along with gender ($p = .02$). Gender predicted the number of hours in the office above and beyond all other variables included, with women CIOs being positively and significantly associated with more hours in the office. See Table 16 for a summary of the results.

There was an independence of residuals, as assessed by a Durbin-Watson statistic of 2.05. Examining the studentized residual against predicted values plot revealed that the assumption of homoscedasticity was met. That plot, along with partial regression plots showed linear relationships between the dependent and independent variables, while residual normality was illustrated in the P-P plot. Diagnostics to assess multicollinearity were all in an acceptable range, with all VIF values less than 10.

**Summary for research question 2, sub-question 1.** Sub-question one for research question two investigated how organizational work norms differ for women and men CIOs, operationalized by questions relating to working hours and flexible work options. Two main findings came out of the analyses run to address this question. First, gender was a significant predictor of the number of hours higher education CIOs spend in the
office, with women spending an average of 2.78 more hours each week in the office than their male counterparts. Second, men in the population were more likely than women to use flexible work alternatives such as a compressed workweek. These two findings complement one another: when both women and men are working approximately the same number of hours in a week, more time in an office environment means less time working flexibly elsewhere. The findings lend credibility to the notion that working norms do differ at least somewhat for CIOs, depending on their gender.

**Univariate data for section 2B: Workplace climate descriptives.** Four questions in section 2B focused on whether CIOs felt that they had a supportive workplace climate in their current role. Data from those questions are summarized in the table below.

Table 17

*Higher Education CIOs’ Perceptions of Workplace Climate*

<table>
<thead>
<tr>
<th>Description of Item</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Strongly Agree/Neutral Disagree</th>
<th>Strongly Agree/Neutral Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supportive executive group</td>
<td>187</td>
<td>4.13</td>
<td>0.91</td>
<td>80.9%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Supported by institutional peers</td>
<td>186</td>
<td>4.11</td>
<td>0.86</td>
<td>83.0%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Strong internal network</td>
<td>187</td>
<td>4.15</td>
<td>0.76</td>
<td>84.0%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Strong external network</td>
<td>187</td>
<td>4.17</td>
<td>0.78</td>
<td>81.8%</td>
<td>1.6%</td>
</tr>
</tbody>
</table>

*Note.* Mean based on a rating scale of 1 to 5, with 1 being strongly disagree and 5, strongly agree.
Bivariate tests for Research question 2, sub-question 2. The second sub-question for research question two inquired, “How do perceptions of workplace climate differ for women and men CIOs in higher education?” The four scale-based variables above were introduced in order to answer this sub-question. The Mann-Whitney U test was utilized to examine whether men and women CIOs’ perceptions of climate differed significantly across the variables’ distribution.

Mann-Whitney U analyses showed no significant differences between women and men higher education CIOs in any of their rankings on workplace climate. Women (M rank = 94.00) were no more likely to feel that they had a supportive group of executives at their institutions than men (M rank = 94.00), $z(187) = < 0.01, p = 1.00$. Similarly, women (M rank = 89.81) were no more likely to feel supported by institutional peers than men in the population, (M rank = 94.86), $z(186) = -0.62, p = .54$. The same was true for perceptions of a strong internal network of colleagues: no statistically significant difference was found between women (M rank = 95.37) and men (M rank = 93.50), $z(187) = -0.23, p = .82$. Finally, in their self-reported assessment of CIO access to a supportive group of external professional peers, no significant difference was found between women (M rank = 103.17) and men (M rank = 89.92), $z(187) = -1.84, p = .07$.

Research question 2 sub-question 2 summary. The four questions that focused on workplace climate for higher education CIOs revealed no significant differences between women and men. Both ranked measures of workplace climate on the more positive end of the scale – a point worth noting.
Reliability. In this four-question scale (questions 2.8 through 2.11) aimed at measuring workplace climate for higher education CIOs, Cronbach’s alpha was used to measure the scale’s internal consistency, or reliability. The alpha for perceptions of workplace climate was .75, indicating that the scale had acceptable internal consistency. The scale mean was 16.56 (SD = 2.50). Removing the fourth item on the scale – strong external network – would result in a higher alpha (.86), indicating that the first three items on the scale were the ones most strongly tied together.

Factor Analysis. Exploratory factor analysis (EFA) was employed to uncover the underlying structure of the set of workplace climate variables. The extraction method of principal axis factoring (PAF) and varimax rotation was utilized for the factor loading. Inspection of the correlation matrix showed that all but one variable had at least one correlation coefficient greater than 0.3. Bartlett’s Test of Sphericity was statistically significant (p < .001) indicating factor analysis was appropriate.

PAF revealed one component with an eigenvalue greater than one, explaining 51.67% of the variance. Visual inspection of the scree plot indicated that just one factor should be retained. As just one factor was extracted, the solution was not rotated. The interpretation of the data was consistent with the work climate attributes the scale was designed to measure. Component loadings and communalities of the solution are presented in Table 18.
Table 18

Factor Loadings From Exploratory Factor Analysis: Communalities, Eigenvalues, and Percentages of Variance for Items of the Workplace Climate Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to supportive group of executives</td>
<td>.90</td>
<td>.80</td>
</tr>
<tr>
<td>Feel supported by senior-most leaders at institution</td>
<td>.86</td>
<td>.74</td>
</tr>
<tr>
<td>Has strong collegial network at institution</td>
<td>.70</td>
<td>.49</td>
</tr>
<tr>
<td>Access to supportive group of professional peers</td>
<td>.19</td>
<td>.03</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>2.39</td>
<td></td>
</tr>
<tr>
<td>% of variance</td>
<td>51.67</td>
<td></td>
</tr>
</tbody>
</table>

Note. Extraction method: Principal Axis Factoring. Factor loadings of about .5 (positive or negative) are considered to be high.

Section Three: Home Responsibilities

Section three explores the findings under research question two that are related to the third sub-question, “How do home responsibilities – housework, child and elder care – differ for women and men higher education CIOs?”

Univariate data for section three: Home responsibilities. Section three included 10 variables, five of which measured hours spent each week on a variety of home-related tasks, while the other five evaluated whether higher education CIOs hired anyone to assist with those responsibilities. Results from the first five questions are summarized in the following table.
Table 19

**Number of Hours CIOs Spent on Home-Related Duties Each Week**

<table>
<thead>
<tr>
<th>Category</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours spent cleaning each week (N = 179)</td>
<td>2.61</td>
<td>1.98</td>
</tr>
<tr>
<td>Number spent shopping for groceries each week (N = 181)</td>
<td>1.58</td>
<td>0.93</td>
</tr>
<tr>
<td>Hours spent cooking meals each week (N = 177)</td>
<td>3.14</td>
<td>2.44</td>
</tr>
<tr>
<td>Hours spent providing childcare each week (N = 107)</td>
<td>9.86</td>
<td>8.03</td>
</tr>
<tr>
<td>Hours spent providing eldercare each week (N = 187)</td>
<td>4.63</td>
<td>1.84</td>
</tr>
</tbody>
</table>

Responses to the five questions that asked respondents whether they hired anyone to help complete the tasks above were as follows: 38.3% \((n = 72)\) hired cleaning assistance, 0.5% \((n = 5)\) hired grocery shopping assistance, 6.4% \((n = 12)\) hired cooking assistance, 8.5% \((n = 16)\) hired childcare assistance, and 4.3% \((n = 8)\) hired eldercare assistance.

**Bivariate and multivariate analysis for research question 2, sub-question 3.**

The third sub-question for research question two asked, “How do home responsibilities – housework, child and elder care – differ for women and men higher education CIOs?” The ten questions above delineated five common types of home-related tasks that are often noted in the glass ceiling literature (Eagly & Carli, 2007; Hewlett et al., 2005; Powell & Graves, 2003; Yasmin & Helms, 2007). In order to assess gender’s strength as a predictor of the five continuous variables, hierarchical regression models were used. A chi-square goodness of fit test, with Fisher’s exact test, then evaluated whether the observed number of women and men higher education CIOs who hire assistance for these home-related tasks was significantly different from what was expected.
Bivariate test for research question 2, sub-question 3. For questions 3.6 through 3.10 in section three, the chi-square goodness of fit test, with a Fisher’s exact test, was used to determine whether the numbers of women and men higher education CIOs who hired assistance for different types of home-related work differed significantly from what was expected. In testing whether men and women CIOs hired someone to assist them with cleaning, women were significantly more likely to do so than what was expected by chance, $\chi^2(1, N = 184) = 4.77, p = .03; \Phi = .16, p = .03$. Women CIOs were also significantly more likely to hire assistance with meal preparation, $p = .02$, Fisher’s exact test, 2-tailed $(1, N = 185); \Phi = .19, p = .01$, and childcare, $p = .01$, Fisher’s exact test, 2-tailed $(1, N = 80); \Phi = .30, p < .01$. There were no significant differences, however, between what was observed and expected for women and men who hired someone to assist them with grocery shopping, $p = .61$, Fisher’s exact test, 2-tailed $(1, N = 185)$, or eldercare, $p = 1.00$, Fisher’s exact test, 2-tailed $(1, N = 65)$.

Multiple regression results for research question 2, sub-question 3.

Regression model results. Simple linear regressions were run on each of the five continuous home responsibilities variables prior to running the hierarchical regression model with two blocks of control variables. This was done in order to see if gender alone was a predictor of any of the variables. Of the variables representing hours spent cleaning, grocery shopping, cooking meals, providing childcare or providing eldercare, only cooking and providing childcare were variables for which gender was a predictor. These two variables were thus run through the hierarchical regression model. In addition to looking at each of the home responsibilities in isolation, a sixth, concatenated variable
was created representing the hours that higher education CIOs spend on all five tasks each week. This variable – total home care hours – was also run through the same regression model.

The regression models for section three assessed whether gender was significantly associated with hours spent cooking, hours spent providing childcare, or total home care hours after controlling for ethnicity, marital status, number of children, years spent in current position, years spent at current institution, annual salary, number of FTEs, and organizational structure. The three model structure used was the same described for research question two, sub-question one.

Regression model results: Hours spent cooking. For the first dependent variable, hours spent cooking, Model 1 produced from the first block with four demographic control variables was not significant ($F = 0.66, df = 4/158, p = .62$) with an adjusted $R^2 = -.008$. Model 2, from the second block with nine organizational control variables, was again, not significant ($F = 0.57, df = 7/151, p = .85$) with an adjusted $R^2 = -.03$. Finally, Model 3 produced from the final block that included the key independent variable of gender, was also not significant ($F = 1.46, df = 1/150, p = .14$) with an adjusted $R^2 = .03$. Thus, gender as a predictor of the number of hours spent cooking was significant when gender was the sole independent variable, but not when demographic and organizational control variables were introduced into the model. See Table 20 for a summary of the results.

There was an independence of residuals, as assessed by a Durbin-Watson statistic of 1.82. Examining the studentized residual against predicted values plot revealed that the
assumption of homoscedasticity was met. That plot, along with partial regression plots showed linear relationships between the dependent and independent variables, while residual normality was illustrated in the P-P plot. Diagnostics to assess multicollinearity were all in an acceptable range, with all VIF values less than 10.

**Regression model results: Hours spent providing childcare.** The next dependent variable tested was hours spent providing childcare. Once again, Model 1 produced from the first block with four demographic variables was not significant ($F = 0.55, \text{df} = 4/94, p = .90$), with an adjusted $R^2 = -.02$. Model 2 produced from the second block with nine organizational control variables was also not significant ($F = 1.11, \text{df} = 7/87, p = .36$), with an adjusted $R^2 = .01$. As well, Model 3, the block isolating the independent variable gender, was not significant ($F = 1.63, \text{df} = 1/86, p = .10$), with an adjusted $R^2 = .07$. As with the variable for hours spent cooking, gender was not a significant predictor of hours spent providing childcare when controlling for the identified demographic and organizational variables. See Table 21 for a summary of the results.

There was an independence of residuals, as assessed by a Durbin-Watson statistic of 2.00. Examining the studentized residual against predicted values plot revealed that the assumption of homoscedasticity was met. That plot, along with partial regression plots showed linear relationships between the dependent and independent variables, while residual normality was illustrated in the P-P plot. Diagnostics to assess multicollinearity were all in an acceptable range, with all VIF values less than 10.

**Regression model results: Total home care hours.** The final concatenated variable, total home care hours, was examined using the same three regression models.
Model 1 produced from the first block that included four demographic control variables was significant ($F = 3.45$, $df = 4/16$, $p = .01$), with an adjusted $R^2 = .06$. Model 2, from the second block with nine organizational control variables was also significant ($F = 3.10$, $df = 7/158$, $p < .01$), with an adjusted $R^2 = .12$. Finally, Model 3 produced from the third block that introduced the key independent variable, gender, resulted in a $R^2$ change of 0.06, with a significant $F$ change ($p = .001$) of 12.23. The overall model was significant ($F = 4.06$, $df = 1/157$, $p < .001$), with an adjusted $R^2 = .18$. These results suggest that the amount of unique variance in the number of house care hours explained by gender while controlling for ethnicity, marital status, number of children, years spent in current position, years spent at current institution, annual salary, number of FTEs, and organizational structure was six percent. In this case, when all of the home responsibility hours were combined into one number, gender was determined to be a significant predictor of house care hours worked after controlling for all other variables. In Model 1, the factor having/not having children was significant ($p < .01$). With the addition of the organizational variables in Model 2, having/not having children remained a significant factor ($p < .01$), and annual salary was added as one ($p = .01$). In the last model, both having/not having children ($p < .001$) and annual salary ($p = .02$) were once again significant, along with gender ($p < .01$), the key independent variable. In this analysis, gender predicted the number of hours spent on home care after accounting for both personal and organizational demographic variables; women were positively and significantly associated with spending more time on combined household duties. See Table 22 for a summary of the results.
There was an independence of residuals, as assessed by a Durbin-Watson statistic of 1.52. Examining the studentized residual against predicted values plot revealed that the assumption of homoscedasticity was met. That plot, along with partial regression plots showed linear relationships between the dependent and independent variables, while residual normality was illustrated in the P-P plot. Diagnostics to assess multicollinearity were all in an acceptable range, with all VIF values less than 10.

**Summary for research question 2, sub-question 3.** In evaluating how women and men higher education CIOs differ when it comes to home responsibilities, there were some significant distinctions. When simple linear regressions were run on the five different types of tasks, gender showed up as a significant predictor of hours spent cooking and providing childcare. Women in this sample spent an average of 1.11 hours more cooking, and 3.74 more hours providing childcare each week than men. When the regression model added numerous demographic and organizational control variables in, however, gender’s predictive power was reduced for those individual duties. Adding up the collective hours CIOs spend each week on all of the home care tasks illustrated a different story. Each week, women CIOs spend an average of 5.96 more hours than their male counterparts engaging in all of the duties combined (see Table 23 for details). When a variable representing the cumulative hours per week was used as the dependent variable and the regression models run, gender was indeed a significant predictor of the number of hours spent each week, above and beyond what was accounted for by demographic and organizational variables.
Complementing these findings were the ones that asked whether CIOs hired people to help them with their home-related tasks. Those findings showed that women were more likely than their male peers to hire out for assistance with cleaning, cooking and childcare. Thus, not only were women CIOs spending more time carrying out these duties at home than men in the same role, but they were also more likely to be spending money in order to manage their lives at home.

Section Four: Perceived Bias and Discrimination

In section four, findings are explored that relate to sub-question four under research question two: “How do perceptions of bias and discrimination in hiring and promotion practices differ for women and men higher education CIOs?”

Univariate data for section four: Perceived bias and discrimination
descriptives. The survey section on bias and discrimination in hiring and promotion processes had 12 variables in it. The first six asked respondents to rank their perceptions of hiring and review processes in higher education IT as they relate to the role of the CIO. Results from the questions are summarized in the following table.
Table 24

*CIO Perceptions of Hiring, Salary Negotiation, and Review Processes*

<table>
<thead>
<tr>
<th>Description of Item</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Strongly Agree/Agree</th>
<th>Neutral</th>
<th>Strongly Disagree/Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair hiring process at institution</td>
<td>186</td>
<td>4.38</td>
<td>0.76</td>
<td>90.4%</td>
<td>5.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Fair salary negotiation process at institution</td>
<td>185</td>
<td>3.93</td>
<td>1.02</td>
<td>70.7%</td>
<td>16.0%</td>
<td>11.7%</td>
</tr>
<tr>
<td>Salary equivalent to internal peers</td>
<td>186</td>
<td>3.53</td>
<td>1.06</td>
<td>56.9%</td>
<td>21.8%</td>
<td>20.3%</td>
</tr>
<tr>
<td>Salary equivalent to external peers</td>
<td>185</td>
<td>3.07</td>
<td>1.20</td>
<td>39.4%</td>
<td>26.1%</td>
<td>33.0%</td>
</tr>
<tr>
<td>Fair review process (current)</td>
<td>186</td>
<td>3.95</td>
<td>0.92</td>
<td>73.9%</td>
<td>17.6%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Fair review process (prior)</td>
<td>185</td>
<td>3.95</td>
<td>0.88</td>
<td>75.0%</td>
<td>15.7%</td>
<td>7.9%</td>
</tr>
</tbody>
</table>

*Note.* Mean based on a rating scale of 1 to 5, with 1 being strongly disagree and 5, strongly agree.

The second group of six questions explored higher education CIOs’ experiences with gender as an influential factor in hiring, promotion and pay. Of 188 respondents, 2.7% (*n* = 5) of them answered that over the course of their careers in higher education IT, they felt that they had been hired because of their gender, while 7.4% (*n* = 14) felt they had *not* been hired because of their gender. In terms of being promoted because of their gender, 2.1% (*n* = 4) felt that they had, while 6.4% (*n* = 12) felt they had *not*. Finally, 2.7% (*n* = 5) felt they had been paid *more*, and 14.9% (*n* = 28) felt they had been paid *less* because of their gender.
Women as Chief Information Officers in Higher Education

**Bivariate test for research question 2, sub-question 4.** The fourth sub-question for research question two asked, “How do perceptions of bias and discrimination in hiring and promotion practices differ for women and men higher education CIOs?” The twelve scale-based and dichotomous variables described above were used to answer that question. The Mann-Whitney U test was run on the scale-based variables to assess whether there were differences in women and men CIOs’ perceptions of bias and discrimination in hiring and promotion practices. For the dichotomous questions, a chi-square goodness of fit analysis, with a Fisher’s exact test, was used to determine whether the proportions of women and men reflecting on questions about bias and discrimination differed significantly from what was expected in the population.

None of the scale-based variables revealed significant differences in women and men’s perceptions of bias and discrimination in hiring and promotion practices. Women ($M_{rank} = 91.87$) were no more likely than men ($M_{rank} = 94.10$) to feel that the hiring process for their current role was fair and unbiased, $z(186) = -0.28, p = .78$. Neither was there a significant difference between how women ($M_{rank} = 85.36$) and men ($M_{rank} = 95.75$) regarded the fairness of the salary negotiation process, $z(185) = -1.23, p = .22$. Looking at whether CIOs felt that their own salaries were equal to or better than their peers’ at their current institution, women ($M_{rank} = 90.29$) and men’s ($M_{rank} = 94.68$) responses again did not differ significantly, $z(186) = -0.52, p = .61$. The same was true for women ($M_{rank} = 86.06$) and men’s ($M_{rank} = 95.50$) perceptions around salary equity with peers at other institutions, $z(185) = -1.10, p = .28$. When asked about the fairness of their current review process, women ($M_{rank} = 96.32$) and men ($M_{rank} = 92.46$) did not
differ significantly from one another, $z(186) = 0.46, p = .64$, as was the case when women ($M_{\text{rank}} = 98.52$) and men ($M_{\text{rank}} = 91.01$) ranked past review processes, $z(185) = .91, p = .36$.

In contrast to the Mann-Whitney U test results, the findings for the dichotomous questions showed that some significant differences between women and men CIOs did, in fact, exist. When asked if they felt if they had ever been hired because of their gender, the proportions of women who felt this was true, and men who felt it was not, was higher than expected in the population, $p = .02$, Fisher’s exact test, 2-tailed ($1, N = 185$); $\Phi = .20, p = .01$. While there was not quite a significant difference between women and men who felt that they were not hired because of their gender, $p = .06$, Fisher’s exact test, 2-tailed ($1, N = 186$), an examination of the data revealed that proportionally more women and fewer men felt that way. The distribution of women and men CIOs’ responses to whether they were promoted because of their gender were significantly different than expected, $p = .05$, Fisher’s exact test, 2-tailed ($1, N = 185$); $\Phi = .17, p = .02$, with more women and fewer men agreeing with this statement. The same was true when asked if they felt that they had not been promoted because of their gender, $p = .02$, Fisher’s exact test, 2-tailed ($1, N = 186$); $\Phi = .19, p = .01$: women were more likely, and men less likely, to say this was true. The last two questions focused on whether CIOs felt as though they had ever been paid more or less because of their gender. For the first question, there was no significant difference between what was observed and expected in the population, $p = .33$, Fisher’s exact test, 2-tailed ($1, N = 187$). Interestingly, no women answered this question in the affirmative. There was a significant difference, however, in the
distribution of women and men CIOs who said they were paid *less* because of their
gender, \( \chi^2(1, N = 187) = 1.88, p < .001; \Phi = .57, p < .001 \): women were far more likely
than men to say this was the case. This last comparison represented the most significant
findings of the entire section. Table 25 shows the full results.

**Summary for research question 2, sub-question 4.** When asking CIOs about their
perceptions related to a variety of hiring and promotion practices in higher education IT,
there was surprisingly little contrast between what women and men reported. Hiring and
review processes were ranked positively by CIOs, while the average scores comparing
their own salaries to their peers’ were the lowest among the variables. Respondents’
reflections on the role that gender has played in their careers highlighted a number of
significant differences between women and men. Women were more likely than men to
feel that their gender had a positive effect on whether they were hired or promoted. At the
same time, however, they also felt that gender negatively affected their chances at
promotions. Though it was not quite significant, proportionally more women than men
thought that they were not hired due to gender. And the most significant finding in this
section revealed that women were more likely than their male counterparts to perceive
negative effects of gender on pay. Only men in the population felt that gender positively
influenced salary – no women reported feeling this way.

**Reliability.** For the six-question scale used to measure higher education CIOs
perceptions of bias and discrimination in hiring and promotion practices (survey
questions 4.1 through 4.6), Cronbach’s alpha measured the scale’s reliability. The alpha
was .69, indicating that the scale was on the low end of acceptability for measuring
internal consistency. The scale mean was 22.84 ($SD = 3.69$). Removing the sixth item from the scale, which measured whether review processes prior to obtaining the CIO position were fair and unbiased, would raise the alpha to .74, a more acceptable level of reliability. The first five items on the scale were most closely tied together.

**Factor Analysis.** Exploratory factor analysis (EFA) was used to look at the structures underlying the bias and discrimination scale-based variables. The extraction method of principal axis factoring (PAF) and varimax rotation was utilized for the factor loading. Inspection of the correlation matrix showed that all of the variables had at least one correlation coefficient greater than 0.3. Bartlett’s Test of Sphericity was statistically significant ($p < .001$) indicating factor analysis was appropriate.

PAF revealed two components with eigenvalues greater than one, the first explaining 33.27% of the variance, and the second, 13.36%. Visual inspection of the scree plot indicated that two factors should be retained. The results of an orthogonal rotation of the solution are shown in Table 26. The analysis yielded a two-factor solution.
Table 26

Factor Loadings from Exploratory Factor Analysis: Communalities, Eigenvalues, and Percentages of Variance for Items on the Bias and Discrimination Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair hiring process at institution</td>
<td>.29</td>
<td>.53</td>
<td>.37</td>
</tr>
<tr>
<td>Fair salary negotiation process at institution</td>
<td>.59</td>
<td>.34</td>
<td>.46</td>
</tr>
<tr>
<td>Salary equivalent to internal peers</td>
<td>.78</td>
<td>.07</td>
<td>.62</td>
</tr>
<tr>
<td>Salary equivalent to external peers</td>
<td>.79</td>
<td>.03</td>
<td>.63</td>
</tr>
<tr>
<td>Fair review process (current)</td>
<td>.21</td>
<td>.62</td>
<td>.43</td>
</tr>
<tr>
<td>Fair review process (prior)</td>
<td>-.11</td>
<td>.53</td>
<td>.29</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>2.48</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>% of variance</td>
<td>33.27</td>
<td>13.37</td>
<td></td>
</tr>
</tbody>
</table>

Note. Extraction method: Principal Axis Factoring. Factor loadings of about .5 (positive or negative) are considered to be high.

Three items loaded onto Factor 1, all of which relate to CIOs perceptions of fair salaries. Three different items loaded onto Factor 2. These factors all pertained to the fairness of hiring and review processes.

Section Five: Role Models and Mentors

The final one of this chapter, section five reviews findings related to role models and mentors. The fifth and sixth research sub-questions under research question two are addressed here. Findings associated with the sub-question, “How does the existence or absence of role models differ for women and men higher education CIOs?” are examined
first, followed by those linked to the sub-question asking, “How does the existence or absence of mentors differ for women and men higher education CIOs?”

**Univariate data for section five: Role model descriptives.** The last section of the questionnaire was comprised of 16 variables. The first five measured the influence of role models on the career choice of higher education CIO. Results from the preliminary univariate analysis are presented in the following table.

Table 27

*Perceptions of the Influence of Role Models on the CIO Role*

<table>
<thead>
<tr>
<th>Description of Item</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Strongly Agree/Agree</th>
<th>Neutral</th>
<th>Strongly Disagree/Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursued CIO role because of admired exec (current institution)</td>
<td>149</td>
<td>2.76</td>
<td>1.24</td>
<td>22.3%</td>
<td>24.2%</td>
<td>47.6%</td>
</tr>
<tr>
<td>Pursued CIO role because of admired exec (other institution)</td>
<td>171</td>
<td>3.13</td>
<td>1.11</td>
<td>29.3%</td>
<td>21.8%</td>
<td>39.9%</td>
</tr>
<tr>
<td>Male executive influence</td>
<td>167</td>
<td>3.21</td>
<td>1.26</td>
<td>42.6%</td>
<td>16.0%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Female executive influence</td>
<td>150</td>
<td>3.15</td>
<td>1.27</td>
<td>37.3%</td>
<td>12.8%</td>
<td>29.8%</td>
</tr>
<tr>
<td>Role models influence next generation of CIOs</td>
<td>185</td>
<td>4.00</td>
<td>0.86</td>
<td>78.7%</td>
<td>13.8%</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

*Note.* Mean based on a rating scale of 1 to 5, with 1 being strongly disagree and 5, strongly agree.

**Bivariate and multivariate analysis for research question 2, sub-questions 5.**

The fifth sub-question under research question two was, “How does the existence or absence or role models differ for women and men higher education CIOs?” The first five
Likert scale questions in this section addressed that question. The Mann-Whitney U test was used for analyzing differences in the distribution of women and men’s responses to the questions around role models.

**Role model influence.** The first question that asked CIOs if they pursued that role because of an executive they admired at their own institution illustrated no significant difference between women (M rank = 79.90, n = 39) and men’s responses (M rank = 73.26, n = 110) z(149) = 0.85, p = .40. The same was true for executives at another institution, where women’s mean rank was 92.10 (n = 46) and men’s, 83.76 (n = 125), z(171) = 1.02, p = .31. The next question asked CIOs if a male executive influenced their decision to pursue that role; women’s responses (M rank = 81.87, n = 45) were not significantly different than men’s (M rank = 84.79, n = 122), z(167) = -0.36, p = .72. The same was true when asked about a female executive’s influence: women’s mean rank on the variable (M rank = 85.31, n = 43) was higher than men’s (M rank = 71.56, n = 107), but not quite significant, z(150) = 1.81, p = .07. The last question asked whether current higher education CIOs feel that role models are important for the next generation; the mean rank overall was the highest of all five questions, at 4.00. Men (M rank = 90.63, n = 135) and women (M rank = 99.41, n = 50) did not differ significantly in their ratings, however, z(185) = 1.09, p = .28.

**Summary for research question 2, sub-question 5.** For the most part, women and men higher education CIOs did not significantly differ in their opinions about the influence of role models for their particular work role. The only place where the difference was nearly significant was when women ranked the importance of other
women executives on their decision to seek out the CIO position. Those results showed women valuing that more than men.

**Reliability.** The five-question scale in this section aimed to measure how role models influenced CIOs’ decision to pursue that job (survey questions 5.1 through 5.5). Cronbach’s alpha measured the scale’s internal consistency; the alpha for role model influence was .79, which demonstrated that the scale was acceptably reliable. The scale mean was 15.90 ($SD = 4.18$). Removing the fifth item from the scale – ranking the importance of role models for future generations of higher education CIOs – would very slightly improve the alpha (from .785 to .788), but not by much. All items on the scale were consistent with one another.

**Factor Analysis.** Exploratory factor analysis (EFA) was conducted to expose the underlying structure of the set of role model influence variables. Principal axis factoring (PAF) and varimax rotation were used for factor loading. The correlation matrix showed that all variables had at least one correlation coefficient greater than 0.3. Bartlett’s Test of Sphericity was statistically significant ($p < .001$), demonstrating that factor analysis was appropriate.

PAF uncovered one component with an eigenvalue greater than one, explaining 43.48% of the variance. Visual inspection of the scree plot illustrated that just one factor should be retained. Since only one factor was extracted, the solution was not rotated. The interpretation of the data matched the role model influence attributes the scale was designed to measure. Component loadings and communalities for the solution are presented in Table 28.
Table 28

Factor Loadings from Exploratory Factor Analysis: Communalities, Eigenvalues, and Percentages of Variance for Items of the Role Model Influence Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursued CIO role because of executive I admire at current institution</td>
<td>.64</td>
<td>.41</td>
</tr>
<tr>
<td>Pursued CIO role because of executive I admire at other institution</td>
<td>.74</td>
<td>.55</td>
</tr>
<tr>
<td>Male executive influenced my decision</td>
<td>.71</td>
<td>.51</td>
</tr>
<tr>
<td>Female executive influenced my decision</td>
<td>.69</td>
<td>.48</td>
</tr>
<tr>
<td>Role models have strong influence on next generation of CIOs</td>
<td>.47</td>
<td>.22</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>2.71</td>
<td></td>
</tr>
<tr>
<td>% of variance</td>
<td>43.38</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Extraction method: Principal Axis Factoring. Factor loadings of about .5 (positive or negative) are considered to be high.

Univariate data for section five: Mentor descriptives. The next nine survey questions dealt with the presence and gender of mentors over the arc of participants’ careers. Of the 188 participants, 6.9% (n = 13) said that they currently had a formal mentor assisting them in their careers. Of those who said they had formal mentors, 0.5% (n = 1) indicated their mentor was female, while 2.7% (n = 5) reported that they were male, and 3.7% (n = 7) said they were mixed (female and male). More respondents reported that they currently had an informal mentor, 39.9% (n = 75), with 8% (n = 15) of them being female, 12.2% (n = 23) male, and 19.7% (n = 37) both female and male.
Women as Chief Information Officers in Higher Education

Next, respondents were asked if they had a formal mentor prior to their role as CIO; 19.7% ($n = 37$) answered that they had. The gender breakdown for the prior formal mentors was as follows: 2.7% ($n = 5$) female, 10.1% ($n = 19$) male, and 6.9% ($n = 13$) mixed. In response to whether participants had had an informal mentor prior to their current role, 55.3% ($n = 104$) responded that they had; 8.0% ($n = 15$) of them were female, 25% ($n = 47$) male, and 22.3% ($n = 42$) mixed. The ninth variable asked if respondents’ institutions had formal mentoring programs: only 3.7% ($n = 7$) indicated that a formal program existed on their campus.

The final two questions ranked respondents’ perceptions about the importance of formal and informal mentoring for the CIO position. Results are presented in the following table.

Table 29

*Perceptions of the Importance of Mentoring for the CIO Role*

<table>
<thead>
<tr>
<th>Description of Item</th>
<th>$N$</th>
<th>Mean</th>
<th>$SD$</th>
<th>Strongly Agree/ Agree</th>
<th>Neutral</th>
<th>Strongly Disagree/ Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal mentoring for CIO role is important</td>
<td>184</td>
<td>3.46</td>
<td>0.89</td>
<td>45.7%</td>
<td>39.9%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Informal mentoring for CIO role is important</td>
<td>186</td>
<td>4.04</td>
<td>0.80</td>
<td>79.2%</td>
<td>15.4%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

*Note.* Mean based on a rating scale of 1 to 5, with 1 being strongly disagree and 5, strongly agree.

**Bivariate and multivariate analysis for research question 2, sub-questions 6.**

Research sub-question six under the second research question asked, “How does the existence or absence of mentors differ for women and men higher education CIOs?”
Eleven questions (which contained 18 variables) were geared toward answering that question; 16 of the variables were dichotomous and the other two, scale-based. The chi-square goodness of fit test, with the Fisher’s exact test, was run on the dichotomous variables to assess whether the proportions of women and men were statistically significantly different than what was anticipated in the population. The Mann-Whitney U test was used in order to assess whether any significant difference existed in the Likert scale rankings for the two groups.

*Mentor presence and influence.* The nine dichotomous questions focused on what kind of mentors – formal and informal – current CIOs have now and have had in the past, and whether those mentors were women, men or a mix of the two. It is important to note that if respondents indicated they did not have a mentor (current formal/current informal/prior formal/prior informal), the questionnaire skipped the gender questions. Thus, only those who indicated they had a mentor were branched to and answered the gender-related questions. The results should be read with that information in mind.

For the variable that measured whether there was a difference in the numbers of women and men who currently have formal mentors, no significant difference between what was expected and observed was found, $p = 1.00$, Fisher’s exact test, 2-tailed ($1, N = 186$). Results from the tests that looked at the mentors’ gender were all insignificant. Those results follow in Table 30.
Table 30

*Gender of Current Formal Mentors for Higher Education CIOs*

<table>
<thead>
<tr>
<th>Mentor Gender</th>
<th>Male</th>
<th>Female</th>
<th>Fisher’s Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>0.7%</td>
<td>0</td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>2.2%</td>
<td>2</td>
</tr>
<tr>
<td>Mixed</td>
<td>6</td>
<td>4.4%</td>
<td>1</td>
</tr>
</tbody>
</table>

The next variable evaluated the difference between the actual proportions of women and men who currently had informal mentors, and what was anticipated in the population. This was followed by three variables measuring whether there was a difference for women and men CIOs in the gender of their informal mentors. Based on the statistical analysis, the observed and expected proportions of women and men who had informal mentors were not significantly different, $\chi^2(1, N = 185) = 0.00, p = .99$.

Results from the analyses of the mentors’ gender, none of which were statistically significant, are itemized in the table below.

Table 31

*Gender of Current Informal Mentors for Higher Education CIOs*

<table>
<thead>
<tr>
<th>Mentor Gender</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2(1)$</th>
<th>Fisher’s Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>6.5%</td>
<td>6</td>
<td>12.8%</td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>14.5%</td>
<td>3</td>
<td>6.4%</td>
</tr>
<tr>
<td>Mixed</td>
<td>27</td>
<td>19.6%</td>
<td>10</td>
<td>21.3%</td>
</tr>
</tbody>
</table>
The next variable assessed whether the proportions of women and men who had formal mentors prior to obtaining their CIO role were different than what was expected in the population: no significant difference was found, \( \chi^2(1, N = 187) = 2.61, p = .11 \). The group of variables that looked at the gender of the formal mentors also found that there were no significant differences between expected and observed numbers of women and men in the sample. Results from those analyses are listed below.

Table 32

<table>
<thead>
<tr>
<th>Mentor Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>%</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>1.5%</td>
</tr>
<tr>
<td>Male</td>
<td>17</td>
<td>12.4%</td>
</tr>
<tr>
<td>Mixed</td>
<td>12</td>
<td>8.8%</td>
</tr>
</tbody>
</table>

The final group of dichotomous variables looked at whether the ratios of women and men who had informal mentors before becoming CIOs varied significantly from what was anticipated. Out of the four groupings (formal present, informal present, formal past and informal past mentors), this was the only one that showed significant differences in the population. Men had statistically significantly more prior informal mentors, and women fewer than predicted, \( \chi^2(1, N = 185) = 4.14, p = .04; \Phi = -.15, p = .04 \). Looking more granularly at the gender of the past informal mentors also showed variation between the groups, illustrated below. Women had proportionally more female informal mentors.
prior to their CIO role than men did. The other two groups, male and mixed, showed no significant differences between the populations.

Table 33

*Gender of Prior Informal Mentors for Higher Education CIOs*

<table>
<thead>
<tr>
<th>Mentor Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>4.4%</td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>25.5%</td>
</tr>
<tr>
<td>Mixed</td>
<td>30</td>
<td>21.9%</td>
</tr>
</tbody>
</table>

*Note.* For female mentor, \( \Phi = .23, p < .01 \). **\( p < .01 \)

The last two questions of the survey asked higher education CIOs whether they thought formal and informal mentoring were crucial for that role. CIOs ranked informal mentoring as more important than formal mentoring for the position, but the Mann-Whitney U analyses illustrated that there was no difference in how women (\( M \) rank = 85.54, \( n = 48 \)) and men (\( M \) rank = 94.96, \( n = 136 \)) ranked the importance of formal mentors, \( z(184) = -1.12, p = .26 \). The same was true for informal mentors, as women’s mean rank, 99.09(\( n = 49 \)), and men’s mean rank, 91.50(\( n = 137 \)), were not significantly different from one another, \( z(186) = 0.93, p = .36 \).

**Summary for research question 2, sub-question 6.** In this sample, more CIOs had informal than formal mentors, and they valued those connections more. Additionally, whether current or prior formal, or current informal, women and men CIOs were equally likely to have (or have had) them. The one place where that differed for the two groups
was in the realm of prior informal mentors. There, men more frequently had an informal mentor before they became CIO. Additionally, it was more likely for women than men to have relied on a female mentor in earlier parts of their careers.

Chapter Summary

Given the vast amount of data reported in this chapter, the significant findings from each section are highlighted below. Inferences from these findings and connections to the literature are explored in the discussion chapter.

Research question one. The first research question in the quantitative stage of the study inquired, “What individual and organizational factors describe higher education CIOs and their work environments, and how do they differ for women and men?” Two sub-questions were designed to help answer that, through inquiry into both demographic characteristics of the population, and the pathways chosen that led to the senior-most IT leadership job in higher education.

Research sub-question one. The first research question this study asked was what individual and organizational factors described CIOs and their work environments, and how those factors differed for women and men. The first sub-question under that investigated how women and men CIOs in higher education differ demographically. Higher education CIOs were likely to be White, married/partnered, and in their 50s, with two children or fewer who were over 18. Of the demographic variables explored, only the one that compared how likely it was for women and men to have children proved significant; men CIOs were more likely to have them. Also, though comparisons of women and men’s salaries showed no statistical difference, the actual mean difference
between the two groups was noteworthy. An annual gap of almost $14,000 between the two groups points to a short and long-term practical problem for women. All else being equal, earning that much less than men each year can lead to significant cumulative differences in pay over time, as annual increases are tied to base pay. Implications tied to this finding are discussed in Chapter Six.

Research sub-question two. The second sub-question looked at whether the pathways to the CIO office in higher education varied for women and men. The population could be described as highly educated, especially in the technical and business domains, and were likely to have come from another CIO position, or one in administrative or academic technology management. It was also probable that they had previously worked in academic departments or business units within higher education, and in private industry or consulting outside of higher education. As with the demographic findings, the variables used to answer this sub-question illustrated little variation between the two groups. Women were more likely to have had held non-IT positions within higher education in business/financial affairs, while men were more likely to have worked outside of higher education as consultants, but other than that, the paths taken by women and men closely resembled one another.

Research question two. The second research question for the quantitative phase of the study asked, “What specific cultural factors identified throughout the glass ceiling literature exist in higher education IT, and how do women and men’s experiences within the culture of IT in higher education differ?” Six sub-questions were designed to help answer this question and centered on themes of organizational work norms, workplace
climate, home responsibilities, bias and discrimination, and role models and mentors.

Findings from each of the research sub-questions are summarized here.

**Research sub-questions one and two.** Research question two inquired what specific cultural factors identified throughout the glass ceiling literature existed in higher education IT, as well as how women and men’s experiences within the culture differed. Six sub-questions were developed under this as a way to help answer the main question. The first posed the question of whether organizational work norms differ for women and men in higher education IT. When comparing the total number of hours worked, women and men’s experiences appeared similar. Assessing where those hours were spent painted a different picture, however, with women occupying significantly more time in the office than men. By CIOs’ reports, the higher education IT workplace offers flexible options. Men used that flexibility more often than women, however, as illustrated by their significantly higher usage of the compressed workweek, as well as their less significant but noteworthy usage of flex time and the distributed office. In assessing the research sub-question that asked how perceptions of workplace climate differ for women and men CIOs, no significant differences between the two groups were found: both rated the climate as supportive and positive.

**Research sub-question three.** The third sub-question under research question two examined how home responsibilities, as enumerated in the glass ceiling literature, differed for women and men higher education CIOs. In addressing this question, multiple regression models were used to evaluate whether gender would predict hours spent cleaning, grocery shopping, cooking, or providing child or eldercare, when controlling
for a variety of demographic and organizational variables. When the tasks were examined individually, gender fell short as a predictor variable. Combining those tasks into one variable, however, revealed a different story, with gender significantly predicting homecare duties. Women CIOs were significantly more likely to spend time on those tasks than their male counterparts. They were also more likely than men to hire cooking, cleaning and/or childcare assistance to help them manage their lives outside of the workplace.

**Research sub-question four.** Sub-question four inquired how women and men higher education CIOs’ perceptions of bias and discrimination in hiring and promotion practices differed. The two groups both ranked hiring and promotion practices quite positively, and the data uncovered no significant differences between them. They rated their pay, as compared to their peers, less favorably than the other measures, but again, no gender-based differences were found. When asked about the impact of gender on hiring, promotion and pay, however, there were a number of significant findings. Women were more likely than men to feel that they had been hired and promoted because of their gender, but even more so, *not* promoted because of that. Additionally, and most significantly in this group of variables, women CIOs felt the negative impact of gender on their pay, far more than their male peers.

**Research sub-question five.** The fifth sub-question asked whether the existence or absence of role models varied for women and men CIOs. No statistical difference between women and men emerged when asked about the influence of role models or
those role models’ gender on their career choice of CIO, though women executives’ influence on women CIOs’ choices came close to reaching that point.

**Research sub-question six.** The sixth and final sub-question for research question two looked at how the existence or absence of mentors differed for women and men higher education CIOs. Overall in the population, informal mentors were valued more highly than formal ones, and there were no tremendous imbalances in whether women and men currently had either type. The only significant distinctions in the population were seen in the answers around prior informal mentors. Men were more likely to have had an informal mentor earlier on in their career, and women were more likely to have worked with a female informal mentor before they became CIO.

**Summary.** The profile of higher education CIOs in this study’s survey displayed strong demographic homogeneity. Both personal characteristics and ones related to career pathways (educational background, prior positions) tended toward norms familiar to the IT community in general: fifty-something White men with technical and/or business backgrounds are and have been the standard archetype for IT leaders in North America and beyond for decades. Demographically, women in the population looked like their male counterparts, and aside from gender, contributed to the population’s uniformity.

Some interesting differences between women and men emerged from the questionnaire’s statistical analysis, however. Male CIOs were more likely than their female counterparts to have children, yet they spent significantly less time than women on home-related and caretaking tasks, and were less likely to employ others to help them fulfill those obligations. At the same time, women CIOs spent more time in the office
than men, who more frequently used flexible work options like the compressed work week. Additionally, though both groups communicated some satisfaction with hiring and promotion processes in higher education IT, only women felt gender’s negative influence on their pay and opportunities for promotion. The qualitative phase of this study took the opportunity to explore these significant findings in depth; the next chapter presents data related to women CIOs’ interpretations of these particulars.
Chapter Five

Qualitative Findings

Introduction

This chapter presents the findings that emerged from semi-structured interviews with nine women CIOs at higher education institutions. The research question driving the qualitative phase of the study was, “How do women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position?” The question was designed to provide context for significant findings from the study’s quantitative phase; the interview protocol was framed around those findings. As the quantitative data detailing gender’s negative affect on pay, hiring and/or promotion was so significant in the first phase of the study, those criteria were used to choose participants for the qualitative stage. All of the participants reported bias in at least one of the three areas – pay, hiring or promotion – and most did so for more than one. After selecting based on those criteria, participants were then further sorted in order to achieve demographic diversity. Demographic descriptions of the participants follow. Because of the relatively low number of women CIOs in higher education, the descriptions are ambiguous in places in order to maintain participants’ anonymity.

Gina is a 52-year-old White woman with a domestic partner and no children. She has a doctoral degree in a STEM discipline, lives in the South, and oversees a staff of between 26 and 50 individuals. She has been in her job and at her institution for three years, and earns between $125,000 and $150,000. Gina works at an institution with a Carnegie Classification of Master’s Colleges and Universities I.
Jeanne is a 47-year-old non-White woman who is married with no children. She has a doctoral degree in a STEM discipline, lives in the Pacific Northwest, and oversees a staff of 50 and 100 individuals. She has been in her job and at her institution for less than a year, earning between $200,000 and $225,000. Jeanne works at an institution with a Carnegie Classification of Doctoral/Research University – Extensive.

Jen is a 52-year-old White woman who is married with two children who are both over the age of 18. She has a Doctoral degree in a STEM discipline, lives in the South, and oversees a staff of between 100 and 200 individuals. She has been in her job for six years, and at her institution for 24 years, earning between $150,000 and $175,000. Jen works at an institution with a Carnegie Classification of Doctoral/Research University – Extensive.

Katie is a 49-year-old White woman who is married with two children who are between the ages of 12 and 17. She has a Master’s degree in business, lives in the Northeast, and oversees a staff of between 26 and 50 individuals. She has been in her job and at her institution for 14 years, and earns between $100,000 and $125,000. Katie works at an institution with a Carnegie Classification of Baccalaureate/Associate’s Colleges.

Kimberly is a 56-year-old White woman with a domestic partner and four children who are all over the age of 18. She did not complete her Bachelor’s degree, lives in the Mid-Atlantic region, and oversees a staff of between 26 and 50 individuals. She has been in her job and at her institution for 11 years, and earns between $125,000 and $150,000.
Kimberly works at an institution with a Carnegie Classification of Baccalaureate Colleges – Liberal Arts.

*Linda* is a 56-year-old White woman who is divorced and has more than four children who are over the age of 18. She has a Master’s degree in business, lives in the Midwest, and oversees a staff of between 26 and 50 individuals. She has been in her job and at her institution for five years, and earns between $125,000 and $150,000. Linda works at an institution with a Carnegie Classification of Associate’s Colleges.

*Rita* is a 57-year-old White woman who is married with one child who is over the age of 18. She has a Master’s degree in administration, lives in the Midwest, and oversees a staff of between 26 and 50 individuals. She has been in her job for 10 years, and at her institution for 22 years, earning between $125,000 and $150,000. Rita works at an institution with a Carnegie Classification of Doctoral/Research University – Intensive.

*Sheila* is a 41-year-old non-White woman who is married with one child under the age of two. She has a Master’s degree in IT, lives in the South, and oversees a staff of between 76 and 100 individuals. She has been in her job for four years, and at her institution for 18 years, earning between $100,000 and $125,000. Sheila works at an institution with a Carnegie Classification of Master’s Colleges and Universities I.

*Tracey* is a 46-year-old White woman who is married without children. She has a Master’s degree in business, lives in the Midwest, and oversees a staff of fewer than 25 individuals. She has been in her job for 15 years, and at her institution for 31 years, earning between $100,000 and $125,000. Tracey works at an institution with a Carnegie Classification of Master’s Colleges and Universities I.
Data collected from the nine interviewees provided context for the significant findings from the quantitative survey. In all, seven areas were explored, which included the following:

- Pathways to the CIO office
- How women CIOs explain:
  - Spending more hours in the office and using fewer flexible options;
  - Spending more time on household tasks (cooking, cleaning, childcare, eldercare, and grocery shopping);
  - Bias in hiring and promotion processes;
  - Bias in pay; and
  - Why mentors are important for the CIO role; as well as
- How women are attaining the CIO role in higher education at better rates than their corporate counterparts.

Themes from each of the categories will be discussed in turn.

**Pathways to the CIO Role**

In this category, two themes helped describe participants’ paths to the CIO role:

1) Demographic trends, which mirror those found in the survey population; and
2) Internal and external opportunities are both viable ways to obtaining the role.

**Demographic Trends**

The questionnaire results showed that overall, higher education CIOs are highly educated, mostly in technical or business-focused areas. They also tend to work in technically focused jobs prior to obtaining the CIO role, such as administrative or
academic technology, or networking. The demographics for the nine interviewees corroborated the survey data: the routes taken to CIO are (or have been) technical. As illustrated above (Figures 11 and 12), all but one of the participants had post-graduate degrees, all of which were concentrated on business, administration or STEM disciplines. Prior positions for the interviewees were also technically focused: before their current roles, participants had previously worked as CIOs, administrative or academic technology directors, or overseeing systems and networking areas in their organizations. On the whole, high value seemed to be placed both on educational attainment and more technical or business-oriented disciplines for the role.

**Internal and External Opportunities as Viable Pathways to the Role**

Aside from what was observed demographically, participants were also asked to describe their career progression and how they ended up in their current job. Their responses emphasized two advancement modes: external and internal progression. External progression consisted of moving, sometimes across country, to make the career progress desired. Four of the nine participants had made good-sized geographical leaps to obtain a CIO position. The other five made most of their progress internally, by proving themselves and climbing the career latter at their current institutions. When discussing that internal progression, an interesting pattern emerged with the participants: four out of five, and one who had mostly progressed externally, noted how illness, death or the retirement of their supervisor contributed to their opportunities to move into the CIO role. These significant extenuating circumstances launched sudden possibilities for a notable number of women. For Jen, it was her boss retiring:
The existing chancellor was talking about retiring, then my boss started talking about retiring. They asked me to be the CIO. I said, ‘Don’t you want to have a search?’ because I thought . . . I could compete in a search. I thought that might be the better way to handle it. The CFO at that time was a wonderful man . . . who had brought of lot of positive change at [the institution]. He got Lou Gehrig’s disease. We were looking at a chancellor change, and he was sick. He said he didn’t want to go through the charade of a search. . . . We were organizationally very stable, and they wanted to continue.

Unexpected retirement affected Linda’s position as well, and she spoke about a prior boss’ encouragement when he wanted to leave:

He was the CIO at that time. . . . We bonded really quick. We had a lot to accomplish, so we really needed to count on each other. It was a good fit, a really good fit. Shortly after that, within the year, he wanted to get out of that role. He was a little bit older and he was just like, “I don’t want to do this.” He was very encouraging for me in many things.

Her boss’ sudden illness acted as a launch pad for Rita:

My CIO went to Las Vegas and got sick and could not come back. He couldn’t get on a plane for quite a while, at least six months. He just told me, “Do the job, and move into my office, and make them move you out, and just do it.” When he decided he couldn't come back, he told the university, “You really ought to promote her, because she’s been doing the job,” and that’s how I got into it.
For Tracey, it was her boss’ death than opened up the opportunity for her. As she said, “Then I got back on the administrative track, where I went through: systems analyst, assistant director and director. Then my boss died. He was diagnosed with lymphoma and three months later, he died. I was the second in command.” Sheila’s story was similar, but poignant in that the sudden change in plans altered her perspective on her own capabilities. “There’s a piece of me that says if my former boss hadn’t passed away, I would have never stepped out to try this because I was very comfortable in being in that supporting role.” Only one of the five who progressed internally did not talk about a major change with her boss as a catalyst for her move into the CIO role.

The tales of moving externally were far less dramatic, but underscored another path women took to advance their careers. In four cases, participants saw moving as a strategic necessity for staying in higher education IT. Though the coastal areas of the United States are bursting with academic institutions, the same is not true of all geographic regions. Even in institutionally rich states, the fewest number of jobs exist at the top of the organizational hierarchy. Thus, for women living in areas with fewer institutions from which to choose, pursuing new executive roles can require not only an organizational change, but also a geographical one. Understanding this helps to underscore why the participants who advanced their careers by changing schools and locations spoke about it in such a matter-of-fact way.

**Longer Hours in the Office and Fewer Flexible Work Options**

The themes for this category that helped explain why women work longer hours in the office and use fewer flexible work options include:
1) Face time is required; and

2) Women compartmentalize work and home.

The quantitative analysis showed that women CIOs worked significantly more hours in the office than men. They were also significantly less likely to use a compressed workweek in order to flex their schedules. Additionally, though other flex options did not rise to the level of the statistical significance, flex time and the distributed office were also less frequently used by women. Overall, men were more likely than women to avail themselves of the types of flexible options their employers offered. When asked to explain these phenomena, two themes emerged from the women CIOs’ responses: face time and compartmentalization.

**Face Time Required**

*I think women as a whole, professional women as a whole, are always mindful that they don’t want to be seen as a weak link or not up to the task, and so in my opinion, we have to be better than men to be taken seriously. You have to be strong, and you have to be on, and you have to be here . . .* (Kimberly)

**Working norms for CIOs.** The theme described as “face time” – making sure people in the office see your face – came up frequently when asking participants why they thought women were spending significantly more time than men in the office and using fewer flex options. It came together as a series of factors that, when united, contributed to what women interpreted as an implicit imperative to be in the office. The first factor centered on the working norms of higher education IT organizations. Many of the women described the long hours and expectations attached to the CIO role. As Gina said, “I’m in the office 10, 11 hours a day. I’m hopefully not asking you to be in the office 10, 11 hours a day, but on the days that I am asking you to do that, I’m there too.”
Others did not describe their situation by the hours they kept, but rather, in terms of the overall intensity of the position. Kimberly said, “You’re never really not working. You’re always working,” while Katie indicated that it is expected “. . . that you’re available 24/7. Absolutely. If you’re going to go into this field, you need to know that.” Tracey also echoed those sentiments, remarking:

My responsibilities are 24 hours a day, seven days a week. When the work goes down, that’s a crisis. . . . I’m on call 24/7. Everybody knows that. They know my home phone number and my cell phone number. I get called at home. I get called in the middle of the night.

Sheila, who has a small child, described her work norms in a similar way, though with the additional pressures of managing that intensity with obligations at home. She said,

I have a little bit of home time – I have a two-year-old – and then his dad has to take over and I get back to work, and then I’ll be up until sometimes two in the morning and then start back again at six o’clock.

In their descriptions of working norms, these women expressed concrete models of what has been described in the literature as the “ideal worker norm,” the social expectation of being completely dedicated to your job (Drago, 2007). That dedication, associated with a role like that of CIO, is based on an assumption that if there are obligations outside of work, someone else is tending to them. A masculine bias is inherent here, with norms built on historical expectations of who sat in executive positions. The woman with the two-year-old articulated this bias clearly, when talking about her own ambivalence in mentoring more women employees:
I think my issue is that the folks [women] who have been more of the family types, I think I don’t want to, and this is going to sound horrible, but I feel like I just won’t have anybody on my team. I don’t want to waste time on them because I feel when the family factor is a big deal in their life, they’re going to choose family over the job that needs to be done.

Thus, this first factor established the level of intensity associated with the higher education CIO role. The hours can be long, and CIOs are expected to place their job at the center of their universe of priorities.

**Defining IT leadership as masculine.** In addition to work expectations with masculine overtones, assumptions about how an IT leader looks and acts, and the gendered/masculine nature of those presumptions stood out as the second factor that contributed to the theme of face time for women CIOs. Kimberly had never thought of the CIO role as something inappropriate for women until she took her current job. She said, “I did meet with some definite bias when I first stepped into the role. I actually had a couple of faculty tell me that this wasn’t a woman’s job.” Linda had a similar experience, and felt the consequences of others presuming that CIOs ought to be men. When her boss was in the position, he was a member of the cabinet. When he retired and she moved into the position, however, they removed the CIO from that group. As she saw it:

A lot of men . . . thought that . . . women were second-class citizens, and struggled with having women involved with the cabinet level. It was a real shift. It
was problematic. It wasn’t all men at the cabinet level, but just a few that held positions of power.

Jen described how she learned to act in more masculine ways as an IT leader through observing her boss when he was CIO:

I would watch [my boss] with vendors bang his fists on the table and say, “We’re not going to pay that.” If I hadn’t watched him do that, I never would’ve done that on my own. Now I do that. I’m tough as nails with them, and I feel like that’s what I’m supposed to do.

What these women described amounted to prescriptive, gendered biases attached to the top executive position in IT. Their experiences informed them about existing notions for who belongs in the CIO role – men – and behavioral norms associated with the position. It also resulted in understanding themselves as outsiders in the role.

CIO gender bias and its consequences for women. Defining the CIO as a man’s job also meant that women in those roles experienced gender bias around workplace and leadership norms, the final factor that contributed to the theme of face time. A number of participants spoke of their constant battle against others’ perceptions of them simply because of the gendered assumptions attached to the CIO position. Katie, who is a slight woman who looks much younger than her age explained how her appearance affected how others viewed her. As she told it, they would look at her and think, “There’s this five-foot-two blond walking in saying she’s going to run my technology? You’ve got to be kidding.” She also told tales of working with vendors. When she meets with them and
her network staff member, who is a six-foot-two man with a commanding voice, is present, she says:

I can sit in a meeting. I can guarantee you that any time [he] and I are on a first meeting, they will say nothing to me. The whole conversation will be with him. . . . Virtually every sales person will do that. Even female sales people, they will always defer to [him], despite the fact that he’s not aggressive. He’s quiet as can be.

Jeanne gave her assessment of why this bias occurs, and how it affects women’s actions saying:

It’s got to be partly because we still haven’t proved ourselves in the executive role, and so you feel as if you have to be there. I mean you have to be present. I feel a certain obligation to be here all work hours, and I actually get in between seven and seven-thirty in the morning, as a matter of fact, and I stay certainly until after five . . .

Rita also articulated how that bias has affected her confidence as an IT leader, as well as her behavior:

I think that it’s very easy for the campus community to view women as not as serious, and so we feel, I certainly feel, the pressure to be here and be available and be accessible. I think we’ll always have that doubt that people are taking us seriously. That’s one way you demonstrate your seriousness.

Similarly, Jen reflected on this masculine bias and its consequences, saying, “I would think that some women might . . . be afraid that they’ll be viewed as less capable or less
real, if they’re working flex time.” Gina also tied the bias women feel to their behavior, stating:

I would guess there are a decent number of women who would say . . . it doesn’t hurt to be in the office to make sure that they see that you’re there and know that you’re working hard and those sorts of things. I think we tend to demonstrate that physically through our presence, and I would guess that there are probably a lot of men who don’t, who wouldn’t even think that that was a need.

Taken together, the above factors contributed to conditions in which women felt the need to tangibly – with their physical presence – prove their worth as the top IT executive: face time was required. The CIO role can be demanding, which has led to presumptions that the job belongs to men. Those beliefs, of course, are based on stereotypes related to work and family life, and dichotomized by gender; in this world of polarities, IT leaders are distinctly masculine. Assuming that women have obligations outside of the workplace leads to perceptions of diluted loyalty to their jobs. These underlying conventions, in turn, leave women in executive roles needing to prove that they are up to the task. A major way they demonstrate that is through their physical presence. If they are in the office, their focus is clear.

Compartmentalizing Work and Home

*I’m not getting as much done as I would like at home, in the evenings or on the weekends, so for me, I’ll just stay in the office.* (Sheila)

The second distinct theme that emerged in response to questions about why women spend more time in the office and use less flex time was compartmentalization. Compartmentalization can be defined in this context as a coping mechanism women use
for managing the dual pressures of work and home: each has its place. As with face time, masculine work norms laid the foundation for this theme. CIO jobs have demanding requirements, and so women must spend a good amount of time each week ensuring that the duties of their role have been fulfilled.

How does that explain more time in the office, however, especially with the technological capacity to work remotely? Conversations with participants revealed that though masculine norms ruled the workplace, feminine norms governed responsibilities at home, often making it necessary to separate their two worlds. Tracey talked about housework as hers to manage:

> I have a lot of other things to do at home. Now, when I think about what my husband does, he watches me do all these other things at home. He is a farmer and a cattle feeder. He works at home. It's not like he doesn't work [emphasis added] there. He does, but he doesn't do the laundry and whatever.

Kimberly recounted how for many years she used the car ride to and from work to switch between her two modes:

> I would get the kids where they needed to be, then I’d get in the car and drive to work. By the time I got to work, I was in work mode. Then, at night when I was coming home, I would decompress in the other direction so by the time I got home, I could be mom and get supper, and hear about their days, and do all of those things.

Living close to her office, Katie would actually go back there late at night to avoid the tug of even more housework after putting her children to bed:
Actually for many years, I would put them to bed and then I’d come back here [to her office]. I’d come back here from 9:00 p.m. to midnight because I could not focus even though they were in bed. It was mostly because of the age and the mess around the house. I could not focus; there were too many other things that were distracting me.

Linda also appreciated the separation between work and home, noting, “When you go home you’ve accomplished the majority of what you needed to accomplish at the office, so the focus could be more on home and family.” And Sheila succinctly summarized why she often extends her time in the office, saying, “I would prefer to just stay beyond, just get it done, and then I go home and I don’t have to deal with it.”

Thus, in their explanations, participants chronicled how they managed work and home by segregating the two into distinct compartments, each with a full set of needs. The requirements at home – often related to children – made it difficult for them to move fluidly between the two worlds, so they would spend more time in the office finishing the daily requirements of their IT job. There was, however, an interesting feature to this explanation. These women were all asked why their peers (other women higher education CIOs) reported spending more time in the office. Several of the women relating tales of compartmentalized work, however, were talking about past experiences – prior to when they were CIOs, and at a point when their children were younger. Most survey participants’ children, however, were nearly or fully-grown and did not require much or any day-to-day care. Thus, the compartmentalization explanation may carry less weight for current CIOs without childcare duties to manage at home.
Household and Caretaking Duties: Women CIOs Spend More Time

For the category that describes why women CIOs spend more time on household and caretaking duties than their male counterparts, the interviews revealed the following themes:

1) The impact of gender norms on interpersonal relationships; and

2) Gender norms and expectations are changing at home.

In the quantitative analysis, regression models were run to see whether gender was a predictor for any of the following house care duties: house cleaning, grocery shopping, cooking, childcare and eldercare. As individual dependent variables, only cooking and childcare emerged as significant, with women CIOs spending more time than men CIOs on those tasks. When demographic and organizational variables were introduced into the regression model, however, gender’s significance as a predictor of either cooking or childcare was eliminated. That said, when all of the house care duties were combined into one variable, gender emerged again as a significant predictor of the group of tasks, above and beyond the demographic and organizational variables; women spent more time on these duties than men. Additionally, when asked whether they hired people to help them with those house care tasks, women were significantly more likely than men to hire someone to help with cleaning, cooking, and/or childcare. Men were not more likely to hire assistance for any of the categorical tasks. Thus, the data showed that women CIOs not only did more house care than men CIOs on a regular basis, but they were also more likely to hire others to assist them with those duties.
Gender Norms and Interpersonal Relationships

We talked about how all of us want a stay-at-home wife. I want a stay-at-home wife; he wants a stay-at-home wife. Having somebody who is handling the home front is really helpful if you’re going to pursue a high-stress career. (Rita)

Gender norms and work around the house. How did the women interviewed in this study explain these phenomena? The first theme that emerged from the interviews with women CIOs centered on the impact that gender norms have on interpersonal relationships. Gina put it succinctly when she explained,

In general, professional women are going to tend to be married to professional men. Each of them has a high-profile job and the work [at home] has to get done. Whereas there are lots of professional men who are married to women who have accepted jobs that have less responsibility.

In other words, stereotypical gender norms for the division of labor in the office and at home persist, and are a reality even for high-achieving women in higher education IT. Other women interviewed substantiated that claim. Kimberly explained that “. . . the reason women CIOs might report that [putting in more home/caretaking hours] is because we still have our stereotypes. We still have our ingrained, ‘moms make dinner and moms take care of children.’” Linda said this slightly differently, but made a similar point:

A lot of times the men will be saying, well, "Okay, but I can do that a little bit later, because I want to read the paper or watch the news, or whatever."

Depending on the personality type women will go, "Yeah, okay, so I can wait for him to do that or I can just do it myself."

Jeanne corroborated these explanations with her understanding of the situation:
My perception is just across the board that women in the workplace do tend to be the ones that are taking care of their families more and spending more time at home. That’s my perception anyway because our role is traditional as caretakers. Jen described how she dealt with things earlier in her career, noting that because of childcare duties, taking a CIO job then would have been too hard on her family:

Fifteen years ago it would have been hard to be in the job I’m in now and not add a lot of stress to everybody in our family and myself. I wouldn’t have tried it.

That’s hard because there are certainly some women who can do the job, but they are faced with these very difficult choices.

That sentiment echoed the difficult choices that women, more often than men, are making when sorting through their arrangements to satisfy life at work and at home. Tracey and Rita spoke of how these norms have affected their lives, both now and in the past. Describing the details of her current situation, Tracey illustrated how the ingrained nature of these stereotypes impact her day:

I live 30 minutes away. I bring my lunch. I usually eat at my desk. I'm often here at 7:30, I'm usually here at 5:30, so my days are typically ten hours. I go home. I have four cats. I feed my cats. I feed my husband, work for an hour, water flowers, go to bed, and start the next day.

Rita, on the other hand, expressed the insidious effect these choices and pressures had on her first marriage:
Sure, you had this job all day, and then you go home and you have all of these things to do. I'll be honest with you. It was very disruptive for my home life, and my marriage at that time ended in divorce, in large reason because of that.

Sheila conveyed her impression of how the gender stereotypes and norms around house care duties might play themselves out differently for men:

The guys who are supermen at work and are out in the community doing things, nobody’s going to expect them to be doing things at home. It makes it easier for them. If they choose to, it’s fine, but if they don’t choose to, hey, that’s fine too.

**Hiring others to help.** In addition to gender stereotypes influencing the division of labor for home-centered work, a majority of the participants hired out for some assistance, whether it was for cleaning, cooking, shopping or childcare. Five of the nine hired cleaning assistance, where two of those five also hired cooking assistance, and one added grocery shopping and childcare to the list. Jen described her use of hired help best, noting that, “We have take out at least five days a week... We have people clean the house and stuff like that, so that I don’t, I’m not as focused on doing those things.” Of the four participants who did not hire anyone, three of them had some help at home (a grown son, a stay-at-home-partner, and a husband who shared the load), while only one took care of the household tasks without any assistance.

While confirming what the quantitative data showed, the qualitative data exploring why women spend more time on these duties pointed squarely at ingrained gender norms and expectations around work at home. When professional women marry or partner with professional men, women’s experiences at home are often different than
their spouses/partners’. While women CIOs may take on more stereotypically masculine roles in the office, it is not uncommon for more traditional roles to be in place at home, with women absorbing a greater portion of the household and caretaking duties.

**Gender Norms and Changing Expectations**

*I remember a conversation maybe a few months back with somebody who, a peer in another institution in our local area. I was kind of shocked when she was like, “I have to rush home and make dinner for the husband.” What?! You work, he works; why are you having to rush home and make dinner for him? I don’t get that. I think I’m a little different. I explained that in the beginning and my husband knew who I was. I said, “I’m not a domestic person. I’m not going to try to be domestic, so don’t expect those things from me.”* (Sheila)

Another theme that came out of the discussions about executive women and home-related care focused on evolving gender expectations at home. In some cases, women were married to or partnered with other professionals, where the conversations between the couples were shifting. Rita, the same woman whose first marriage ended in divorce partially because of the tensions of the conflicting work/home responsibilities, noted how different things are for her with her current husband, “I’m remarried, and my husband now, my husband of now 15 years, is very, very, very supportive, and he’s the one that’s doing the bulk of the grocery shopping and the bulk of the cooking, honestly.” She indicated, however, that this change did not come easily, saying:

I just happen to have a very special situation, but it has been a big discussion. It’s not something that just happens. It is something that we’ve had big discussions about in our home. I’m not coming home at eight o’clock because systems were doing whatever, and starting dinner. Not happening.
In addition to Rita’s personal story, Linda had also observed a generational shift happening with her children. In reflecting on one of her son’s situations – he and his wife recently had a child – she sees behavioral patterns between couples evolving over time. She described her son’s situation, noting:

Now I think it's a little bit different. I see my oldest son who actually lives in [town] with his wife. They just had their first baby. He is working full-time. She's working part-time. He comes home, jumps right in and helps out, and it will continue to shift as generations go on.

In other cases, participants were married to or partnered with individuals with less intense or lower paying jobs, or even no job. In essence, in these contemporary circumstances, traditional gender norms were reversed. Rita, who had spoken about the adjustments she made with her second husband, relayed a story about another couple’s reversed gender norms, “It’s interesting. I’m thinking about a woman who’s in her first CIO role and her husband followed her. They don’t have children, but he’s the tag-along spouse, if you will.” Jeanne and Gina told more personal stories. Jeanne, who is a younger CIO, stated:

Now, I might be a little off normal because my spouse often says, he says that I think like a white male, and so yes, I know, and that’s an interesting statement about our marriage because he is a white male, but independent of that, I mean we have tended to be pretty independent in our existence, and I am the breadwinner as well, so we are in non-traditional roles.

While Gina told of her partner, who takes care of the house:
I have a partner who doesn’t work and she takes care of the house. She takes care of most of life otherwise. She does the grocery shopping. She takes care of the finances. She takes the cars to the shop. She handles all those things, so I don’t.

In these situations, gender norms played themselves out in reverse, which the interviewees attributed to changing times and expectations for women, men, and couples. In this theme, participants perceived that generational progress might affect the time that women CIOs spend on household and/or caretaking duties, bringing the hours more in line with what men CIOs report.

**Women Higher Education CIOs and Bias in Hiring and Promotion Processes**

The category in which women higher education CIOs were asked to shed light on bias in hiring and promotion processes had no clear and consistent explanation. Rather, general responses settled into one of the following two groups:

1) Processes are fair; and

2) Processes are biased.

The quantitative data from the questions exploring whether higher education CIOs perceived bias in hiring and promotion processes revealed a mixed picture. On the one hand, women were significantly more likely than men to feel that gender positively affected hiring and promotion for them. At the same time, however, women were also more likely than men to feel the negative effects of gender on their promotion prospects. Additionally, while not statistically significant, women answered proportionally more often than men that they felt they were not hired because of gender. Overall, what
emerged from the quantitative data around hiring, promotion and gender bias was not entirely clear.

The portion of the interview where participants were asked about their observations of hiring and promotion processes produced equally mixed results. Some women interviewed felt that their experiences had been fair and unbiased. That was not true for everyone, however, and a number of women spoke about discrimination they had experienced over the years relating to these areas.

**Processes are Fair**

*I mean, I’ve only been in IT since the year 2000 and started from the ground up and have not had a problem.* (Jeanne)

A number of participants reflected positively on the processes they had been through with regard to being hired or promoted. Sheila indicated, “I would say that, it’s a hard one to answer and I think I’ll leave that one alone, because I think the [hiring] process is fair overall.” Linda did not feel that her gender interfered with whether or not she was hired either, saying, “I haven’t found it a hindrance. I just turned down a couple finalist jobs, because they were intriguing, but they were just not quite the right fit. . . . I haven’t seen a problem with that at all.” Jeanne, who had been hired and promoted numerous times during her twelve years in higher education IT, said the same (above), as did Gina:

*I don’t think so. . . . Any interview I ever went on, I never felt as though my gender had any impact. I got the jobs I wanted, so . . . I don’t think my gender had an impact in that regard.*
**Fair processes explained.** When these positive sentiments were explored further, what emerged was a description of higher education as an industry that pays attention to gender (and other types of) diversity. Participants articulated that in a variety of ways, with a couple making more passive observations about the environment, while others pointed to concrete, institutional or industry-wide endeavors that affect organizational change. Jen noted what things were like at her institution, saying, “Our environment is open and you see people of all shapes and sizes at every level . . .” Jeanne observed how her mere presence as a director affected who was brought on board, without any intentional efforts made to diversify her staff:

   My second director position was taking over for a Caucasian male, and we did go through a small hiring spurt at that point, and I never told the managers anything different than, “Just hire the best candidate.” All of a sudden, we had greater diversity. It was almost as if having a non-White male sitting in the director’s seat somehow made it a bit okay.

Others spoke more concretely, mentioning either broad efforts across higher education, or institutional ones that encourage more diversity: such efforts have made women feel more comfortable in academic environments. Linda and Tracey mentioned endeavors in higher education that value and encourage diverse working environments. Linda said, “I think in higher ed we talk about more, a better ratio of female to male CIOs. I think that holds true for most of the executive levels of higher ed.” Tracey articulated this focus a bit more broadly, stating, “Well, one of the big things, at least on the public side, [is] we do look at diversity, and diversity can be gender diversity and
ethnic diversity. I think that does play some role in hiring and promotion.” Mentoring efforts for higher education executive roles was something that Tracey also pointed to, noting, “I think there has been an effort in higher ed to mentor women, or help women who wanted to move into . . . executive roles in higher education,” while Sheila focused more closely on human resource practices, saying, “HR practices at my institution have gotten much better and they are trying to be clear and transparent.”

**Processes are Biased**

_They would ask the questions that I would expect and I would fire back, but then he was very sweet. He would go and fill up my water bottle and my glass and say, “Are you okay?” He didn’t know exactly how to treat me because they have so few [women] in their environment._ (Jen)

While there was positive news about fair hiring and promotion practices, other women who were interviewed told quite different stories about their hiring and promotion experiences. For them, practices steeped in masculine gender norms had permeated their time in higher education IT. Kimberly ran into bias from multiple directions when interviewing for her current CIO post:

I think that when I came down here to go work at [my institution], I think that there were three men who were really the deciding factors. I think that they all took a huge chance in hiring a woman. . . . The provost at the time had to convince his faculty that they were going to work with a woman CIO and it was going to be okay.

Tracey relayed the story of when she was hired into the CIO position at her current institution. She had already watched three failed searches for the CIO role, and some amount of executive politicking was keeping her out of the running, which she attributed
to her gender. Finally, when the person blocking her appointment left and she was hired, she still had to face the Chancellor’s assistant, who had never been kind to her. She noted, “I could learn to accept [his] behavior. I would just shudder when he would call me. I just hated to deal with him. . .” Jen (quote above) described a recent hiring process she had been involved in, in which she definitely felt a bias against her because of her gender:

I was telling my mother and my aunt this weekend, I don’t know if they know what one [a woman CIO] would look like, that they haven’t figured it out on what to expect. Because the men in those roles are used to their wives, who in the traditional South. . . may do volunteer work or they may be teachers, but they have devoted most of their lives to raising their children. . . . Their ideas of women in the workforce are maybe real non-feminine women.

Others shared accounts of promotion bias, attributing the prejudice to masculine gender norms that affect perceptions of women’s worth and abilities in IT. Kimberly spoke of how the double bind affected her when she would act in stereotypically masculine ways associated with IT leadership roles:

I think because you have to be so assertive, especially in IT as a woman, sometimes you get taken. People believe that you are more of a bitch than they’d like to work with. There was one time when there was a promotion that I was up for at [a former institution] where a couple of the men, and I was told this, given direct feedback, saying that I was too assertive. They didn’t like that. I think that if I was a man they would’ve liked it. They would’ve cheered.
Women as Chief Information Officers in Higher Education

Rita also put this succinctly, saying, “Yes, I don’t think my gender has ever helped me get a promotion. It certainly has hindered.” She told of how she got stuck in a role as a Senior Assistant Analyst with a supervisor resistant to advancing her because she was a woman.

I’m designing the data center, designing, bringing in the new network plans. I’m doing all this work and I could not get any attention, and as I said, the person that I was working for at the time was an interim CIO. He was a Math faculty member and just flat-out said, “I can’t… let the boys do the hardware.”

**Bias processes explained.** In explaining why they thought these type of biased practices persisted, answers revolved around poor process at the hiring manager level. Linda explained how she has seen the wrong person get promoted because of weak process, saying, “It can be given to them because they’ve been here so long, they earned this right to be in this role, even when they’re not a good fit for the role . . .” Kimberly noted what can happen when men dominate as hiring managers, stating, “I think it was the hiring managers . . . they were mostly all men. They were like, ‘I’ll take this woman, but I’m not sure I want her.’” Rita also explained how hiring managers can make or break the gender diversity of an organization by not understanding different gendered communication styles. She talked about patterns she has seen over the years hiring hundreds of employees:

When you ask a woman a technical question in an area where she has maybe what she perceives to be less-than-ideal experience, she will answer that question by starting with all the things she doesn’t know and all the softeners. . . . You ask the
same question of a man who has the same experience, he’ll skip all that softener stuff at the beginning and just go to the heart of the answer.

She went on to talk about the consequences of this type of gendered communication with inexperienced hiring managers and committees:

I think women will often disenfranchise themselves in the interview process, and unless you have a hiring committee that’s very astute in the listening to all of the details throughout an answer, and cutting off that stuff, it can be tough.

In chronicling their exposure to poor hiring processes, it was easy to see how idiosyncratic individuals’ experiences can be, not only between institutions, but within them too.

**Bias and a Lack of Data Clarity**

Overall, the qualitative data reflected the lack of clarity seen in the quantitative output. On the one hand, some amount of cultural evolution appears to have taken place, as witnessed by the information shared about fair hiring and promotion practices. On the other hand, however, ample evidence of continued bias existed. Differences at the regional, institutional, and/or hiring manager level may account for the variation in the data, though the study participants honed in on the latter of these three.

**Women Higher Education CIOs and Perceptions of Lower Pay**

The themes that emerged in this category consisted of two main contributors to women’s perceptions that they are paid less than their male counterparts. They included:

1) The effect of masculine norms in higher education IT on women’s salaries; and

2) The effect of women’s discomfort with and unwillingness to negotiate.
In the questionnaire, one of the most significant findings was women CIOs’ perception of receiving less pay because of their gender. The effect size for the question linking pay and gender was larger than for any other in the survey (Φ = .57). Because of this, negative perceptions about gender’s effect on pay became a main criterion for choosing qualitative participants.

The qualitative interview questions around gender and pay were designed to better understand why women felt this way, and what was contributing to their perceptions. In sorting through the data from the interviews, two themes became apparent. First, was the effect of masculine norms in higher education IT on women’s salaries, and second, was women’s ability and willingness to negotiate.

**Masculine Norms in Higher Education IT and Women’s Salaries**

*I still think even today women struggle with being seen as equal. I think they’re better off today than they were, let’s say, 10 years ago, 15 years ago. There are a lot of young women that are coming up through the ranks that are taking no prisoners. I think we’re still in a man’s world and have to figure out how to work that.* (Kimberly)

Stories from the women interviewees revealed how an IT culture built upon masculine norms translated into negative results for women’s pay. At a prior institution, Kimberly shared how clear it was to her that she was underpaid, noting:

*I think a couple times when I was at [my former institution], for sure I was being underpaid because they could. There wasn’t much I could do about that except for get promoted out of that position and go to the next level. . . . It was reflected in [the] day-to-day work too. It was the good old boys club. . . .* She instinctively felt her role as an outsider and the consequences that had for receiving a salary equivalent to that of her male peers. With her current job, she was not certain that
her initial low salary was directly connected to her gender, stating, “I think that I was probably offered the job at less money, but I’m not so sure that that was gender or just because I was a non-proven entity.” Linda and Rita’s stark tales of being paid significantly less than the men who preceded them, however, cast doubt on whether there was no gender effect present for Kimberly. Linda remarked, “I found out that the person that they just hauled out physically by the police was earning ten thousand dollars more than what they offered me, you know a male – female.” Rita voiced the same frustration and made a direct connection between lower pay and gender discrimination:

When I took over the CIO role from my predecessor, my pay was twenty-five thousand dollars less a year. At twenty-five thousand dollars less a year, it’s not just perceived. “Oh well, this is her first CIO role.” It was his first CIO, too, when he took the job. I was paid twenty-five thousand dollars less than his starting pay when he took the job as a first-time CIO. . . . We were both CIOs for the first time. We both came in with the same type of experience. I actually had more experience than he did.

For these women, prescribed masculine norms for IT leadership resulted in undervaluing their skills and abilities, with very concrete and negative outcomes for them. This element of undervalue extended to other participants as well. Jen articulated it clearly, saying:

I’m undervalued. You know, they talk about you have to have market-based salary, but I’m easy because they know we both work there [she and her husband], whereas they just brought in new employees into ours [institution], and
they’re paying them at the rate in their fields – higher in fact. They’re comfortable with me, and I’ve been there so long.

Katie’s story was even more incredulous; in its poor human resources practice, it smacked of overt and thoughtless gender discrimination. It also underscored the gendered assumptions made about women’s value at work and at home.

I think they look at me and say, they’re not going to say women in general, they’ll say [Katie], it’s that she’s not the sole – I am not the breadwinner of my family. It is clear to them that I’m not. Though they say we value you and you’re doing an excellent job, the incremental increases and where I fit compared to the Director of Undergraduate Admissions . . . I believe there’s a discrepancy and there shouldn’t be. . . . These breadwinners I’m thinking of in this institution, their wives don’t work. I’m of a dual income family.

Katie sincerely felt that because others in executive roles were their families’ sole or main source of income, her institution valued and paid them more. That she was not in the stereotypically masculine role of breadwinner for her family led to an overt devaluing of her institutional contributions. In all of these situations, masculine norms determining who belongs in the CIO role as well as their worth had a negative impact on women’s actual pay, and thus, their perceptions.

**Women and Negotiation**

*Even though they’re going to give you the title and even though they’re going to give you, I guess, all of the other things that you’ll be in charge [of], if you don’t ask for the money, you don’t get it. I suppose that’s something I should tell all the women coming up. You’ve got to ask.* (Sheila)
The effect of masculine norms on women’s pay in higher education IT was noted as one issue by participants, but the other theme emphasized women’s behavior more than it did their environments. Sheila’s story was an interesting one. She began by telling how prior to becoming CIO at her institution, she realized that there were salary discrepancies between her and a peer:

I was always happy, happy, happy, [until] I found out at one juncture that a male counterpart of mine was way above and beyond where I was on pay, just by pure accident. I can laugh about it now, but it was a very hurtful thing to find out.

When she approached her boss about the variance in pay rates, she was surprised at what he told her:

The conversation I had with the CTO at the time was very interesting because what he ended up saying was basically, “It’s not that I’m paying him more because I think he’s doing more than you are doing, but he really demanded more, and I gave him more.”

Not negotiating for more pay left Sheila at the mercy of a hiring manager and his poor practices. Yet despite that experience, Sheila still does not negotiate for herself, noting that:

I was never one to go in and ask for anything. I still do that today. I think if I’m doing it, and I’m doing a good job, then you should compensate me. . . . As I sit here telling you the story, I realized that I’ve been told about this promotion and it’s changing my reporting relationships. I haven’t even asked them, “So what are
you going to pay me?” . . . I’ve never, ever had that conversation. . . . I don’t, and I guess I never will.

Listening to that narrative, it is hard to disagree with Jeanne’s assessment of the situation:

I think that in general, women are lousy at negotiating. That’s part of the problem.

I did not do a good job negotiating this job, but in many ways, that was just because I wanted to get out of where I was last and so I didn’t bother.

Gina’s sentiments mirrored this, as she noted, “I don’t think I’m a very good salary negotiator. I would say I don’t negotiate. I pretty much take what’s offered.” Linda indicated that, “. . . Women might just have to fight a little harder in order to get the salary that they should,” and that, “There might be more negotiation that takes place,” but the CIOs interviewed in this study did not necessarily think that was such an easy thing to do. The unease that Sheila expressed with attempting negotiation was echoed in Jen’s stories about first taking the CIO role at her institution, as well as with her current situation. When she first took on the CIO role, she felt as though she could not advocate for herself, even as the institution needed her to take on greater responsibilities. With a number of executives leaving and the person asking her to move into the job being very ill, she felt uncomfortable asking for anything.

I just couldn’t negotiate in that situation. . . . How could I be looking out for myself when he [the CFO] was suffering and facing that? There was nobody else I could go to [to ask for money], with the Chancellor being so elderly and stepping out. To go around him would have been a slap.
Women as Chief Information Officers in Higher Education

Yet even today, she is still uncomfortable asking for more money, even though she knows that her salary is lower than it ought to be, based on what she knows about the market and her peers. As she explained:

There are two reasons I’m unwilling to go and stomp around about it. It’s because it’s valuable for both my husband and I to work here. . . . The other reason I would not go and clamor around is because my employees are also – it’s a struggle to keep their salaries up. I’m not effective as a leader if I can’t get them up and I’m selfish and looking out for myself.

The extreme discomfort with ensuring adequate pay for themselves reflected an internal dissonance for these women leaders. They expressed how wrong it felt to be advocating for something that they actually knew they deserved. Feminine stereotypes are at play here; women are supposed to be supporting and nurturing, rather than self-serving. These ingrained messages make it difficult for many women to reach out and ask for what they are entitled to, even when they should. This says nothing of how they might be received if they did try to negotiate, but it certainly helps to explain why women perceive they are paid less. Connecting masculine norms and bias in pay to women’s discomfort with and inability to negotiate helped make sense of the strong quantitative results around questions of pay equity.

The Importance of Mentoring for Higher Education CIOs

In this category, two distinct themes helped provide context for the question that asked why mentoring is important for the CIO role:

1) The CIO role is unique; and
2) The CIO role is a political one.

The quantitative survey results illustrated that higher education CIOs rank mentoring, especially informal mentoring, as crucial for the CIO role. The survey population had far more informal than formal mentors, with close to forty percent of respondents having one now and/or in the past. The qualitative data reflected what was found in the survey: mentoring came up as important 57 times over nine interviews. One-third of the women interviewed had experienced formal mentoring at some point in their IT career, and all but one had been the recipient of informal IT mentoring. Higher education CIOs, for the most part, think of mentoring as positive and crucial for the job, but why is that the case?

Chief Information Officer: A Unique Role

*I think most of the time, a technology professional has existed throughout their career as a member of a team, where they are one of several people with a skill set, and it’s only later in their career that they start to be one of something. . . . By the time that you get to the CIO position, that’s that. You are not part of a CIO team, typically. If you aspire to that, the job is behind a curtain, because you’ve not existed as a part of a CIO team – you don’t know what that job is all about. You don’t know the ins and outs of the job. (Rita)*

The first qualitative theme exploring the importance of mentoring made note of the uniqueness of the position. As indicated in the above quote from Rita, the job is not part of a team of individuals; rather, it is a completely different experience, distinct from any other on the way up the IT career ladder. Two women reflected this characteristic in their comments about learning the CIO job without prior mentoring. Tracey spoke of her experience growing into the position:

I know my background and what I knew. When I went back, “Oh my God I was unprepared.” I was so unprepared for this. . . . I go back even 10 years and think, “Oh geez, you were so inexperienced.”
She went on to ask, “How do you get them [CIO aspirants] that experience? How do you prepare them?” Sheila also talked about her lack of mentorship for the role and its effect on her early performance in it:

I think it could’ve been a lot easier because I think I spent my time maybe overdoing, trying to overcompensate for things that maybe weren’t real issues to other people. I spent my time trying to be the perfectionist in a lot of things. I spent my time maybe putting in way too many hours on specific projects and stuff because I really didn’t have anybody in that role to really talk to me about what’s really important and what’s not.

Katie pointed out why moving into this particular leadership role can be difficult, and how mentoring can make a difference, remarking:

We tend to be technical people doing a management role. We need mentorship to learn how to do this better and be part of the senior managers, be seen as a senior manager rather than a technical person. . . . We’re being sought after to solve business problems. We need to think differently and figure out how to do that, so I think we need mentors.

Rita corroborated that perspective, saying, “Mentoring gives you an insider view, an insight to the decisions, to the day-to-day that you simply will not get, even working as a director in a technology department in the university.” Jen spoke about her own experience with her CIO mentor, and what it meant to her:

When you travel together and when you’re working so closely, their philosophies rub off on you. . . . You get to see how decisions are made at the highest level.
When you understand that, and you understand what the people above you are going through, [you learn] how you need to frame your request and time your request.

She also reflected, “I would not have thought that I could do it or would like it, had I not watched [her mentors] in these roles.” Her mentors gave her a view into the world of the CIO, helping her prepare herself for the position and its unique demands. Gina, though she indicated that she never had an IT mentor, understood instinctively that the role requires something different than IT employees get at other organizational levels, and explained how she regularly mentors a CIO aspirant of hers who comes from the technical side of the IT house:

I’ll do something active where I might send something to him and say, “You should be aware of this. This could come up in an interview. You should probably pay attention to this discussion that’s going on. . . .This is important.” He’s not an academic, he comes from the networking operation side.

Participants expressed and understood that good mentors had the potential to make the unique nature of the CIO job easier and more comprehensible.

The CIO Job and Politics

If you get good people who work for you, you get a lot accomplished, but it’s the politics. How do you learn to deal with the politics? How do you teach them to deal with the politics? (Tracey)

The political nature of the job was another theme articulated by the interviewees explaining why mentoring is so important for the CIO role. At other levels in higher education IT, politics might not be as present, but are intrinsic to the CIO’s world. As
Rita noted, “Getting that broader perspective of how the politics are different and the decisions are different. . .” needs to happen as one transitions into the role. Jen indicated how difficult political situations could be for the uninitiated, saying, “At a certain level, it’s not about logic. It’s about relationships and politics and who’s going to benefit. That can be frustrating to you unless you know that’s how it works, and have to figure out how to navigate it.” Sheila echoed that, connecting this aspect of the job to the importance of mentoring:

I think you can come up through the ranks and be real good, and real good at your job technically, and maybe if you have a nice personality you’ll get along with a lot of people, but I don’t think you’re going to be prepared enough for all of the political maneuvering that you have to do without the help.

Two of the women spoke of how mentors assisted them with political situations. When Linda moved into her first CIO position and that role was removed from the cabinet, she turned to her former boss – the previous CIO who had been on the cabinet – for support around what she saw as both a political and gendered maneuver, saying, “The predecessor, who was my informal mentor, was livid. . . He saw those things. We’d talk through those type of things.” His support with the politics of the office helped her navigate her new role. Tracey spoke about how a mentor of hers fought through administrative politics for several years in order to promote her into the CIO position. As she told it, “The Chancellor was – I learned this later – trying to get me hired into that position [the CIO job] and the woman Vice Chancellor was fighting it off. When she left, the Vice Chancellor, the woman Vice Chancellor, she left for another school. They
finally ended the search and I was hired.” These examples were illustrations of what the other women described as the fundamental part politics play in the CIO role. This, along with the unique nature of and skills needed for the position, were the reasons given by qualitative participants for why mentoring is so important both before and while in the job.

**External support networks.** Due to the isolated and political nature of the job, and because mentors are not always readily available within individuals’ institutions, a number of participants expressed the importance of developing external networks to obtain the necessary mentoring. Rita stressed using this strategy:

The external support network is particularly important, if you consider that most CIOs are going to move into that CIO role by leaving their existing institution and moving up into that role at another institution. . . . There’s a core body of knowledge that’s the same. What’s reusable and what’s not reusable? You’re going to get that by talking to CIOs at other institutions and getting that broader perspective.

Katie also talked about individuals in her external network that helped her at different points in her years as CIO. In the early years, she leaned on a fellow CIO at an institution close to hers. She remarked, “We would have lunch. He would ask me about projects. I considered, it was mentoring for me whether he thought it was mentoring or we were just, we were having lunch. It was definitely mentoring for me.” At this point in her career, she often connects with another woman CIO who works nearby, noting the mutual mentoring they do for one another, “We’re more colleagues, but I think we mentor each
other in some ways. We certainly help each other out on projects.” Having peers to rely upon in a mentoring capacity was a support strategy participants made a point of mentioning. And for Katie, connecting with another woman in the role may have made a lonely job – one that is even lonelier for women – more palatable.

In addition to local networks of CIOs, participants named EDUCAUSE, in its professional development capacity, as an important avenue to the mentorship required for the position. Rita indicated, “I have found the EDUCAUSE CIO community to be a tremendous value.” Kimberly also articulated distinct aspects of the EDUCAUSE community that provide mentor-type support:

I did find that the [CIO] room at EDUCAUSE where we could just get a cup of coffee, sit down and talk to be helpful, even if it was just not even directly about work. It was just, “I’m struggling with budgets and this is a bummer. How do you feel? Are you doing better? What have you done that’s innovative? What’s fun?”

That was helpful.

Having this type of support can reap rewards for individuals. Jeanne relayed a story of one of her CIO job searches. A firm was running the search, and she had sent all of her paperwork into them. When a consultant contacted her about the position, they spoke for a while and then he asked her to send in her materials, not realizing that he had them already. She said, “The only reason he contacted me is because half a dozen CIOs had nominated me for that.” Her extended network of mentors had worked for her, providing sponsorship for her new role. Overall, the message from participants was that because the position is unique, solitary and rife with political maneuvering, mentorship is important
both before and while in the CIO position. What was also clear was that higher education has resources at hand to be leveraged.

**Making Progress: Women CIOs in Higher Education IT**

Interviewees were all asked why they think women are making more headway as CIOs in higher education. The major theme that emerged from that question was:

1) The benefits of working in higher education IT outweigh its disadvantages.

In the categories discussed above, a number of negative factors impacting women’s careers in higher education IT were enumerated. These included how the ideal worker norm, in combination with perceptions of IT leadership as masculine, contribute to women spending more time in the office and using fewer flexible options; biases found in hiring and promotion processes, as well as in pay; and how social norms and expectations on the home front affect the hours women spend completing home and family related tasks.

Despite those factors, all of which have the potential to negatively affect women’s experiences in higher education IT, what became apparent over the course of the nine interviews was that there are numerous beneficial environmental characteristics that make it appealing for women and help them in their careers. These positive elements might not necessarily neutralize the potentially negative tone associated with IT organizations, but may very well contribute to a positive environment for women in the profession. The factors articulated by the participants included:

- Higher education IT is a stimulating environment;
- The hours required in higher education IT are reasonable;
Women as Chief Information Officers in Higher Education

• Higher education IT environments provide flexibility throughout the arc of a career;

• More women executives are present in higher education;

• Higher education IT supports a culture of professional development and mentoring; and

• The mission of higher education appeals to women.

Each one of these elements is discussed individually below.

**Higher Education IT: A Stimulating Environment**

*In the end, it is a tremendously worthwhile profession. I very much enjoy what I do. It’s wonderful to be able to create and build something in a university environment. That’s one reason I stay here, is there’s so much creation and building going on. It’s very, very rewarding. So, for all of that other stuff, there are a lot of rewards and positives.* (Rita)

That higher education IT is an engaging employment environment came through as a clear message from participants. Jen said, “I love the university environment where every day you have a different challenge. It is still that way. It would not work for somebody who thrives on sameness.” Katie articulated something similar, reflecting on her past experience working in the legal field:

*It turns out that it was everything I was looking for. . . . In law firms, there’s only so much that you can do with technology. There’s only so innovative you can be; it’s about the attorneys. It’s about giving them tools. They’re not looking to do different, crazy things in their business. . . . That’s what attracted me to higher ed. I’ve stayed in it because it’s offered me everything I’d been looking for.*

Participants were enthusiastic about the work they had the opportunity to do in higher education IT, recognizing that with the variety of organizations within each institution, it was a place where they could be absorbed in creative and challenging work. Jeanne
enjoyed the type of contributions she could make, saying, “It was just the pull was so strong, this desire to be doing something that allowed people to communicate more broadly,” while Gina spoke of seeing things from a broad perspective, something her role as a CIO in higher education IT provided:

I enjoy the big picture that I get at the institution. A faculty member is successful as long as they keep their blinders on and just worry about the things they have to worry about. Once you take those blinders off and you start seeing the entire institution, at least for me, that became addictive. I liked seeing the entire institution. I liked having interactions with people outside of just my discipline with my blinders on.

Participants genuinely expressed how engaged, challenged and excited they were by the diversified ways in which they could contribute to their institutions. These were women who loved their work, and, of course, they loved the technology, as Kimberly pointed out:

It is a great career. I sometimes wonder why I do it and sometimes get tired enough to go, “I don’t think I want to do this anymore.” Ultimately, something will catch my fancy and I will come back. I still love the technology. I still love the ideas, the concepts, the neatness. I’m a card-carrying geek. I still like it a lot. I like the toys. I think as long as I have that love, I’ll probably love my job.

Higher education IT provides individuals with a stimulating work environment, one that applies the problem-solving lens of information technology to the multifaceted sectors of a college/university setting.
Women as Chief Information Officers in Higher Education

Reasonable Hours

It’s not entirely an IT goal. I think just being in higher ed in general is less rigorous than it can be in parts of the private sector. No matter how much we think we’re being overworked here, I don’t think we’re being nearly as overworked as some of the areas of the private sector. (Jeanne)

Though there were numerous reports of always having to be “on” and available, with ample face time required for women in the CIO job, interviewees also spoke about the hours required in higher education IT as being reasonable. Rita reflected on the cultural shift she went through when she moved from the corporate sector to higher education IT:

I was so excited when I came to higher ed, and at the time I started at the university, we worked. . . it was really very much a commitment to an eight-hour day, five days a week, and in the summer we worked four nines and four hours on Friday, and left at noon. . . . I thought I had gone to a very civilized work environment.

Several of the women talked about the specifics of their hours, and felt that they were not overbearing. Jen said, “I do work . . . 50 or 60 hours a week, but it’s not oppressive. A lot of it is because I want to.” Linda indicated something similar, noting, “I have it down to 50 hours. It’s certainly more workable.” While Gina did not speak specifically about the number of hours she worked each week, she did describe her schedule:

I really get to my office around 8:30 or so, depending on how early the meetings begin. I’m usually in the office until about six. . . . Most of the time I get home a
quarter after six, I’m home and fine. I work the occasional Saturday, but not regularly.

All three of those women described their work schedules as ones with which they were comfortable. The hours they describe might not be universally interpreted as reasonable, but from their subjective points of view, and at the particular moments in their lives, they certainly felt that way. Rita put it another way, one that reflected more upon how she feels organizations should run, remarking, “I’ve always taken the mindset that if I’m having to be called all weekend and all night, that there’s something wrong with my strategic approach to the department.” She contrasted this with what she saw as a different approach in the corporate sector, indicating why women might find higher education more palatable:

I do think overall, [that] higher ed has been more friendly to women CIOs, and women are more interested in pursuing the role, I think, because of the humane work environment. I’m not always convinced that women want to pursue that role in the business world if they think it’s going to be 100-hour weeks and 52 weeks of the year on call, and that kind of work environment. That’s really tough.

Perhaps the term “reasonable” becomes a relative one when the perception of CIO roles and IT outside of higher education is far more demanding and all consuming. Regardless, an element of reasonableness was expressed by four of the nine interviewees.

**Flexibility Throughout the Arc of a Career**

*Here, we do it with a little more grace. Maybe that’s part of it. I think that higher ed does not penalize women as much for trying to have it all. I had children. I have a home. I have a husband. I had all that and I had my career, and I did it to the best of my ability. I think sometimes women in corporate pay a penalty for wanting to have a baby that we*
A major element of this theme centered on the flexibility higher education affords women over the course of their careers. Higher education as an industry was described as flexible, and participants described both how it helped their careers and how they, in turn, used that flexibility to help others’. Linda connected higher education’s flexibility to the ethos of education:

I think this comes down just to the field, the field of education, and trying to be more understanding to, as they [educators] look at different learning styles and the adult student, problems with people coming back and managing multiple things. As far as being flexible, I think that carries over then to the employees as well.

Gina also pointed to the industry as a place where flexibility is valued:

Higher education, as an industry, is certainly an industry that allows you balance. It allows you flexibility that you don’t get in other places, and of course, that’s what we sell to the people who work for us for less money than they could get in industry.

Others told personal tales of how the environment’s flexibility helped them with their own careers. Jen felt very attached to her institution because of the allowances made for her earlier in her career:

That made me feel really loyal to the university – that they would give me that flexibility. . . . Because they would accommodate our family situation, we’ve had longevity there. I think that is key right there: having both of us work at the same place reduced stress on our family.
Katie also linked flexibility to her commitment to academia, saying, “I’ve always been there, always been at every activity [for her children]. That’s part of why I’m in higher ed: obviously, I see the benefit of that.” Tracey spoke about the latitude she was given when taking care of ailing parents:

If I needed to re-direct the day, medical appointments or whatever happened to be going on, I could take an hour here or there and go and do that. . . . the administration was very good about it. Everybody eventually goes through this sort of thing. They were very compassionate and considerate. . . . I feel like a lot of that, that’s an advantage of higher education.

While many of the women described how helpful flexibility was for their own careers, two others noted how they used it to help others. Gina said of her staff, “I have lots of really good people who I trust. I don’t have a situation, yeah, where that guy’s taking off. . . I can allow that kind of flexibility. . .” For Jeanne, the spirit of flexibility permeated her approach to managing staff:

My statement has always been: as long as the work gets done and everything gets covered, I don’t really care where you are. Just tell me where you are. That’s my opinion. At my last job, the head of telecom services actually was on extreme flex time. He was coming in at 6:30 in the morning and leaving at 3:30, and that’s a pretty prominent position.

Flexibility stood out as a factor that contributed to women’s progress in higher education IT. Based on the data from the interviews, it appears to be a strong cultural element of the industry that women genuinely appreciate.
More Women Executives Present in Higher Education

Though not as prevalent as some of the other elements contributing to this theme, several of the interviewees mentioned how the relatively larger proportion of women executives in higher education influenced women’s presence as higher education CIOs. A perception that more women exist in executive roles throughout higher education was connected to higher numbers of women among the ranks of CIOs. Linda compared higher education IT to what she saw in other industries:

I go to some other conferences, [and] higher education I think has been more balanced, in their IT executives not being mostly male, than other industries. . . . I think in higher ed we talk more [about] a better ratio of female to male CIOs. I think that holds true for most of the executive levels of higher ed.

Katie made note of what she saw at her own institution, stating, “I look around this institution – there are just more women here. I was hired by a woman. Virtually all the directors are women. Virtually our whole senior management is women.” Jeanne had asked her provost why he thought there was a trend toward more women executives, trying to make sense of the shift she witnessed, “He said, ‘Almost every position is now being filled by women at the VP level,’ but he said, ‘Five years ago, it was the exact opposite.’” Neither one of them could fully answer that question, but she felt that women’s presence in executive roles across higher education was somehow associated with their presence in CIO positions.
Higher Education IT’s Culture of Professional Development and Mentoring

Another element that participants connected to women’s presence as CIOs in higher education IT was the culture of professional development and mentoring present in higher education. As noted in the section on mentoring, the subject of its importance surfaced 57 times over the course of the interviews, and it was a prevalent part of the participants’ career paths. As a professional development organization, EDUCAUSE received recognition for paying attention to this need and focusing on it. Sheila observed:

EDUCAUSE as an association within the last three years, I think they’re really doing a lot of things to help in this arena. Maybe they were doing it all along. I don’t know. It just seems to me like it’s more of a focus lately.

Kimberly acknowledged their efforts as well, remarking, “One of the things they’re doing is mentoring. EDUCAUSE is trying to hook aspiring CIOs up with sitting CIOs.” Rita also mentioned them, indicating:

I think EDUCAUSE is now trying to do more formally. . . . They did not used to have those kinds of programs, but they’re doing more formal mentorship. More mentorship at conferences, more events where you can actually sign up and request a mentor – you can choose a mentor.

These types of deliberate professional development efforts were viewed as helpful for women who sought out the CIO slot, contributing to the overall trend of more women CIOs in higher education.
Women as Chief Information Officers in Higher Education

The Importance of Mission and Vocation

*Feeling good about the industry that you’re in is important to us, and education is one of those industries that attracts us at all levels. I, personally, am an educator who happens to be in IT.* (Gina)

The final element contributing to the theme of higher education IT’s benefits outweighing its downsides related to the importance of organizational mission for women. Several women spoke of their attraction to academia’s mission and how it related to their own choice of work. Jen commented:

*I believe in the mission of a university, and I’m not willing to . . . I’m not willing to sacrifice for that. I’m not willing to sacrifice just to make more of a profit. . . . I wholeheartedly believe in what universities are about.*

Katie moved from the corporate sector into higher education IT specifically because of this:

*I was looking for something more interesting than working in IT in a corporate environment. I really thought education might offer me all the variety that I was looking for, because not only could I be in IT, but I could teach classes. I could be involved with students. I could do mentoring. There was so much more that this job offered.*

Gina made a general connection between mission and gender, commenting:

*To me, I think women tend to do those kinds of jobs in the industries that they feel best about. . . . We were nurses and teachers; we’re still in those same industries. We’re just higher up in those industries now, but we’re still in the same industries. There’s something about those industries that are important to us.*
In this context, Gina connected education with other feminized, vocational fields. The purpose-driven quality of higher education was clearly a draw for her, and she reasoned it was the same for other women as well:

I would not ever conceive to move into another industry: this is my industry. I wouldn't even think of moving into another industry. I’m in education first and I’m in IT second. I would guess that a lot of women feel that way too.

These comments added context and depth to data found in the survey indicating that 78% of women agreed or strongly agreed that working in higher education was important. Being able to contribute something positive to the overall goals of academic institutions appeared to be a significant and positive benefit for participants, adding to the general picture of academia as an appealing place for women. Though IT may be a masculinized profession, the perceived feminized nature of education may signal a unique entry point into its corridors.

Taken together, the benefits outlined above appeared to outweigh the more negative aspects of the higher education IT culture. Though masculine biases seem to be a solid component of the IT culture in higher education, as articulated by the women in this study, other, more positive aspects of the culture make it an attractive place to plan a career. The combination of a stimulating work environment connected to the educational mission, where more women executives are perceived to be present, along with reasonable hours, work flexibility, and a professional development culture focused on mentoring offer women an environment in which they can grow and enjoy their careers: the good outweighs the bad.
Summary

The research question asked in this phase of the study was, “How do women CIOs in higher education IT explain the organizational level factors that have contributed to their ability to attain the CIO position?” This chapter presented seven categories that were explored with nine interviewees in response to this question, along with the themes associated with each of the categories. The category that looked at how women higher education CIOs explain their pathways to that role included a demographic description of the participants, comparing their profiles to the overall survey population’s. It also investigated how internal and external paths contributed to participants’ ability to attain the CIO position. The themes associated with the category addressing why women CIOs work longer hours in the office and use fewer flexible work options included face time requirements and the ways in which women compartmentalize their work and home lives. For the category looking at why women CIOs spend more time than their male counterparts on household and caretaking duties, the themes included the impact of gender norms on interpersonal relationships, and changing gender norms and expectations at home. The themes linked to women’s explanations for bias in hiring and promotion practices were less clear than in other categories, and included explanations of fair processes and biased ones. The category in which women CIOs clarified perceptions of being paid less included themes exploring the effects of both masculine norms in higher education IT on women’s salaries, and women’s discomfort with and unwillingness to negotiate. Asking women CIOs why mentoring is important for the CIO role turned up two themes: the CIO job is unique and it is political. Finally, the major
theme discussed in response to the overarching question about why women are making more headway as CIOs in higher education IT than they are in other industries was that the benefits of working in higher education IT outweigh its drawbacks.
Chapter 6

Discussion

Introduction

The purposes of this sequential explanatory mixed-methods study were twofold: first, it gathered descriptive, demographic information on today’s higher education CIOs in order to compare women and men in that position, and second, it addressed the organizational-level elements contributing to women’s better proportional attainment – relative to their corporate counterparts – of the CIO position in higher education IT organizations. The two main research questions driving the study were, “What individual and organizational-level factors predict women’s presence as Chief Information Officers in higher education IT?” and “How do women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position?” The qualitative data in chapter five, from which seven categories with thirteen themes emerged, helped to flesh out significant findings from the quantitative portion of the study. Based on the data from both of the study’s phases, the following integrated findings are discussed in relationship to the relevant literature: demographics and the pathway to the CIO office, higher education IT’s masculist culture and environmental factors women must navigate, and positive organizational-level elements contributing to women’s presence in the field. The chapter concludes with implications for policy and practice, as well as suggestions for future research.
Summary, Integration, and Discussion of Major Findings

Population Demographics

Prior to this study, some data had been collected on higher education CIOs, but those data were limited in scope. This study not only affirmed what had previously been documented about the population, but also reinforced what was known. Data collected by the Center for Higher Education CIO Studies, Inc. (CHECS) and the EDUCAUSE Center for Applied Research (ECAR) since 2004 have shown the higher education CIO population to be predominantly male, White and highly educated (Arroway et al., 2011; Brown, 2010; Brown, 2011b; Goldstein & Pirani, 2008; Katz et al., 2004). Participants in this study’s survey were 73.4% male and 83.5% White, and 78.3% had a Masters degree or higher (Tables 2 and 4). These data further reflect the very first information captured on the higher education CIO in 1990, though there are proportionally far more women in the role today than the four (6.9%) documented in that study of 58 higher education CIOs (Penrod et al., 1990). When it comes to gender, race, and educational level, not that much has changed in the nearly quarter of a century since higher education began its research on the role of the CIO.

This study’s inquiries into participants’ educational backgrounds substantiated recent CHECS data that reported technology (IT, IS, Computer Science, etc.), business, education and administration as the top four disciplinary areas for CIOs’ highest earned degrees: Table 4 shows that 25.5% of survey respondents had degrees in business, 22.4% in IT/Computer Science, 12.8% in education, and 4.3% in administration (Brown, 2010; Brown, 2011b). Though women dominate in the disciplines of education and public
administration, that is still not the case in either business or technical disciplines like computer science and IT (Bell, 2010; Hill Corbett, & Rose, 2010; Jaschik, 2010; Mangan, 2012; McGrath Cohoon & Aspray, 2006). If those two categories, which are so closely aligned with pursuing the CIO role, continue to attract proportionally fewer women, questions must be raised about the pipeline of potential women for that position. If we use Eagly and Carli’s (2007) labyrinth metaphor to understand the complex journey women take on their way to high-ranking leadership roles, then the pipeline represents the entry point to the maze. Fewer women in that pipeline reduce the potential for gender proportionality at all levels of IT, and certainly at the top.

**Today’s CIO role.** Scholars who have looked at what CIOs do (in and out of higher education) have indicated that a big part of the role is bridging the gap between the institution – or business – and technology, aligning IT with the mission and goals of the organization (Black, 2009; Gupta, 1991; Lineman, 2007; McClure, 2000; Penrod et al., 1990; Savarese, 2004). Understanding the multifaceted needs of higher education institutions has also been emphasized as something that higher education CIOs must bring to the job. Unlike businesses focused on selling products or services, higher education’s goals are far less tangible and more diverse, and thus require leaders who can help find technology solutions for a variety of campus domains. Additionally, those who have asked higher education CIOs what skills they need in order to be effective on the job have found communication and strategic thinking to rank far higher than technical proficiency (Arroway et al., 2011; Goldstein & Pirani, 2008; Katz et al., 2004; Brown, 2010; Brown, 2011b).
There seems to be at least some disconnect between what the data show demographically about higher education CIOs’ educational backgrounds, and competencies CIOs say are important for the work the role entails. Technical proficiency does not necessarily translate into business strategy or communication expertise. With a wave of higher education CIOs on the verge of retirement (Arroway et al., 2011), this dissonance offers the community something to think about for future generations of CIOs. If higher education wants to further diversify the top ranks of its IT departments, looking to the same male-dominated disciplines may yield disappointing results.

**Demographic differences between women and men.** The demographic analysis showed very few statistically significant differences between women and men higher education CIOs. No major distinctions were recorded between the two groups for most individual characteristics, including age, race/ethnicity, marital status, age of children, salary, and the years spent in their jobs and at their institutions (Tables 2 and 3). The one personal difference revolved around children, with women CIOs more likely to be childless than men. A similar pattern was seen in the data around education level and background: women and men’s educational profiles looked very similar. Slightly, but not significantly more men than women had degrees in education, and the same was true for women with IT degrees (Table 4). Furthermore, the organizationally based demographic profiles of the two CIO groups displayed little contrast; whether evaluated along lines of Carnegie Classification, cabinet membership, size or structure of their organizations, no significant differentiation between the genders was measured. In these various ways, the descriptive data revealed that core principles behind CIO selections trend strongly toward
a homogenous norm. Such a norm might be difficult to adjust unless the homogeneity is first acknowledged, and even then, as scholars of organizational culture tell us, it can be quite resilient and resistant to change (Deal & Kennedy, 1982; Schein, 2010). On the other hand, some of the data about the position in higher education could be interpreted from a slightly more encouraging perspective. Women were not significantly older or more highly educated, nor ghettoized in smaller, less prestigious institutions. Yes, they were less likely to have children, a fact about women executives reflected in and outside of higher education, and a persistent trouble spot, for sure (Alex-Assensoh, 2012; Nichols, 2013). The uniformity, however, suggested that if women candidates fit into the established CIO mold, they too were being considered and chosen for those positions. Still, the fact cannot be ignored that the norms of the role as it stands were created by men and remain skewed toward masculine characteristics. In the cultural design of the higher education CIO position, women continue to exist on the periphery. One final note about the demographic comparison between women and men CIOs: when analyzed for differences between the genders, no statistically significant salary differences were found. Women, however, made an average of almost $14,000 less than men annually, a gap with practical significance. This fact figures into the discussion around salary bias later in this chapter.

**Pathways to the CIO Office in Higher Education**

In this study, the qualitative interviews helped add context to the demographic data gathered for understanding women’s routes into the CIO role. In *The Myth of the Ideal Worker: Does Doing All the Right Things Really Get Women Ahead?* Nancy M.
Carter and Christine Silva (2011) reported findings showing that women make the most progress within organizations, as opposed to men, who advance more quickly when they jump from place to place. The qualitative portion of this study partially affirmed that, with five of the nine interviewees attaining their CIO role by rising internally through the ranks at their institutions. What was interesting about those pathways, however, was the phenomenon of major extenuating circumstances. For four of the five who progressed internally, they initially made it into the CIO role because their male bosses either retired, became very ill, or died. Though there is no known literature that investigates this phenomenon, it is certainly an interesting thread to follow. If these extenuating circumstances did not come about, would these women have had the opportunity to step into that top role? Do women get stuck as second-in-command unless something drastic happens more often than is the case for men? Or is this just a by-product of the age of individuals in executive roles? In order to understand this better, it would help to examine advancement patterns for women and men to see whether this particular finding illustrates a gendered experience.

The interviews did not entirely support what Carter and Silva (2011) had to say, however. Four of the nine interviewees, in fact, advanced their IT careers in higher education not only by changing institutions, but also by making geographical leaps, at times clear across country. Two of the four women who did this had no children, and expressed no qualms about moving to get the job they wanted. Of the internal advancers, however, four of those five had children and had spent many years at their current institutions while raising them. Several actually mentioned family as a key reason for
staying put. Their rationale for staying reflects what scholars have said about choices women make – more often than men – when they decide to have a family alongside a career: family needs play a big role in how they manage their commitments (Eagly & Carli, 2007; Hewlett et al., 2005; Powell & Graves, 2003). So though moving from one job or location to another might be a pathway to advancement for some women, it is not necessarily an option for others. There are not that many higher education CIO jobs, however, and so moving when it is possible might, in fact, be an advancement strategy that works for women.

**Higher Education IT: Masculine Discourse and Organizational Culture**

The descriptive information on today’s CIOs in the academy offered a picture of higher education IT’s topmost echelon as male-dominated. This comes as no surprise when looking at both the history of the IT profession and data that have been collected about CIOs both in and out of higher education. Technology historians draw the connection between the profession and men back to times before information technology was even formed as a field (Campbell-Kelly & Aspray, 2004; Ceruzzi, 2003). Women were absent from arenas such as engineering, computer science and business due to socially ascribed gender norms in existence when those domains emerged in the workforce. And the CIO role, when organizations first began incorporating it into their structures, inherited those norms: in both the corporate sector and higher education, CIOs were White, middle-aged men with technical or business degrees (Pemberton, 1992; Penrod et al., 1990).
Examining this information through a social structural lens gives shape to understanding higher education IT culture as masculine. Scholars of organizational theory have asserted that when a profession has a strong, historical tie to a dominant gender, the occupation itself is informed by that gender, and the values, assumptions, and stereotypes associated with it (Ely & Padavic, 2007). Such scholars have also recognized organizations as locations where gendered relations are produced and regulated, through discursive practices biased toward those in the majority (Acker, 1990; Martínez Alemán, in press). Thus, the discourses embedded in higher education IT, where men have dominated in the profession and leadership roles since the very beginning, provide a distinctly masculine foundation for the profession’s culture. In such a culture, women exist on the periphery of cultural creation – they are “outsiders” (Deal & Kennedy, 1982; Schein, 2010).

As Edgar Schein (2010) tells us, organizations’ cultures become entrenched, and unless drastically disrupted, retain the assumptions that drive them, as well as their design. What Schein posits makes sense when considering today’s higher education CIO, a position that is still overwhelmingly White and male, and primarily educated in technical or business-related disciplines (Arroway et al., 2011; Brown, 2011b; Goldstein & Pirani, 2008; Katz et al., 2004), characteristics that were supported by this study’s survey data.

Higher Education IT: Navigating the Labyrinth

While the demographic data from this study illustrated that higher education IT is indeed dominated by men at the top, other data from the survey and interviews painted a
fuller picture of the ways in which masculine discourse is acted on and circulated within the IT environment for CIOs. Discursive practices that give rise to a masculine organizational culture emerged, along with their associated consequences for women CIOs. I come back to Eagly and Carli’s (2007) labyrinth metaphor, as the factors discussed below contribute to a complex, labyrinth-like environment that women must navigate in order to succeed.

Ideal worker norm. In his 2007 book, *Striking a Balance: Work, Family, Life*, Robert Drago (2007) defined what he called the “ideal worker norm,” a cultural norm – or shared belief – associated with managers and professionals. The norm requires high levels of commitment to one’s job, with little regard to life outside the work sphere. This norm, he states, “serves as a dividing line within the workforce, segmenting off those who strive to be worthy and committed to meeting the demands of the norms from those who are unworthy and not expected to adhere to the norm” (Drago, 2007, p. 10). The assumptions behind the norm are bound to gender stereotypes and dichotomies, especially when it comes to life outside the boundaries of work. While men are presumed able to commit to the ideal worker norm (whether or not they like it), women are assumed to have mixed loyalties if family is involved. Through its commitment standards, this particular norm exemplifies how masculine discourse, as Martínez Alemán (forthcoming) describes it, regulates organizations and the individuals within it.

Looking at the average reported hours worked by the survey population of women and men CIOs – 53.59 hours per week (Table 15) – does not tell the full story about how this norm might affect those individuals, as one could argue that this is a reasonable
number of hours to expect in an executive role. The interviewees, however, painted a different picture of working norms for higher education CIOs, one more closely aligned with Drago’s description of the ideal worker. Five of the nine participants related intense expectations associated with the job. Having to always be “on,” or “working 24/7” were phrases used to illustrate the work intensity level. Others talked about their days starting early and ending late, sometimes with only brief breaks in the middle to tend to a spouse or child. In all of these cases, the necessary commitment women described augmented what could be understood from a sole data point about number of hours worked. An unrelenting work schedule has some serious implications for women at various points in their lives, and will be discussed further in the section on home responsibilities.

**Masculine bias and IT leadership.** The ideal worker norm presented one example of masculinity working discursively to permeate higher education IT’s value system and inform its culture. Other expressions of masculinity’s discursive centrality were illustrated in the various types of bias associated with IT leadership. According to Rosabeth Moss Kanter (1977), even at 26.6% of the population, women exist in a role that is skewed toward men. Existing as outsiders in the CIO position, they are subject to bias and discrimination as participants in that role. Though women interview participants described an existence consonant with Kanter’s theory of proportionality, more than 35 years have passed since she first articulated it. As research on women in higher education IT advances, her assumptions and percentages need testing for workers’ reality in modern times.
Leadership bias and discrimination. Scholars who study leadership and gender have illustrated that, especially in male-dominant professions, there is often a perceived incongruity between the female gender role and positions of leadership (Eagly & Karau, 2002). That women leaders are perceived as out of place can lead to prejudicial treatment (Eagly & Carli, 2007; Eagly & Karau, 2002; Heilman, 2001; Johnson et al., 2008; Oakley, 2000). Being treated differently in environments where the primary discourse is highly masculine then becomes something that women need to manage as a part of their careers, whether consciously or unconsciously (Eagly & Carli, 2007; Eisner & O’Grady Harvey, 2009; Heilman, 2001). In this study, several different overcompensating behaviors were articulated as methods of managing that bias. They included spending
more time in the office, using fewer flexible work options, and adopting learned, gendered behaviors.

*Face time required.* In this study, linear regressions for various permutations of where women and men CIOs in higher education spent their working hours were run on the survey data. The analyses showed that women spent significantly more hours in the office than their male counterparts (Table 16). Additionally, comparisons between women and men’s use of flexible work options revealed a pattern in which men CIOs were more likely to use those options than women in that role, and significantly more likely to use the compressed work week alternative.

Asking women CIOs why they and their peers spend more time in the office than men and use fewer flexible work options revealed that, in order to prove themselves as worthy leaders, they felt that they needed to be visible to others at their institutions. Interviewees expressed a clear and conscious need to publicly demonstrate their competence in the IT leadership role, given the gender-based bias they had experienced. Understanding themselves as outsiders in the role led them to modify their behavior to compensate for that bias. Being physically present in an office space illustrated commitment to their job – being an ideal worker – and left no reason for doubt as to whether they might be tending to something else when not in the office. The “something else” that often gets attached to women in the workplace is their family. Presumptions about leaving early or needing flexibility for family reasons can corrode perceptions of women as ideal workers, leading them to behave in ways meant to counterbalance the bias like spending more time in the office.
Learned behaviors. Another way that women in this study managed the masculine bias associated with the CIO role was to adopt behaviors that they felt were either appropriate for the role, or appropriate for their gender within the role. Research on leadership and gender has found that knowing how to lead as a woman can be tricky business. Because of the associations between leadership and masculinity, women can trip into proverbial landmines if they act in ways that are too masculine or too feminine, especially in masculine domains like IT (Eagly & Carli, 2007; Heilman, 2001; Johnson et al., 2008). Knowing “how to act” becomes an even thornier task when considering other influential cultural factors such as geographic region. Being a woman CIO at a Southern institution may be vastly different than being one in the Northeast region or Pacific Northwest. Even within a region, navigating cultural gender norms can be complex, as demonstrated by two participants, both from Southern institutions. One woman had to learn to “bang her fist on the table” and act aggressively in order to be taken seriously, while another learned to “act like a lady,” as she saw the price other women leaders had paid for being both smart and aggressive (aggression being a characteristic of “proper” masculine behavior). These two stories illustrate nicely the concept of the “double bind”: women who lead in a too authoritative, stereotypically masculine way can be criticized, while the contributions of those who are too stereotypically feminine may be dismissed (Aisenberg & Harrington, 1988; Chliwniak, 1997; Eagly & Carli, 2007; Freeman & Bourque, 2001; Klenke, 1996). They also point out how in addition to gender, regional cultural norms can add to the complications women face as IT leaders.
**Hiring and promotion: Bias, or no?** The literature around leadership and gender touches upon how bias can affect who is hired and promoted for particular positions. In 1977, Rosabeth Moss Kanter coined the term “homosocial reproduction” to describe how organizations with a heavily dominant population – like men in IT – enforce their culture through the selection of new members who resemble those already present. Edgar Schein (2010) also wrote about how leaders tend to be most comfortable with and choose new employees based on existing cultural norms. These very human tendencies often subconsciously influence decisions about who is best suited for particular jobs, undervaluing or not recognizing competence in the “other.” These tendencies, when left unchecked, have been found to lead to different rates of promotion for women and men (Heilman, 2001). Again, when the organizational discourse is decidedly masculine, women tend to suffer. In order to counteract the negative influences of such unconscious stereotypes, researchers have proposed redesigning recruitment and evaluation practices (Eagly & Carli, 2007; Heilman, 2001; Johnson et al., 2008; Liedtke, 1995; Powell & Graves, 2003).

The survey findings illustrated that significantly more women than men felt that they had not been promoted because of their gender. Though not statistically significant, proportionally more women also felt they had not been hired because of their gender (Table 25). Of the women interviewed, four expressed some very definitive negative connection between gender and their experiences with hiring and promotion opportunities. Those who spoke about these forms of gender bias pointed squarely at the hiring manager and/or supervisor level as the root of their own problems. Whether being
informed that the reason they were not promoted was because they were too aggressive, or being told not to meddle because technical work was “boys” work, there were qualitative data that supported what scholars have previously noted about unconscious stereotypes impacting who fits in particular positions or deserves to be promoted. Indicating that the hiring manager level was where the problems lay also supports the research that recommends altering recruitment and evaluation practices. Even with institutional practices in place, however, the hiring manager or supervisor level can be very dangerous, as results can be quite idiosyncratic. Without a good deal of clamor and a strong dose of accountability, poor hiring and promotion processes can go undetected for very long periods of time.

The survey data were not entirely clear around hiring and promotion, however, as they also demonstrated a positive relationship between hiring, promotion and gender (Table 25). Additionally, four interviewees indicated that they had not experienced hiring or promotion bias. Those who reported those processes as fair said that transparent and/or improving human resources practices had helped. Human resource departments certainly play an important part in setting standards for hiring and promotion; Helfat et al. (2000) found that organizations perpetuate biases when they have ambiguous hiring and promotion procedures that lack proper structure. There are important practice-based implications then, for what might be done to improve situations at institutions where procedures might not be well defined or clear. If the women who stated that they had not felt such biases present had either all been from one geographic location or did not exhibit great insight into how gender impacts behaviors and experiences, there might be
more to unpack from these data. They did, however, and so the mixed results for hiring and promotion bias lead to questions around how much prejudice that women experience is tied to idiosyncratic behavior at the hiring manager and/or supervisor level, as well as to poorly designed human resource practices. Another question that ought to be asked is if higher education is more cognizant of diversity (gender, race, ethnicity, etc.) because of the impact the topic of institutional diversification has played in the life of the academy, and if so, are human resource departments taking this up to good effect? These are questions worth posing if these more unclear data are to be better understood in the future.

The varied results on this topic imply that the situation may be evolving at the institutional level. Institutions that are paying attention to the issue of gender diversity may be putting practices into place that work. However, even organizations with the best-laid plans cannot necessarily ensure that good policies are being implemented in a uniform fashion. Without better monitoring and accountability in place, those who are in positions to hire and promote can continue to do a world of damage.

**Salary bias.** The pay gap between working women and men has been well documented for years. In its most recent report, the American Association for University Women (2013b) noted that in 2011, women earned an average of 77 cents on the male dollar. The same forces that impact hiring and promotion bias have been articulated in the literature as ones linked to differences in pay rates for professional women and men. Women tend to be undervalued in professions where they exist as the “other,” which shows up in wage-based inequalities despite the attention given to the topic. Wage
discrimination is difficult to assess directly, as so many factors must be taken into account, but when researchers have controlled for elements like education, profession and type of employment, they have still found that women earn less, on average, than men (Eagly & Carli, 2007).

Though not statistically significant, data from this study’s survey indicated women CIOs earned an average of $13,976.38 less than their male counterparts annually, or 91% of men’s earnings (Table 3). Though better than the national average, a discrepancy still exists. Where men and women did not vary significantly along other demographic variables like age, education level and background, and, in fact, women had greater average tenures both in their roles and at their institutions, their lower salaries can and should not be ignored. Given that women in the study were significantly more likely than men to say that their gender negatively influenced their pay, more exists here to explore in depth. Though results around hiring and promotion practices were somewhat mixed, they were far clearer when it came to gender’s impact on salary. That salary is attached to both hiring and promotion processes calls into question the lack of bias reported by women in those areas. Wages are tangible evidence of fair or biased processes and must figure into any evaluation of how higher education institutions are doing when it comes to gender equity at the executive level.

**Negotiation.** The other qualitative theme that emerged related to the pay gap was the topic of salary negotiation. As of late, women in IT negotiating high-octane careers with top salaries alongside family life have been front and center in the news. COO of Facebook, Sheryl Sandberg advises women to just “lean in” in order to negotiate the lives
they want. Melissa Myers, Yahoo’s CEO, negotiated a package with the company worth
tens of millions, complete with a nanny office next to her own. These examples not only
lack relevance in the academic world, as Myers and Sandberg’s positions are more
mythical than real for higher education employees, they also imply that there are no
structural barriers for women who want top jobs and salaries, and associate failure on
either front with the individual. Though the virtues of such an argument could be debated
endlessly, at its heart it does ignore the systemic biases inherent in masculine
environments like IT that affect women’s experiences with negotiation. Researchers have
found, in fact, that when masculine norms are at play, women leaders who buck gender
conventions and do things like negotiate aggressively are often punished for doing so
(Eagly & Carli, 2007; Eagly & Karau, 2002; Heilman, 2001; Johnson et al., 2008;
Oakley, 2000).

In this study, five of the nine interviewees spoke about the issue of salary
negotiation. A number of them noted either their own, or women’s trouble in general,
asking for more money. They rationalized their behavior, saying that they were satisfied
with what was offered, or they did not want to rock the boat, or even that they would feel
like a bad leader if they got something for themselves but not for their staff members.
What was clear, however, was their discomfort with the process of advocating for
themselves. This discomfort can be directly tied to messages they have absorbed about
gender appropriate behavior and consequences for violating it, confirming what scholars
have found about the impact of gender stereotypes on activities like negotiating (Bowles,
Babcock, & Lai, 2007; Eagly & Carli, 2007). One woman’s story about discovering the
discrepancy between herself and a male peer, and her boss’ unequal treatment of their salaries points to how different layers of the organizational structure can negatively impact outcomes for women. In that case, her boss only gave her peer more because he asked for it. While one could certainly put the onus back on the individual woman for not requesting more, given what has been documented about the double bind phenomenon and the predicament women often find themselves in when they aggressively pursue what they want, it might more easily be argued that a structural solution would have a greater impact on this issue.

**Responsibilities at home.** Another major piece of the labyrinth professional women must navigate has been well documented in the literature: socially ascribed assumptions around gender, housework and caretaking deeply affect women’s lives outside of work, and impact their career choices. Numerous scholars have assessed the lingering effects of gender roles on working women. When women first moved into the workplace, the historical roles that they had been assigned on the home front did not disappear. Housekeeping and caretaking as feminine domains proved stubbornly difficult to shift over the years, and contemporary research shows that decades later, high-achieving women are still spending more time on domestic and relational duties than their partners or spouses (Eagly & Carli, 2007; Hewlett et al., 2005; Powell & Graves, 2003; Yasin & Helms, 2007).

This study validated that, illustrating that when five types of home-related duties were combined, women CIOs spent an average of 5.96 hours more on these tasks than their male counterparts; this was statistically significant when controlling for both
demographic and organizational variables (Tables 20 and 21). In this crucial way, women and men higher education CIOs varied significantly. The largest mean difference shown between women and men on the individual tasks was for childcare, where women spent 3.54 more hours per week on this than men – which adds up to 184 additional hours each year on that one duty (Table 23). When asked to explain this, all nine interview participants felt very clearly that stereotypical gender norms were at the heart of this difference.

If these patterns persist, there are some unmistakable implications for women who want to pursue the CIO role in higher education, and for higher education institutions if they want to diversify their executive IT ranks. If the working norms of the job are demanding in the ways described earlier in this chapter, and if women have to spend more time in the office in order to prove themselves, and if they put in extra hours at home taking care of obligations there, the stakes for taking on the job might be too high for certain women to want to pursue it, especially during the years when childcare needs are taken into account.

There was some commentary in the qualitative portion of the study about roles at home shifting with the generations, which corresponded to what Eisner and O’Grady Harvey (2009) found in their study of Generation Y business students. Their participants expressed a greater desire for workplaces that supported shared responsibilities at home. However, given the tenacious nature of gendered cultural norms, it will take time to tell just how quickly conventions at home and in the professional workplace will shift to a more egalitarian place.
What Helps?

Much of what was documented in the quantitative survey and explored through the semi-structured interviews confirmed what researchers who study gender and masculine professions like IT in the corporate sector have already found: demographics influence the discourse and culture of organizations, which when dominated by men take on masculine attributes. These characteristics have the potential to affect women’s participation inside the profession, and often negatively impact their experiences as potential and actual leaders.

It is still the case, however, that women are attaining the CIO position in higher education IT at greater proportional rates than they are in large corporations. In addition to some of the potentially damaging aspects of higher education IT culture for women, this study also revealed a variety of organizational-level factors that contribute to environments that not only appeal to women, but also help them pursue careers in the field and attain executive roles. These factors are discussed in turn below.

Stimulating work. Though no survey questions were posed about what drew participants to higher education IT, two-thirds of the women interviewed spoke of how much they liked their work. They described working in higher education IT as stimulating and intellectually engaging, with something new always on the horizon to explore. Their sentiments reflect something that has been documented in the corporate IT literature: a major reason women choose to be in the profession is because it provides interesting, challenging work (McKinney et al., 2008; Wentling & Thomas, 2004). As technology continuously evolves at a breakneck pace, and because it is used to solve so
many organizational issues and improve processes, it is not difficult to see what might be engaging about the field. There are constantly new opportunities to investigate.

Additionally, one interview participant hit upon a quality of higher education IT that might, in fact, make it unique and an even more interesting place to be than the corporate sector. When she worked at a law firm, IT’s role was to make things work well for the attorneys, rather than to innovate. In contrast, her work in higher education constantly involves a variety of campus constituencies with different problems to solve. As scholars have noted, higher education institutions are loosely coupled organizations (Weick, 1976) with no clear goals or outcomes that focus the work (Bensimon et al., 1989). The variety of organizations within each institution that rely upon IT present interesting opportunities for higher education CIOs. And though higher education is historically and notoriously slow to change, which certainly affects IT leaders within the field, CIOs also have a diverse and ever-changing set of constituents who constantly need their attention.

Flexible environment. A major strategy discussed in the glass ceiling/labyrinth literature for retaining women and helping them attain executive roles is workplace flexibility. As examined in the section above on home-based responsibilities, because gendered norms have connected household and caretaking duties with women’s roles, those who pursue both careers and families often feel the weight of having to manage the competing demands at work and home. Policies such as flexible scheduling, flex time and telecommuting have all been documented as helpful for professional women, and which happen to be facilitated well through the use of technology (Dreher, 2003; Eagly & Carli,
Women as Chief Information Officers in Higher Education 266

2007; Helfat et al., 2000; Hewlett et al., 2005; Trauth et al., 2009; Wilkoff & Schneer, 1995). George Dreher’s 2003 study, in fact, found a positive correlation between an increase of women in senior management and flexible human resource practices. When these type of practices are not in place at organizations, it is not uncommon for women to weigh their options and step out of the workforce. Flexible policies, research has shown, help organizations retain women and keep them from opting out (Bartol & Aspray, 2006; Hewlett et al., 2005; Trauth et al., 2009).

The survey revealed that various flexible work options exist in higher education IT organizations. Compressing the workweek was available at 15.4% of participants’ institutions, while 33% had a distributed office option (working from home/other location), and 51.1% could use flex time. Additionally, six of the nine women interviewed brought up flexibility as an important component of their higher education IT experiences. Several connected the flexibility they had while raising their children to their sense of institutional loyalty. Two women contrasted their experiences in the corporate sector with the relatively humane environment they found in higher education IT, noting again how flexibility helped them manage competing work and family pressures. Others viewed it as an important benefit for their employees, empathic to the variety of life factors everyone needs to juggle.

Most of the conversations about workplace flexibility in the interviews, however, focused on past experiences, at points when participants were not in the CIO role. Add to that the lower percentages of individuals reporting in the survey that they used the available flexible options (8.5% compressed workweek, 23.4% distributed office, and
Women as Chief Information Officers in Higher Education

40.4% flex time), and that women CIOs used these options significantly less often than their male counterparts, and the picture looks somewhat less bright. These collective data suggest that higher education may be more flexible than other industries at earlier points in individuals’ careers, but the executive level is often different, and may disproportionately impact women. Schedule accommodations may help to retain women in the higher education IT workforce, but if the CIO role is considerably less flexible than other positions, not every woman will be able or willing to do it, leaving part of the qualified workforce behind. The situation described by the one interviewee with a small child would not be palatable to everyone, as she detailed the considerable family sacrifices she made in order to excel in her job. If institutions make the role’s requirements such that the choice becomes more “either/or” than “along with,” they may be turning away very qualified candidates who do not want to choose the former way of operating.

Interestingly enough, in an era where many academic institutions, especially larger ones, feel the pressures of corporatization, it was women at smaller institutions who expressed the most distress at the lack of flexibility available to them and their staff. When a staff is so small that there are no layers of redundancy, allowing people to work from home or non-standard business schedules may, in fact, be much more difficult to arrange than in larger IT organizations. This sentiment was not echoed by all interviewees from smaller institutions, but may be a significant reason why some organizations do not offer their employees the flexibility they might want and need.
**Role models and mentors.** Role models and mentors have been documented throughout the glass ceiling/labyrinth literature as crucial factors for developing more gender diverse environments. Role models are defined as others who exist in positions aspirants hope to obtain. Their function is more passive in nature than mentors, and it is their presence in positions of power that matter. Mentors, on the other hand, may be role models, but they are also individuals who actively sponsor and groom aspirants earlier in their careers for positions they seek. Research around women’s participation in male-dominated professions have found a lack of both role models and mentors to deter women’s participation in those fields (Ahuja, 2002; Drury, 2011; Glazer-Raymo, 1999; Goodman et al., 2003).

**Women role models.** It makes sense that a lack of role models discourages participation in particular jobs or industries. When groups of individuals (such as women) are absent from roles like the CIO, it becomes difficult to imagine them as well suited for the job (Bartol & Aspray, 2006). There is a psychological toll women pay when they do not see other women in the CIO role in higher education IT organizations, or even just at the executive level in their institutions. Dreher’s 2003 study that found a correlation between women in senior management and human resource policies also found a connection between the presence of low to mid-level female managers and women in senior management. Though the direction of the correlation was not established, women’s presence stood on its own as an important component of building gender proportionality in organizations.
When survey participants in this study were asked how important role models had been to their decision to pursue the CIO role in higher education, results were decidedly neutral, and there were no significant differences between women and men’s responses (Table 27). On the other hand, when asked if they were important for the next generation of higher education CIOs, both men and women agreed with that statement (Table 27). Additionally, one-third of the interview participants articulated women executives’ presence in higher education – both in general, as well as in IT – as a reason other women felt comfortable pursuing executive roles in higher education IT. Seeing others like them at the top, they felt, made a notable difference. What these data did not indicate was the correlation between proximity, role alignment, and the positive influence of role models. Is observing women executives across higher education as effective as having them at one’s home institution? Are CIO role models in particular more helpful than executive role models in general? Assessing role model impact requires more attention to these types of nuances.

**Mentoring.** An even stronger thread than role models in the literature, mentoring has been documented as a particularly helpful strategy for developing top management (Eagly & Carli, 2007; Helfat, 2000; Locher, 2006). Research specifically in higher education IT has found this to be true as well; ECAR reports by Arroway et al. (2011) and Goldstein and Pirani (2008) both described the importance of mentors for CIO aspirants. Quantitative results from this study supported that view, with current higher education CIOs judging mentoring, especially informal mentoring, as important for that role (Table 29). The qualitative data strongly supported that finding, with participants
Women as Chief Information Officers in Higher Education

brining up the subject 57 times during nine interviews. What they added to the
discussion was a key fact about the culture of higher education: mentoring is not only
something that is recognized as important at the individual and institutional level, but is
also a part of the professional development culture in higher education IT.

EDUCAUSE, the national membership organization supporting the higher
education IT community, was noted by interviewees as emphasizing mentoring for CIOs
among their professional development activities. Aside from the mentoring resource area
on their website, qualitative participants pointed to their online Affinity Finder, which
allows mentors and mentees to find one another based on a variety of factors (geographic
region, skill set, position, among others). The many leadership institutes run by
EDUCAUSE were also mentioned as a way in which higher education IT professionals
develop necessary skills and connections for their careers. Participants highlighted these
support mechanisms as valuable for aspiring and current CIOs’ careers.

Understanding what types of mentoring models work for women in higher
education IT needs further attention. Scholars who have looked at specific mentoring
models have found women’s networks and/or support groups to be valuable (Helfat et al.,
2000; Trauth et al., 2009; Wilde, 1997). This framework for mentoring was mentioned
only once in the qualitative interviews, but could be explored in future research about
effective mentoring models for the higher education IT community. Some very positive
types of mentoring are already in place in the community, thanks to a robust, national
professional development presence. Because mentoring has been correlated with senior
managers’ development, further investigation ought to focus more specifically on the
models in place and ones that might be further utilized to influence gender diversity in leadership roles. Additionally, understanding the benefit of specific aspects of mentoring – such as coaching or sponsorship – would help to guide CIO-specific mentoring activities in the professional development community. Furthermore, it would be useful to know whether particular areas of the corporate sector have strong, national professional development organizations guiding efforts like mentoring that help women in the field. EDUCAUSE’s existence could be a positive factor distinguishing higher education from other industries. This study certainly raises that question.

**The role of education’s mission.** Long ago, Burton Clark pointed out a defining characteristic of higher education: those who work in it believe in the educational mission (Tierney, 1988). This detail has received attention in the higher education IT community as well. The 2004 ECAR study identified mission as important to leaders working in higher education IT (Katz et al., 2004). Survey data from this study corroborated that, with high percentages of respondents agreeing or strongly agreeing that it is important for them to work in higher education. The concept of mission came up in the qualitative interviews as well, when asking participants why more women were attaining the CIO role in higher education: working toward something positive for society meant a good deal to them, with attention paid to the vocational aspect of education. One participant even framed education as a feminized field, indicating women’s comfort working in those types of disciplines (such as nursing or social work), despite men’s historical dominance in higher education. That last notion is worthy of consideration, however, as women may indeed be more drawn to working in higher education IT because of the
societal purpose served by academia. Is higher education, in fact, attracting more women to IT because of its mission? If so, what lessons might IT in the corporate sector learn from that if they too want to appeal to a more gender-diverse base of individuals?

In summary, the combined quantitative and qualitative data from this study suggested that a number of positive elements are at play in higher education IT that not only make the environment an appealing one for women, but also assist their career aspirations and help them in their quests for leadership roles. Stimulating work in a discipline that draws upon vocational commitment, coupled with the presence of role models, a strong professional development commitment to mentoring, and the flexibility women need throughout the arc of their careers might provide the type of positive work culture that women need to succeed, in spite of androcentric elements. While the more favorable aspects associated with the academy may not neutralize the masculine bias inherent in higher education IT, they may, in fact, contribute tangibly to a positive, compelling setting in which women can grow their careers.

Limitations

Although this research study was carefully constructed, limitations and shortcomings still existed. First, though the survey population was given several weeks to fill it out, it was distributed at the beginning of the academic year, a particularly busy time for Chief Information Officers in higher education. Though adequate for generalizing to the larger population of higher education CIOs, extending the survey a few more weeks with reminders may have improved the survey’s response rate. Second, four of the survey variables related to participants’ career pathways – degree major,
organization type for previous position, previous position title, and title for two positions prior – were detailed in such a granular way as to make the proposed statistical analysis difficult. Future research on higher education CIO pathways would be very helpful, so I suggest recreating the variables by grouping logical categories together in order to catch the essence of the population’s background without eliminating too much nuance in individuals’ responses. Finally, because of the relatively small number of women CIOs in higher education, demographic descriptions of the interview participants needed to be somewhat restricted in order to protect their anonymity. Until the number of women reaches a greater level of proportionality in the population, this limitation may continue to plague future research of this kind.

Implications for Practice

Findings from this study around career pathway, the masculine bias inherent in higher education IT organizations, and the importance of mentoring suggest changes to organizational and human resource practices that could address the more negative aspects of the culture for women, while strengthening efforts that help them. The following recommendations are by no means exhaustive, but they do identify creative opportunities for organizations committed to gender diversity. Suggestions may be readily customized for a variety of environments.

Pathway and practice. What became evident in the data describing the educational pathways of higher education CIOs was that many had pursued degrees in technical and business-oriented disciplines. Though administration and education degrees also topped the list of those CIOs had pursued, more than one out of every five CIO had
some sort of technical degree. At the same time, higher education CIOs have indicated that communication, strategic planning and business process skills are the most important ones necessary for the job, relegating technical skills to the bottom of their priority list (Arroway et al., 2011; Goldstein & Pirani, 2008; Katz et al., 2004; Brown, 2010; Brown, 2011b). The work of a CIO, however, is often unfamiliar to the executives hiring them. The lack of familiarity can lead hiring committees to emphasize skills and experience that, while helpful, may not be best suited to what organizations actually need. Scanning current descriptions for higher education CIO jobs quickly illustrates that persistent focus on technical knowledge and skills (HigherEd Jobs, 2013). With the aforementioned in mind, I recommend re-engineering CIO hiring processes to educate participants about the unique aspects of the role and the skill set necessary to be both productive and successful. Widening the range of accomplished applicants has the potential to open doors for women without technical degrees. This strategy was suggested by Ashcraft and Blithe (2010) in Women in IT: The Facts, and is worthy of attention. National organizations like EDUCAUSE, along with their regional affiliates, could provide materials and professional development support to other organizations like the National Association of College and University Business Officers (NACUBO), as well as educational institutions, with the aim of broadening understanding around the role’s requirements. Human resource departments could perform the same function at the organizational level, helping hiring committees assess institutional IT needs, and focusing their search efforts on meeting them. Expanding job descriptions to include criteria that focus on skills CIOs
Women as Chief Information Officers in Higher Education
dean essential could open opportunities to well-qualified leaders who might have been
left behind in the past because of their educational qualifications.

Even if this strategy helps to broaden the pipeline of available women for the
higher education CIO office, the persistent cultural barriers inherent in such a masculine
profession as IT could temper an otherwise enthusiastic shift toward gender
proportionality in that executive post. Bringing in CIOs from disciplines where women
prevail (education, administration) does not equate to women being chosen for this
historically masculine role. Witness the fact that in this study, men CIOs were slightly
more likely to have studied education than women CIOs. Even in fields like education
and social work, where women have had a dominant presence, men often hold the top
executive positions (Hoff & Mitchell, 2008; Zunz, 1991). Thus, widening the educational
pathways to the CIO office as a way to broaden the pipeline of women available for the
job will not necessarily adjust gender proportions in the CIO office without attention to
the myriad of cultural barriers that make the position unappealing and/or unattainable for
women.

Unconscious gender bias and human resource practices. Unconscious gender
biases affect processes involving hiring, promotion and pay, and must be confronted in
order to achieve substantial change for women in higher education IT. Educating hiring
managers is key to any such evolution. As pointed out in the qualitative phase of this
study, hiring managers can contribute to gender discrimination in IT by upholding
prescribed stereotypes for who belongs in technical and/or leadership positions. The most
straightforward way to counteract such biases is through education, which must happen at
Women as Chief Information Officers in Higher Education

multiple organizational levels in order to be effective. Human resource departments first need to understand how gender stereotypes play themselves out in androcentric professions like IT. Tapping into the variety of resources, education and training on gender diversity provided by associations like the Society for Human Resource Management (SHRM) is one way that human resource professionals can become conscious of such tendencies. Additionally, research provided by organizations like EDUCAUSE could deepen their awareness of gender bias in technical domains. Human resource officers must recognize how associations between technology and masculinity affect hiring, promotion, and salary decisions in order to help prevent gender inequality related to those activities. In addition to educating themselves, however, these professionals must also share their knowledge with hiring managers and search committees across their institutions.

Knowledge alone is not sufficient to stem the tide of gender bias. Concrete change also requires transparent and fair hiring, promotion, and compensation processes in order to prevent and offset individual, idiosyncratic behaviors. If human resource departments lack clear procedures, hiring managers do not have the necessary structures to be truly effective for their organizations. It was common for interviewees to point out how an absence of proper process impacted their own experiences. In contrast, when situations were described as fair, good practice was the element highlighted. A final component to this recommendation is accountability. Human resource officers not only need to act as educators and guides, but must also watch over hiring and promotion efforts led by
departments or committees, providing them with an essential network of checks and balances.

Another educational initiative for institutions to undertake should emphasize how gendered approaches to negotiation affect women’s salaries. Hiring managers ought to be cognizant of the different ways men and women approach the topic of pay, and the biases that can prevail when women assert themselves. Only when those nuances are understood can they begin to make more objective decisions about wages. There is truly no excuse for the unfairness articulated by the interviewee whose supervisor paid a male peer more simply because he asked for it. And yet, such behaviors will persist until institutions take this issue seriously and provide guidance for their employees.

**Flexible work options.** Flexible work options were explored as a part of this study, and found to be an important ingredient to women’s career commitment in higher education IT. Workplace flexibility and organizations’ dedication to helping employees manage their obligations at work and home have become clear threads in the scholarship around women in management. At this point in time, no doubt exists: flexible work options help women stay in the workforce and grow their careers. This study revealed, however, that though some academic institutions provide flexible accommodations for their employees, not all do. Additionally, CIOs did not always take advantage of the options even when they were available, and women in that role were less likely than men to do so.

One of the key components to diversifying executive ranks involves the presence of a robust pool of aspirants. To ensure that an ample, heterogeneous supply exists,
organizations require strategies for retaining women throughout the entirety of their careers. Having a full, gender-diverse crop of qualified individuals for the CIO role entails recognizing the issues that women face when balancing careers and families, and the importance of flexibility for doing that. Younger women may not want to apply for jobs where they perceive the sacrifices to be greater than the gain. With this in mind, I have two main recommendations for academic institutions around flexible work options. First, human resource organizations can design and codify institutional policies and procedures that departmental areas can implement. Education and training on best practices for a flexible workforce would help guide various institutional areas in ensuring that these procedures can work at a local level. ERC, a human resource association in Ohio, recently published a guide to trends and best practices in flexible work as part of its “great workplace” recognition efforts, providing concrete suggestions for organizations of all shapes and sizes (NorthCoast 99, 2013). Recommendations like accommodating top performers’ requests for flexible hours or part-time work, or giving employees autonomy to find a schedule that best fits their role and needs were noted as simple, yet effective ways of strengthening workplace loyalty. Often, institutions do not want to publicly articulate flexibility options, fearing that such practices will make things more difficult for them. However, clearly stating boundaries and conditions for implementation could actually help to eliminate poor examples. In addition to unambiguous policies and procedures, recruiters should also recognize that life today is complex and nearly every professional could benefit from some type of workplace flexibility. Institutions and
departments ought to make flexibility part of the package offered to new employees and a point of negotiation when recruiting top talent.

One factor expressed by interviewees that deterred the use of flexible work options was the size of the institution. Some felt that such practices were more difficult to incorporate for organizations without a lot of built-in redundancy. Others from smaller institutions, however, were quite confident in the types of flexibility they offered to their employees. This is a place where the higher education IT professional development community could make a tremendous impact, though it is not presently a dominant topic being covered. In order to move flexible practices into the mainstream, it is important to educate the community about what works at differently sized institutions. Making the connection between a flexible workplace and a gender-diverse one might just help to move this cause along.

Another factor to consider is women’s comfort level with using flexible work options. In this study, men CIOs were more likely to use flexible options than women CIOs, a fact tied to perceptions of bias against women in that leadership role. If women avoid using flexible alternatives in order to be seen as viable executives, the policies themselves offer little solace for ambitious women who want to lead IT organizations.

What can be done? First, the pattern needs to be acknowledged and discussed at the organizational level, as well as by professional development organizations like EDUCAUSE. Disregarding findings like these only perpetuates the problem, and keeps institutions from diversifying their executive ranks. Second, organizations desperately need to monitor use patterns to ensure that if policies exist, they are implemented and
operationalized in equitable ways. Human resource organizations, and leaders at all levels within IT organizations must attune themselves to the gendered cultural nuances that might dictate behavioral differences for women and men employees.

**Mentoring the future generation of CIOs.** Research in and outside of academia has extolled the virtues of positive mentoring. Higher education IT, primarily through EDUCAUSE, has developed a strong track record both studying this topic, and initiating practices to assist aspiring CIOs. This research study validated the significance of this issue, with a majority of participants emphasizing the importance of the mentoring process. EDUCAUSE has led the mentoring charge for higher education IT, as clearly noted by qualitative interviewees. There remains room in the field, however, to expand upon what already exists.

Scholars have recognized women’s support networks as a helpful mentoring strategy for high-achieving women (Helfat et al., 2000; Trauth et al., 2009; Wilde, 1997). EDUCAUSE has a listserv for women in IT, and offers affinity groups and other sessions at their annual conferences, as do other regional affiliates like The NorthEast Regional Computing Program (NERCOMP). Women’s higher education IT support groups, however, tend to form more organically, working well in geographic regions like the Northeast that are densely populated with academic institutions. With so many technological options available today that facilitate communication, however, support network opportunities seem underutilized in the higher education IT community. Both EDUCAUSE and regional EDUCAUSE affiliates could facilitate the organization of networking/support groups to help women in the profession. EDUCAUSE’s Affinity
Finder mentioned above could be modified to incorporate such groups, as well as refined for and distributed to regional audiences.

Because room in the market exists to enhance mentoring opportunities for CIO aspirants, I would assert that regional affiliates should build upon EDUCAUSE’s national efforts. Local seminars, programs and institutes designed to mentor the next generation of CIOs could be quite helpful to women with family considerations and for whom long-distance travel might be more difficult. Additionally, if geographic leaps are more complicated for women as they advance their careers, building local capacity makes a good deal of sense. Enhancing local professional development resources also offers new opportunities to individuals lacking adequate access to mentors at their home institutions.

Finally, because such a small portion of the population participating in this research study acknowledged the presence of formal mentoring programs at their institutions, I would recommend that organizations begin creating these types of programs as a way to groom those at and in various levels and tracks within higher education IT. Building locally upon models like the Leading Change Institute, a leadership development program offered annually by EDUCAUSE and the Council on Library and Information Resources (CLIR) would provide another layer of increased support for aspiring CIOs. If, as current data show, academia does a better job overall retaining women in IT without a good deal of formal mentoring, then support structures built into the career path could add to the benefits women are already finding inside the field. The possibilities for various strands of mentoring to positively affect the gender
balance within higher education IT have not yet been fully exploited, but with all the current focus on women in IT, the timing has never been better.

**Implications for Policy**

Beyond the organizational and professional development practices suggested above, I also propose policy advancements aimed at increasing gender proportionality in higher education IT. My recommendations include altering policies related to the recruitment and retention of women in technical and business academic disciplines, as well as addressing the gaps in equal pay legislation that continue to work against women’s ability to achieve parity. First, women have been underrepresented in both STEM disciplines and MBA programs for years (Bell, 2010; Hill Corbett, & Rose, 2010; Jaschik, 2010; Mangan, 2012; McGrath Cohoon & Aspray, 2006; Mitchell, 2013). The gender distribution in computer science programs has been particularly alarming. In the mid-1980s, women earned 36% of all computer science degrees; that number that dropped to 20% by 2006 (Hill et al., 2010, p. 11). While better than computer science, business has been troublesome as well: in 2009, women still represented only 43% of those earning master’s degrees in business (Bell, 2010, p. 18). At the same time, however, current CIOs are often recruited in part because of their technical and/or business educational backgrounds. In addition to improvements in the hiring practices mentioned above that would broaden the fields from which CIOs are being chosen, more must be done to augment the pipeline of women available for IT careers. Institutional support is necessary for policies promoting women’s recruitment, retention and advancement in technical and business-related disciplines.
Second, one of the most significant findings of this study demands attention be paid to the issue of pay equity. Though institutions can do much locally to ensure that women and men receive equivalent salaries, women also require legislative support to reach a place of parity. Though the Equal Pay Act of 1963 and the Lilly Ledbetter Fair Pay Act of 2009 give women some protection in the courts, loopholes to full protection persist. This research study points to the need for policies like the Paycheck Fairness Act, that “would require employers to show that pay disparity is truly related to job performance and requirements, not gender” (AAUW, 2013a). Data from this study indicate prejudicial treatment still exists in the workplace and in the end, affects women’s salaries. Stronger legislation aimed at diminishing such biases is a necessary component of the road toward gender-based proportionality in IT.

Future Research Directions

This research study looked broadly at the population of higher education CIOs and turned up some intriguing findings; regularly replicating it will help develop awareness about changes to the role over time. Also, because the qualitative phase of the study only involved interviews with women, future similar research should consider incorporating parallel interviews with men. Doing so would allow scholars to compare and contrast how women and men explain the quantitative results the survey instrument yields. Such information could add insight to the varying experiences of women and men IT executives in higher education.

Because this study was broad in nature, many possibilities exist to examine its findings in more depth. In terms of investigations into the CIOs’ career pathways, one
particular thread that is ripe for discovery is that of internal versus external progression for women and men. In this study, extenuating circumstances emerged as an intriguing element connected to women’s internal advancement to the CIO role. That illness, retirement and death were so closely aligned with women’s experiences obtaining their first CIO position led to questions about why that might be the case. Research into whether this phenomenon affects both women and men, or is common primarily for women would be extremely helpful knowledge for the community to obtain. Replicating or slightly altering this study to analyze the next generation of CIOs is another pathway strand to be explored. For a number of years, CHECS has studied two populations in parallel: higher education CIOs and higher education IT leaders. One major benefit of looking at the two populations in tandem would be to further understand the situations of women IT leaders both before and during their CIO tenures. Educational degree, roles and advancement strategies could all be considered from the next layer down in organizations, building upon what was uncovered by this research.

While it was helpful to gain an understanding of higher education IT’s masculine culture, the national nature of this research left lingering questions about regional effects and how they impact women’s experiences as IT executives. Hints of those differences emerged as a part of the interviews, and further exploration of IT culture in different regions could help women prepare themselves for geographically based distinctions when leading IT organizations. Because this study provided some evidence that IT’s masculine bias affects women’s experiences with hiring, promotion and pay, another worthwhile extension would examine human resource practices and their correlation to those
processes. I am particularly interested in the question of equal pay in higher education IT organizations. Data collected provided some empirical proof that women’s perceptions of lower pay were well-founded. Examining CIO pay and identifying differences between women and men’s salaries when controlling for factors such as educational background, years of experience, type of past experience, and years spent at an institution would shed further light on a topic that continues to vex women in the workplace.

In terms of mentoring, because research on the topic consistently illustrates its positive influence on women’s careers, two strands from this study would be helpful to follow. First, examinations into the effect that physical proximity has on the mentor/mentee relationship would aid organizations like EDUCAUSE in further refining leadership programs and services such as the Affinity Finder. And second, various mentoring models could be explored to help figure out which ones best facilitate women’s career advancement in higher education IT.

Institutional mission has often been considered in studies on higher education culture; its importance to women’s involvement in IT was elevated as critical in this study. Higher education as a “woman’s” field was connected to other helping professions like social work, nursing, and K-12 education. Since this perception exists, it would be beneficial to analyze institutional mission as a predictor of women’s presence as IT executives in higher education and other fields stereotypically associated with women.

Finally, one of the most striking findings of this study was the sheer homogeneity of the higher education CIO population – where were the differences between women and men? The lack of distinction between the two groups raised numerous questions that
could be teased apart in future research. The sample size in this study proved too small to parse the data in more granular ways, but future research ought to look at opportunities for examining various segments of the population, in order to understand if it is as homogeneous as it appeared nationally. For instance, might hiring, promotion and pay bias be more present in certain geographic regions? How might societal gender norms in different areas of the country affect how women are treated as IT leaders, and might this broad study have missed some very key trends? Also, though the data illustrated no significant differences in the number of women and men across institutions by Carnegie Classification, would that still be the case if the groups were studied within those categories? What types of variation between women and men might appear if observing higher education CIOs from narrower, but important, angles? Might distinctions be observed within pools of women even? When conducting a study of this breadth, one cannot help but wonder about what might have been missed, as what cannot be seen from 30,000 feet demands discovery on the ground. If the academy really wants to unravel the question of whether better gender proportionality among CIOs – relative to the corporate sector – equates to something fundamental about the higher education environment, much more study of the issue is required.

Concluding Remarks

This mixed methods study examining today’s higher education Chief Information Officers presented a more comprehensive picture of those in the role than heretofore existed, while confirming previous research in the field. The quantitative and qualitative data collected helped to shed light on the similarities and differences between women and
Women in IT leadership persists as salient topic of discussion today, in higher education and beyond. That information technology continues to be a crucial aspect of modern life means the significance of this subject will not fade away any time soon. The more that research uncovers about organizational characteristics that assist women in pursuing and reaching the top levels of IT organizations, the better able those organizations will be to affect positive change related to gender diversity in executive ranks.
Table 2

*Sample Characteristics – Personal Demographics (N = 188)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>138</td>
<td>73.4%</td>
<td>51.98</td>
<td>51.40</td>
</tr>
<tr>
<td>Female</td>
<td>50</td>
<td>26.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>51.76</td>
<td></td>
<td>51.98</td>
<td>51.40</td>
</tr>
<tr>
<td>SD</td>
<td>8.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>157</td>
<td>83.5%</td>
<td>88.3%</td>
<td>87.8%</td>
</tr>
<tr>
<td>African American</td>
<td>4</td>
<td>2.1%</td>
<td>2.3%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4</td>
<td>2.1%</td>
<td>1.6%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Asian</td>
<td>12</td>
<td>6.4%</td>
<td>7.0%</td>
<td>4.1%</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>1</td>
<td>0.5%</td>
<td>0.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>1</td>
<td>0.5%</td>
<td>0.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Missing</td>
<td>9</td>
<td>4.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Partnered</td>
<td>170</td>
<td>90.4%</td>
<td>93.9%</td>
<td>88.0%</td>
</tr>
<tr>
<td>Single/Divorced</td>
<td>14</td>
<td>7.5%</td>
<td>6.1%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>2.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Number of Children</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>28</td>
<td>14.9%</td>
<td>10.9%</td>
<td>28.6%</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>13.3%</td>
<td>14.0%</td>
<td>14.3%</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
<td>38.3%</td>
<td>43.4%</td>
<td>28.6%</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>17.0%</td>
<td>18.6%</td>
<td>16.3%</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>9.0%</td>
<td>10.9%</td>
<td>6.1%</td>
</tr>
<tr>
<td>&gt;4</td>
<td>6</td>
<td>3.2%</td>
<td>2.3%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Missing</td>
<td>8</td>
<td>4.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
### Has/Does Not Have Children**

<table>
<thead>
<tr>
<th></th>
<th>Has Children</th>
<th>Has/Does Not Have Children</th>
<th>No Children</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has Children</td>
<td>156</td>
<td>84.8%</td>
<td>89.6%</td>
<td>72.0%</td>
</tr>
<tr>
<td>No Children</td>
<td>28</td>
<td>15.2%</td>
<td>10.4%</td>
<td>28.0%</td>
</tr>
<tr>
<td>Total</td>
<td>184</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Ages of Children

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Count</th>
<th>Percentage</th>
<th>Has Children</th>
<th>Has/Does Not Have Children</th>
<th>No Children</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>11</td>
<td>7.3%</td>
<td>7.8%</td>
<td>5.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>15</td>
<td>10.0%</td>
<td>11.3%</td>
<td>5.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>16</td>
<td>10.7%</td>
<td>10.4%</td>
<td>11.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-11</td>
<td>27</td>
<td>18.0%</td>
<td>19.1%</td>
<td>14.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-14</td>
<td>29</td>
<td>19.3%</td>
<td>20.0%</td>
<td>17.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-17</td>
<td>33</td>
<td>21.9%</td>
<td>20.7%</td>
<td>25.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18+</td>
<td>104</td>
<td>68.0%</td>
<td>69.2%</td>
<td>63.9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ages of Children (Categorized)

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
<th>Has Children</th>
<th>Has/Does Not Have Children</th>
<th>No Children</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Children Under 12</td>
<td>22</td>
<td>12.1%</td>
<td>13.6%</td>
<td>8.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only Children Under 18</td>
<td>27</td>
<td>14.8%</td>
<td>13.6%</td>
<td>18.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only Children Over 18</td>
<td>104</td>
<td>57.1%</td>
<td>61.4%</td>
<td>46.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**p ≤ .01
Table 3

Sample Characteristics – Organizational Demographics  \((N = 188)\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carnegie Classification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate’s Colleges</td>
<td>30</td>
<td>16.0%</td>
<td>19.3%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Doctorate-granting Universities</td>
<td>38</td>
<td>20.2%</td>
<td>25.4%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Master’s Colleges and Universities</td>
<td>48</td>
<td>25.5%</td>
<td>25.4%</td>
<td>41.3%</td>
</tr>
<tr>
<td>Baccalaureate Colleges</td>
<td>38</td>
<td>20.2%</td>
<td>26.3%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Special Focus Institutions</td>
<td>6</td>
<td>3.2%</td>
<td>3.5%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Missing</td>
<td>28</td>
<td>14.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Employment Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>185</td>
<td>98.4%</td>
<td>1.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Part-time</td>
<td>2</td>
<td>1.1%</td>
<td>98.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Years in Current Position</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>6.14</td>
<td></td>
<td>5.99</td>
<td>6.58</td>
</tr>
<tr>
<td>SD</td>
<td>5.69</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Years at Current Institution</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>11.30</td>
<td></td>
<td>10.74</td>
<td>12.86</td>
</tr>
<tr>
<td>SD</td>
<td>9.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Salary</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>$147,642</td>
<td>$151,476</td>
<td>$137,500</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>$56,483</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cabinet Membership</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>90</td>
<td>47.9%</td>
<td>50.0%</td>
<td>44.0%</td>
</tr>
<tr>
<td>No</td>
<td>96</td>
<td>51.1%</td>
<td>50.0%</td>
<td>56.0%</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>1.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>FTE Employees Supervised</td>
<td>111</td>
<td>59%</td>
<td>57.3%</td>
<td>64.0%</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-----</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Under 50 FTEs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100 FTEs</td>
<td>36</td>
<td>19.1%</td>
<td>18.8%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Over 100 FTEs</td>
<td>41</td>
<td>21.8%</td>
<td>23.9%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organizational Structure</th>
<th>73</th>
<th>38.8%</th>
<th>40.6%</th>
<th>34.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Centralized</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centralized</td>
<td>66</td>
<td>35.1%</td>
<td>33.3%</td>
<td>40.0%</td>
</tr>
<tr>
<td>Balanced</td>
<td>33</td>
<td>17.6%</td>
<td>16.7%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Decentralized</td>
<td>10</td>
<td>5.3%</td>
<td>6.5%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Highly Decentralized</td>
<td>6</td>
<td>3.2%</td>
<td>2.9%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Table 4

*Sample Characteristics – Pathway Variables: Educational Background (N = 188)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highest Earned Degree</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate’s</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>38</td>
<td>20.2%</td>
</tr>
<tr>
<td>Master’s</td>
<td>103</td>
<td>54.8%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>33</td>
<td>17.6%</td>
</tr>
<tr>
<td>Other Terminal Degree</td>
<td>11</td>
<td>5.9%</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Highest Earned Degree: Without Associate’s</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>38</td>
<td>20.2%</td>
</tr>
<tr>
<td>Master’s</td>
<td>103</td>
<td>54.8%</td>
</tr>
<tr>
<td>Doctorate</td>
<td>33</td>
<td>17.6%</td>
</tr>
<tr>
<td>Other Terminal Degree</td>
<td>11</td>
<td>5.9%</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Degree Major</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Science</td>
<td>21</td>
<td>11.2%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>21</td>
<td>11.2%</td>
</tr>
<tr>
<td>Business</td>
<td>48</td>
<td>25.5%</td>
</tr>
<tr>
<td>Administration</td>
<td>8</td>
<td>4.3%</td>
</tr>
<tr>
<td>Biology</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Communication</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>Economics</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Education</td>
<td>24</td>
<td>12.8%</td>
</tr>
<tr>
<td>Engineering</td>
<td>5</td>
<td>2.7%</td>
</tr>
<tr>
<td>History</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Library and Information Science</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>7</td>
<td>3.7%</td>
</tr>
<tr>
<td>Political Science</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Psychology</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Sociology</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Other</td>
<td>31</td>
<td>16.5%</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
### Degree Major: Collapsed

<table>
<thead>
<tr>
<th>Major</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>21</td>
<td>11.2%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>21</td>
<td>11.2%</td>
</tr>
<tr>
<td>Business</td>
<td>48</td>
<td>25.5%</td>
</tr>
<tr>
<td>Administration</td>
<td>8</td>
<td>4.3%</td>
</tr>
<tr>
<td>Education</td>
<td>24</td>
<td>12.8%</td>
</tr>
<tr>
<td>Other</td>
<td>63</td>
<td>33.5%</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Organization/Department Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and Financial Affairs</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>Central IT</td>
<td>168</td>
<td>89.4%</td>
</tr>
<tr>
<td>College Division/Department</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>President’s/Chancellor’s Office</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Provost’s/Academic Affairs Office</td>
<td>9</td>
<td>4.8%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Academic Appointment

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Institution</td>
<td>29</td>
<td>15.4%</td>
</tr>
<tr>
<td>Different Institution</td>
<td>8</td>
<td>4.3%</td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Table 5

Sample Characteristics – Pathway Variables: Prior Work Experience  (N = 188)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Previous Position:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Institution Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Institution</td>
<td>78</td>
<td>41.5%</td>
</tr>
<tr>
<td>Another HE Institution</td>
<td>76</td>
<td>40.4%</td>
</tr>
<tr>
<td>No Previous Position</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Consulting</td>
<td>6</td>
<td>3.2%</td>
</tr>
<tr>
<td>Government</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>K-12</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Military</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>Non-profit Organization</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Private Industry</td>
<td>17</td>
<td>9.0%</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>Previous Position:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Institution Type Collapsed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Institution</td>
<td>78</td>
<td>41.5%</td>
</tr>
<tr>
<td>Another HE Institution</td>
<td>76</td>
<td>40.4%</td>
</tr>
<tr>
<td>Other</td>
<td>33</td>
<td>17.6%</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Table 5

*Sample Characteristics – Pathway Variables: Prior Work Experience, cont.  (N = 188)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Previous Position Title</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIO or Senior-most IT Leader</td>
<td>42</td>
<td>22.3%</td>
</tr>
<tr>
<td>Deputy CIO</td>
<td>13</td>
<td>6.9%</td>
</tr>
<tr>
<td>Executive Director</td>
<td>11</td>
<td>5.9%</td>
</tr>
<tr>
<td>Vice President</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Associate/Assistant VP</td>
<td>9</td>
<td>4.8%</td>
</tr>
<tr>
<td>Non-IT Executive</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Academic Tech Dir./Mgr.</td>
<td>15</td>
<td>8.0%</td>
</tr>
<tr>
<td>Administrative Tech Dir./Mgr.</td>
<td>21</td>
<td>11.2%</td>
</tr>
<tr>
<td>Desktop Support Dir./Mgr.</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Help Desk Dir./Mgr.</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Network Dir./Mgr.</td>
<td>6</td>
<td>3.2%</td>
</tr>
<tr>
<td>Systems Dir./Mgr.</td>
<td>6</td>
<td>3.2%</td>
</tr>
<tr>
<td>Web Dir./Mgr.</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Project Manager</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Professor/Instructor</td>
<td>6</td>
<td>3.2%</td>
</tr>
<tr>
<td>Academic Administrator</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Library Dir./Mgr.</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>IT Consultant</td>
<td>5</td>
<td>2.7%</td>
</tr>
<tr>
<td>Other</td>
<td>31</td>
<td>16.5%</td>
</tr>
<tr>
<td>Missing</td>
<td>7</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Table 5

*Sample Characteristics – Pathway Variables: Prior Work Experience, cont. (N = 188)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title Two Positions Prior</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIO or Senior-most IT Leader</td>
<td>23</td>
<td>12.2%</td>
</tr>
<tr>
<td>Deputy CIO</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Executive Director</td>
<td>14</td>
<td>7.4%</td>
</tr>
<tr>
<td>Vice President</td>
<td>9</td>
<td>4.8%</td>
</tr>
<tr>
<td>Associate/Assistant VP</td>
<td>5</td>
<td>2.7%</td>
</tr>
<tr>
<td>Non-IT Executive</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Academic Tech Dir./Mgr.</td>
<td>16</td>
<td>8.5%</td>
</tr>
<tr>
<td>Administrative Tech Dir./Mgr.</td>
<td>19</td>
<td>10.1%</td>
</tr>
<tr>
<td>Desktop Support Dir./Mgr.</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Help Desk Dir./Mgr.</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>Network Dir./Mgr.</td>
<td>9</td>
<td>4.8%</td>
</tr>
<tr>
<td>Systems Dir./Mgr.</td>
<td>13</td>
<td>6.9%</td>
</tr>
<tr>
<td>Web Dir./Mgr.</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Project Manager</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Professor/Instructor</td>
<td>8</td>
<td>4.3%</td>
</tr>
<tr>
<td>Academic Administrator</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Library Dir./Mgr.</td>
<td>1</td>
<td>0.5%</td>
</tr>
<tr>
<td>IT Consultant</td>
<td>9</td>
<td>4.8%</td>
</tr>
<tr>
<td>Other</td>
<td>33</td>
<td>17.6%</td>
</tr>
<tr>
<td>Missing</td>
<td>16</td>
<td>8.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

| **Other IT Position Location**                 |           |            |
| Central IT                                     | 102       | 54.3%      |
| Advancement/Development                        | 4         | 2.1%       |
| Business and Financial Affairs                 | 9         | 4.8%       |
| College Division/Department                    | 22        | 11.7%      |
| Library                                       | 14        | 7.4%       |
| Medical Center                                | 1         | 0.5%       |
| President’s/Chancellor’s Office                | 8         | 4.3%       |
| Provost’s/Academic Affairs Office              | 8         | 4.3%       |
| Research Administration                        | 2         | 1.1%       |
| Student Affairs                                | 1         | 0.5%       |
| Not Applicable                                | 52        | 27.7%      |
| Other                                         | 5         | 2.7%       |
Table 5

*Sample Characteristics – Pathway Variables: Prior Work Experience, cont. (N = 188)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other Non-IT Position Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central IT</td>
<td>5</td>
<td>2.7%</td>
</tr>
<tr>
<td>Advancement/Development</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Business and Financial Affairs</td>
<td>14</td>
<td>7.4%</td>
</tr>
<tr>
<td>College Division/Department</td>
<td>18</td>
<td>9.6%</td>
</tr>
<tr>
<td>Library</td>
<td>11</td>
<td>5.9%</td>
</tr>
<tr>
<td>Medical Center</td>
<td>2</td>
<td>1.1%</td>
</tr>
<tr>
<td>President’s/Chancellor’s Office</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Provost’s/Academic Affairs Office</td>
<td>10</td>
<td>5.3%</td>
</tr>
<tr>
<td>Research Administration</td>
<td>6</td>
<td>3.2%</td>
</tr>
<tr>
<td>Student Affairs</td>
<td>4</td>
<td>2.1%</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>106</td>
<td>56.4%</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>4.3%</td>
</tr>
<tr>
<td><strong>Prior Industries</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consulting</td>
<td>50</td>
<td>26.6%</td>
</tr>
<tr>
<td>Government</td>
<td>18</td>
<td>9.6%</td>
</tr>
<tr>
<td>K-12</td>
<td>7</td>
<td>3.7%</td>
</tr>
<tr>
<td>Military</td>
<td>10</td>
<td>5.3%</td>
</tr>
<tr>
<td>Non-profit Organization</td>
<td>11</td>
<td>5.9%</td>
</tr>
<tr>
<td>Private Industry</td>
<td>79</td>
<td>42.0%</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>60</td>
<td>31.9%</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>Higher Ed Work Setting Important</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>66</td>
<td>35.1%</td>
</tr>
<tr>
<td>Agree</td>
<td>73</td>
<td>38.8%</td>
</tr>
<tr>
<td>Neutral</td>
<td>35</td>
<td>18.6%</td>
</tr>
<tr>
<td>Disagree</td>
<td>11</td>
<td>5.9%</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>188</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
### Table 6

**Degree Major**

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>(\chi^2(16))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer science</td>
<td>17</td>
<td>4</td>
<td>19.25</td>
</tr>
<tr>
<td>Information technology</td>
<td>12</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>35</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>21</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Library and information science</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Political science</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sociology</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>20</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>
Table 7

*Degree Major: Five Most Popular Majors, with Other Majors Collapsed*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>( \chi^2(5) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>%</td>
<td>( n )</td>
</tr>
<tr>
<td>Computer science</td>
<td>17</td>
<td>12.8%</td>
<td>4</td>
</tr>
<tr>
<td>Information technology</td>
<td>12</td>
<td>9.0%</td>
<td>9</td>
</tr>
<tr>
<td>Business</td>
<td>35</td>
<td>26.3%</td>
<td>13</td>
</tr>
<tr>
<td>Administration</td>
<td>4</td>
<td>3.0%</td>
<td>4</td>
</tr>
<tr>
<td>Education</td>
<td>21</td>
<td>15.8%</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>44</td>
<td>33.1%</td>
<td>17</td>
</tr>
</tbody>
</table>
Table 8

*Organization Type for Most Recent Previous Position*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2(9)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$%$</td>
<td>$n$</td>
</tr>
<tr>
<td>Current institution</td>
<td>54</td>
<td>40.0%</td>
<td>24</td>
</tr>
<tr>
<td>Another higher education institution</td>
<td>58</td>
<td>43.0%</td>
<td>17</td>
</tr>
<tr>
<td>No previous position</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
</tr>
<tr>
<td>Consulting</td>
<td>4</td>
<td>3.0%</td>
<td>1</td>
</tr>
<tr>
<td>Government</td>
<td>1</td>
<td>0.7%</td>
<td>1</td>
</tr>
<tr>
<td>K-12 education institution</td>
<td>2</td>
<td>1.5%</td>
<td>1</td>
</tr>
<tr>
<td>Military</td>
<td>2</td>
<td>1.5%</td>
<td>0</td>
</tr>
<tr>
<td>Non-profit organization</td>
<td>1</td>
<td>0.7%</td>
<td>0</td>
</tr>
<tr>
<td>Private industry</td>
<td>12</td>
<td>8.9%</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.7%</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 9

*Organization Type for Most Recent Previous Position: Collapsed*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2(2)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current institution</td>
<td>54</td>
<td>24</td>
<td>1.30</td>
</tr>
<tr>
<td>Another higher education institution</td>
<td>58</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>23</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
Table 10

*Previous Position Title*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2(18)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$%$</td>
<td>$n$</td>
</tr>
<tr>
<td>CIO/Other senior-most IT position</td>
<td>38</td>
<td>28.6%</td>
<td>4</td>
</tr>
<tr>
<td>Deputy CIO</td>
<td>9</td>
<td>6.8%</td>
<td>4</td>
</tr>
<tr>
<td>Executive director</td>
<td>8</td>
<td>6.0%</td>
<td>3</td>
</tr>
<tr>
<td>Vice president</td>
<td>3</td>
<td>2.3%</td>
<td>0</td>
</tr>
<tr>
<td>Associate/Assistant VP</td>
<td>7</td>
<td>5.3%</td>
<td>2</td>
</tr>
<tr>
<td>Non-IT executive</td>
<td>1</td>
<td>0.8%</td>
<td>0</td>
</tr>
<tr>
<td>Academic technology director/manager</td>
<td>10</td>
<td>7.5%</td>
<td>5</td>
</tr>
<tr>
<td>Administrative technology director/manager</td>
<td>10</td>
<td>7.5%</td>
<td>11</td>
</tr>
<tr>
<td>Desktop support director/manager</td>
<td>2</td>
<td>1.5%</td>
<td>1</td>
</tr>
<tr>
<td>Help desk director/manager</td>
<td>2</td>
<td>1.5%</td>
<td>1</td>
</tr>
<tr>
<td>Network director/manager</td>
<td>6</td>
<td>4.5%</td>
<td>0</td>
</tr>
<tr>
<td>Systems director/manager</td>
<td>6</td>
<td>4.5%</td>
<td>0</td>
</tr>
<tr>
<td>Web director/manager</td>
<td>0</td>
<td>0.0%</td>
<td>1</td>
</tr>
<tr>
<td>Project manager</td>
<td>1</td>
<td>0.8%</td>
<td>0</td>
</tr>
<tr>
<td>Professor/instructor</td>
<td>4</td>
<td>3.0%</td>
<td>2</td>
</tr>
<tr>
<td>Academic administrator</td>
<td>1</td>
<td>0.8%</td>
<td>0</td>
</tr>
<tr>
<td>Library director/manager</td>
<td>3</td>
<td>2.3%</td>
<td>0</td>
</tr>
<tr>
<td>IT consultant</td>
<td>4</td>
<td>3.0%</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>13.5%</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 11

*Title for Two Positions Prior*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2$(18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIO/Other senior-most IT position</td>
<td>18</td>
<td>6</td>
<td>19.55</td>
</tr>
<tr>
<td>Deputy CIO</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Executive director</td>
<td>11</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Vice president</td>
<td>7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Associate/Assistant VP</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Non-IT executive</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Academic technology director/manager</td>
<td>12</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Administrative technology director/manager</td>
<td>13</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Desktop support director/manager</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Help desk director/manager</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Network director/manager</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Systems director/manager</td>
<td>11</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Web director/manager</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Project manager</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Professor/instructor</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Academic administrator</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Library director/manager</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>IT consultant</td>
<td>7</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
Women as Chief Information Officers in Higher Education

Table 12

*IT Professional Positions in Other Areas of Higher Education*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>( \chi^2(9) )</th>
<th>Fisher’s Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central IT</td>
<td>75</td>
<td>27</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Advancement/development</td>
<td>3</td>
<td>1</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Business/financial affairs</td>
<td>7</td>
<td>2</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Academic department</td>
<td>17</td>
<td>5</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td>11</td>
<td>3</td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>Medical center</td>
<td>1</td>
<td>0</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>President/chancellor’s office</td>
<td>7</td>
<td>1</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>Provost/academic affairs office</td>
<td>6</td>
<td>2</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Research administration</td>
<td>2</td>
<td>0</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Student affairs</td>
<td>0</td>
<td>1</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td>38</td>
<td>14</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>
Table 13

*Non-IT Professional Positions in Other Areas of Higher Education*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2(9)$</th>
<th>Fisher’s Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central IT</td>
<td>4</td>
<td>1</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Advancement/development</td>
<td>2</td>
<td>2</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>Business/financial affairs*</td>
<td>7</td>
<td>7</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Academic department</td>
<td>14</td>
<td>4</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td>9</td>
<td>2</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>Medical center</td>
<td>1</td>
<td>1</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>President/chancellor’s office</td>
<td>4</td>
<td>0</td>
<td>.57</td>
<td></td>
</tr>
<tr>
<td>Provost/academic affairs office</td>
<td>8</td>
<td>2</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Research administration</td>
<td>6</td>
<td>0</td>
<td>.34</td>
<td></td>
</tr>
<tr>
<td>Student affairs</td>
<td>3</td>
<td>1</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td>78</td>
<td>28</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>1</td>
<td>.68</td>
<td></td>
</tr>
</tbody>
</table>

*p $\leq$ .05
Women as Chief Information Officers in Higher Education

Table 14

*Prior Industry*

<table>
<thead>
<tr>
<th>Degree Major</th>
<th>Male</th>
<th>Female</th>
<th>$\chi^2(9)$</th>
<th>Fisher’s Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>%</td>
<td>$n$</td>
<td>%</td>
</tr>
<tr>
<td>Consulting*</td>
<td>43</td>
<td>32.8%</td>
<td>7</td>
<td>14.3%</td>
</tr>
<tr>
<td>Government</td>
<td>14</td>
<td>10.7%</td>
<td>4</td>
<td>8.2%</td>
</tr>
<tr>
<td>K-12</td>
<td>5</td>
<td>3.8%</td>
<td>2</td>
<td>4.1%</td>
</tr>
<tr>
<td>Military</td>
<td>10</td>
<td>7.6%</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Non-profit</td>
<td>6</td>
<td>4.6%</td>
<td>5</td>
<td>10.2%</td>
</tr>
<tr>
<td>Private industry</td>
<td>60</td>
<td>45.8%</td>
<td>19</td>
<td>38.8%</td>
</tr>
<tr>
<td>Not applicable</td>
<td>41</td>
<td>31.3%</td>
<td>19</td>
<td>38.8%</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>1.5%</td>
<td>5</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

* $p \leq .05$
Table 16

Hierarchical Regression Analysis Summary for Gender Predicting Number of Hours Worked Each Week in the Office (Final Model)

<table>
<thead>
<tr>
<th>Step and predictor variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>$R^2$</th>
<th>Δ$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 3*</td>
<td>.12</td>
<td>.03</td>
<td></td>
<td>.12</td>
<td>.03</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-1.36</td>
<td>1.96</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>-2.23</td>
<td>2.45</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More/fewer than two children</td>
<td>-0.09</td>
<td>1.36</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have/do not have children</td>
<td>0.97</td>
<td>1.83</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years in current position</td>
<td>0.07</td>
<td>0.14</td>
<td>.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years at current institution</td>
<td>0.13</td>
<td>0.08</td>
<td>.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual income*</td>
<td>0.00</td>
<td>.00</td>
<td>.22*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100 FTEs</td>
<td>0.09</td>
<td>1.65</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 100 FTEs</td>
<td>-1.92</td>
<td>1.97</td>
<td>-.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Decentralized</td>
<td>-0.01</td>
<td>2.80</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Centralized</td>
<td>-0.51</td>
<td>1.71</td>
<td>-.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender*</td>
<td>3.11</td>
<td>1.35</td>
<td>.18*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05. Model 3 Adjusted $R^2 = .06
Table 20

Hierarchical Regression Analysis Summary for Gender Predicting Number of Hours Spent Cooking Each Week

<table>
<thead>
<tr>
<th>Step and predictor variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>R²</th>
<th>ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.76</td>
<td>0.60</td>
<td>.10</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>Marital status</td>
<td>-0.62</td>
<td>0.75</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More/fewer than two children</td>
<td>0.24</td>
<td>0.43</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have/do not have children</td>
<td>0.28</td>
<td>0.55</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.04</td>
</tr>
<tr>
<td>Years in current position</td>
<td>0.01</td>
<td>0.05</td>
<td>.02</td>
<td></td>
<td>.02</td>
</tr>
<tr>
<td>Years at current institution</td>
<td>-0.02</td>
<td>0.03</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual income</td>
<td>0.00</td>
<td>0.00</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100 FTEs</td>
<td>-0.06</td>
<td>0.53</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 100 FTEs</td>
<td>0.65</td>
<td>0.64</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Balanced</td>
<td>0.52</td>
<td>0.55</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Decentralized</td>
<td>0.27</td>
<td>0.87</td>
<td>.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td>.11</td>
<td>.07</td>
</tr>
<tr>
<td>Gender</td>
<td>1.38</td>
<td>0.42</td>
<td>.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 3 Adjusted $R^2 = .03$
Table 21

*Hierarchical Regression Analysis Summary for Gender Predicting Number of Hours Spent Providing Childcare Each Week*

<table>
<thead>
<tr>
<th>Step and predictor variable</th>
<th>$B$</th>
<th>$SE; B$</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.77</td>
<td>2.48</td>
<td>-0.03</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>Marital status</td>
<td>-2.90</td>
<td>4.40</td>
<td>-0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More/fewer than two children</td>
<td>-0.57</td>
<td>1.78</td>
<td>-0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have/do not have children</td>
<td>-5.24</td>
<td>5.04</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td>.12</td>
<td>.10</td>
</tr>
<tr>
<td>Years in current position</td>
<td>-0.29</td>
<td>0.20</td>
<td>-0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years at current institution</td>
<td>-0.01</td>
<td>0.12</td>
<td>-0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual income</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100 FTEs</td>
<td>-0.44</td>
<td>2.53</td>
<td>-0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 100 FTEs</td>
<td>-0.02</td>
<td>2.64</td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Decentralized</td>
<td>-0.54</td>
<td>4.00</td>
<td>-0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Centralized</td>
<td>-2.24</td>
<td>2.76</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td>.19</td>
<td>.06</td>
</tr>
<tr>
<td>Gender</td>
<td>4.81</td>
<td>1.88</td>
<td>.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 3 Adjusted $R^2 = .07$
### Table 22

**Hierarchical Regression Analysis Summary for Gender Predicting Number of Hours Spent on Home Care Each Week**

<table>
<thead>
<tr>
<th>Step and predictor variable</th>
<th>$B$</th>
<th>$SE B$</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong>*</td>
<td></td>
<td></td>
<td></td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-0.10</td>
<td>2.43</td>
<td>-.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>-1.59</td>
<td>3.02</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More/fewer than two children</td>
<td>0.46</td>
<td>1.69</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have/do not have children**</td>
<td>-7.08</td>
<td>2.22</td>
<td>-.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong>*</td>
<td></td>
<td></td>
<td></td>
<td>.18</td>
<td>.10</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.15</td>
<td>2.40</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>-2.71</td>
<td>2.99</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More/fewer than two children</td>
<td>0.50</td>
<td>1.66</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have/do not have children**</td>
<td>-6.18</td>
<td>2.19</td>
<td>-.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years in current position</td>
<td>-0.23</td>
<td>0.17</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years at current institution</td>
<td>-0.07</td>
<td>0.10</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual income**</td>
<td>0.00</td>
<td>0.00</td>
<td>-.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100 FTEs</td>
<td>-2.39</td>
<td>2.02</td>
<td>-.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 100 FTEs</td>
<td>1.74</td>
<td>2.41</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Decentralized</td>
<td>1.91</td>
<td>3.42</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Centralized</td>
<td>0.62</td>
<td>2.08</td>
<td>.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>B</td>
<td>SE</td>
<td>p</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.49</td>
<td>2.32</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>-3.13</td>
<td>2.89</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More/fewer than two children</td>
<td>0.04</td>
<td>1.61</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have/do not have children***</td>
<td>-7.78</td>
<td>2.16</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years in current position</td>
<td>-0.23</td>
<td>0.17</td>
<td>0.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years at current institution</td>
<td>-0.10</td>
<td>0.10</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual income*</td>
<td>0.00</td>
<td>0.00</td>
<td>0.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-100 FTEs</td>
<td>-2.37</td>
<td>1.95</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 100 FTEs</td>
<td>1.56</td>
<td>2.33</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Decentralized</td>
<td>2.48</td>
<td>3.31</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Centralized</td>
<td>1.20</td>
<td>2.02</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender**</td>
<td>5.59</td>
<td>1.60</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05. **p < .01. ***p < .001. Model 3 Adjusted $R^2 = .18$
### Table 23

*Gender Differences for Hours Spent on Household Tasks*

<table>
<thead>
<tr>
<th>Household Task</th>
<th>Male</th>
<th>Female</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours spent cleaning each week</td>
<td>2.47</td>
<td>3.00</td>
<td>177</td>
<td>-1.60</td>
<td>.11</td>
</tr>
<tr>
<td>Hours spent grocery shopping each week</td>
<td>1.62</td>
<td>1.48</td>
<td>179</td>
<td>0.89</td>
<td>.37</td>
</tr>
<tr>
<td>Hours spent cooking each week*</td>
<td>2.83</td>
<td>3.94</td>
<td>175</td>
<td>-2.50</td>
<td>.02</td>
</tr>
<tr>
<td>Hours spent providing childcare each week</td>
<td>8.95</td>
<td>12.69</td>
<td>105</td>
<td>-1.80</td>
<td>.08</td>
</tr>
<tr>
<td>Hours spent providing eldercare each week</td>
<td>4.43</td>
<td>5.15</td>
<td>92</td>
<td>-1.35</td>
<td>.19</td>
</tr>
</tbody>
</table>

*p < .05.*
Table 25

*Perceptions of Bias and Discrimination in Hiring and Promotion Practices*

<table>
<thead>
<tr>
<th>Per</th>
<th>Male</th>
<th>Female</th>
<th>Fisher’s Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hired because of gender*</td>
<td>1</td>
<td>4</td>
<td>.02</td>
</tr>
<tr>
<td>Not hired because of gender</td>
<td>7</td>
<td>7</td>
<td>.06</td>
</tr>
<tr>
<td>Promoted because of gender*</td>
<td>1</td>
<td>3</td>
<td>.05</td>
</tr>
<tr>
<td>Not promoted because of gender*</td>
<td>5</td>
<td>7</td>
<td>.02</td>
</tr>
<tr>
<td>Paid more because of gender</td>
<td>5</td>
<td>0</td>
<td>.33</td>
</tr>
<tr>
<td>Paid less because of gender***</td>
<td>4</td>
<td>24</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*P ≤ .05. ***P ≤ .01
References

http://www.wihe.com/displayNews.jsp?id=439


http://chronicle.com/article/40-Years-of-Title-IX-/132311/


Almanac of Higher Education. (2009). *Number of full-time faculty members by sex, rank, and racial and ethnic group, fall 2007* [Data file]. Retrieved from:
http://chronicle.com/article/Number-of-Full-Time-Faculty/47992/


D’agastino, D. (2003, October). Where are all the women it leaders? *CIO Insight*, 76.


women’s ascent up the organizational ladder. *Journal of Social Issues* 57(4), 657-
674.

Helfat, C., Harris, D., & Wolfson, P. (2000). The pipeline to the top: Women and men in
the top executive ranks of U.S. corporations. *Academy of Management
Perspectives, November*, 42-65.

Hesse-Biber, S. (2011). Qualitative approaches to mixed methods practice. *Qualitative
Inquiry, 16*(6), 455-468.

Off-ramps and on-ramps in women’s careers. *Harvard Business Review Research

http://www.higheredjobs.com

engineering, and mathematics. Retrieved from:
http://www.aauw.org/files/2013/02/Why-So-Few-Women-in-Science-

Hoff, D. L., & Mitchell, S. N. (2008). In search of leaders: Gender factors in school
Retrieved from: http://advancingwomen.com/awl/awl_wordpress/in-search-of-
leaders-gender-factors-in-school-administration/


the community. *Educause Center for Applied Research, 1*. Retrieved from:

http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolume/UnderstandingtheMindsetofHigherEducation/157373

http://www.businessweek.com/technology/women-make-up-half-of-cios-with-top-paydays-10032011.html


Nichols, J. E. (2013, April 10). Understanding the increasing affluence of women. Retrieved from:

http://www.supportingadvancement.com/vendors/canadian_fundraiser/articles/womens_affluence.htm
Women as Chief Information Officers in Higher Education


Todd, K., Mardis, L., & Wyatt, P. (2005). We’ve come a long way, baby! But where women and technology are concerned, have we really? *Proceedings of the 33rd*
Annual SIGUCCS Conference on User Services, November 6-9, (pp. 380–387).


http://www.computerweekly.com/Articles/2003/06/13/194752/What-is-turning-women-off-working-in-IT.htm

Weick, Karl. (1976). Educational organizations as loosely coupled systems.

*Administrative Science Quarterly, 21*(1), 1-19.


Appendix A: Quantitative Questionnaire

EDUCAUSE Center for Applied Research

CIO Survey 2012

The following survey is the first component of a mixed-methods study being conducted by Elizabeth Clark, a doctoral student at Boston College, in partnership with the EDUCAUSE Center for Applied Research. The survey has been designed to better understand the working culture of higher education IT and the effects of that culture on women and men in senior-most IT leadership/CIO positions.

Your participation in this survey is appreciated, as your responses will add to a developing body of knowledge about higher education IT, its culture, and its leaders. The study’s results, in addition to contributing to a doctoral dissertation, will be published in an ECAR Research Bulletin for the higher education community.

Only Elizabeth Clark, her dissertation committee, and EDUCAUSE researchers will have access to institutionally identifiable data collected in this survey. Aggregated results, as well as a list of institutions participating in the survey, may be included in reports, publications, or other products of this research, but they will not contain any information that could be used to identify an individual or a particular institution.

This survey contains five discrete sections and is designed to take less than 20 minutes to complete.

Responses to this survey are kept confidential, and only aggregate results are reported. The ID number you received is for your use only.

This survey is designed for senior-most IT leaders currently working in IT at an institution of higher education. If you are not the senior-most IT leader or are not presently employed at a college or university, the questions in this survey will be difficult for you to answer. If you are not the senior-most IT leader at your institution, we ask that you pass this survey on to that person. If you do not work in higher education, please answer “No” to the question 1.2; we will ask you no further questions.

Please complete this survey by October 10, 2012.

SECTION 1. About You
1.1 Please enter the survey ID provided in the e-mail invitation you received. Your ID is a 4–6 digit number; no letters or symbols should be included. Required.
1.2 Are you the senior-most IT leader working at an institution of higher education? 
Required.

( ) No Go to last page.
( ) Yes Go to 1.3.

Section 1A: Your Personal Demographic Information

1.3 What is your gender?
( ) Male
( ) Female

1.4 What is your age?
[Dropdown menu: “Decline to answer,” “Under 25,” 26 to 75 by 1s, and “Over 75”]

1.5 What is your ethnicity?
( ) Decline to answer
( ) American Indian/Alaska Native
( ) Asian American/Asian/Pacific Islander
( ) African American/Black
( ) Hispanic/Latino
( ) White/Caucasian
( ) Other, please describe (Insert text box for answer)

1.6 What is your marital status?
( ) Single
( ) Married
( ) Domestic partner
( ) Divorced
( ) Decline to answer

1.7 How many children (including stepchildren) do you have?
[Dropdown menu: “0”, “1”, “2”, “3”, “4”, “>4”]

1.8 What are the ages of your children (check all that apply)? [ ] 0–2
[ ] 3–5
[ ] 6–8
[ ] 9–11
[ ] 12–14
[ ] 15–17
[ ] 18+

1.9 What is your highest earned degree?
( ) Associate’s
( ) Bachelor’s
( ) Master’s
( ) Doctorate (PhD)
( ) Other terminal degree (e.g., MFA, JD, EdD, MD)
( ) Other, please specify ____________________
1.10 What was your degree major for your highest earned degree?
( ) Computer science
( ) Information technology
( ) Business
( ) Administration
( ) Biology
( ) Chemistry
( ) Communication
( ) Economics
( ) Education
( ) Engineering
( ) English
( ) History
( ) Library and information science
( ) Mathematics
( ) Physics
( ) Political science
( ) Psychology
( ) Romance languages
( ) Sociology
( ) Other, please specify ____________________

Section 1B: Your Current IT Position

If you hold multiple positions, please respond with regard to the one most focused on IT.

1.11 Which of the following best describes the organization/department in which you work?
( ) Advancement/development
( ) Business and financial affairs
( ) Central IT
( ) College/division/department
( ) Library
( ) Medical center
( ) President’s/chancellor’s office
( ) Provost’s/academic affairs office
( ) Research administration
( ) Student affairs
( ) Other, please specify ____________________

1.12 What is your employment status in your current IT position?
( ) Full-time employee
( ) Part-time employee

1.13 For how many years have you held your current senior-most IT leader position?
[Dropdown menu, “Less than 1 year,” “1 year” to “30 years” by 1s, and “More than 30 years”]

1.14 For how many years have you worked at your current institution?
[Dropdown menu, “Less than 1 year,” “1 year” to “30 years” by 1s, and “More than 30 years”]

1.15 In your current IT position, what is your annual salary?
( ) Decline to answer
( ) Under $50,000
Women as Chief Information Officers in Higher Education

1.16 In addition to your current IT position, do you now hold one or more academic appointments such as instructor, lecturer, or professor at the SAME institution?
( ) No
( ) Yes

1.17 In addition to your current IT position, do you now hold one or more academic appointments such as instructor, lecturer, or professor at a DIFFERENT institution?
( ) No
( ) Yes

1.18 Are you a member of the president's or chancellor's cabinet?
( ) No
( ) Yes

1.19 How many full time equivalent (FTE) employees, excluding students, do you supervise in your current IT position, including those reporting to your subordinates?
( ) None
( ) 1–4
( ) 5–10
( ) 11–25
( ) 26–50
( ) 51–75
( ) 76–100
( ) 101–200
( ) 201–300
( ) 301–400
( ) 401–500
( ) Over 500

1.20 At my institution, IT is:
( ) Highly centralized
( ) Centralized
( ) Balanced
( ) Decentralized
( ) Highly decentralized
Section 1C: Your Previous Position(s)

1.21 In what type of organization/institution was your most recent previous position?  
Required.
( ) My current institution
( ) Another higher education institution
( ) No previous position
( ) Consulting
( ) Government
( ) K–12 educational institution
( ) Military
( ) Nonprofit organization
( ) Private industry
( ) Other, please specify ______________________

1.22 What was your previous position title?
( ) CIO or senior-most IT position
( ) Deputy CIO
( ) Executive director
( ) Vice president
( ) Associate/assistant VP
( ) Non-IT executive
( ) Academic technology director/manager
( ) Administrative technology director/manager
( ) Desktop support director/manager
( ) Help desk director/manager
( ) Network director/manager
( ) Systems director/manager
( ) Telecommunications director/manager
( ) Web director/manager
( ) Project manager
( ) Professor/instructor
( ) Academic administrator (dean, associate dean)
( ) Library director/manager
( ) IT consultant
( ) Other, please specify ______________________
( ) Not applicable

1.23 What was your title two positions prior?
( ) CIO or senior-most IT position
( ) Deputy CIO
( ) Executive director
( ) Vice president
( ) Associate/assistant VP
( ) Non-IT executive
( ) Academic technology director/manager
( ) Administrative technology director/manager
( ) Desktop support director/manager
Not including your current IT position, have you ever held IT PROFESSIONAL POSITIONS in higher education in any of the following areas? Select all that apply.

[ ] Central IT
[ ] Advancement/development
[ ] Business and financial affairs
[ ] College/division/department
[ ] Library
[ ] Medical center
[ ] President's/chancellor's office
[ ] Provost's/academic affairs office
[ ] Research administration
[ ] Student affairs
[ ] Other, please specify

Have you ever held NON-IT PROFESSIONAL POSITIONS in higher education in any of the following areas? Select all that apply.

[ ] Central IT
[ ] Advancement/development
[ ] Business and financial affairs
[ ] College/division/department
[ ] Library
[ ] Medical center
[ ] President's/chancellor's office
[ ] Provost's/academic affairs office
[ ] Research administration
[ ] Student affairs
[ ] Other, please specify

Have you ever held professional IT positions in the following industries or organizations? Select all that apply.

[ ] Consulting
[ ] Government
[ ] K–12 educational institution
[ ] Military
1.27 It is very important to me that I work in higher education rather than another sector.
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

Section 2A: Workplace Norms

2.1 On average, how many hours do you work each week?
[Dropdown menu: “Decline to answer,” “Under 20,” 20 to 70 by 1s, and “Over 70”]

2.2 On average, how many of those hours are spent IN THE OFFICE each week?
[Dropdown menu: “Decline to answer,” “Under 20,” 20 to 70 by 1s, and “Over 70”]

2.3 On average, how many of those hours are worked AT HOME (or another non-provisioned office) each week?
[Dropdown menu: “Decline to answer,” “Under 10,” 10 to 70 by 1s, and “Over 70”]

2.4 Of the hours you work each week, how many of them (on average) are spent working AT HOME (or another non-provisioned office) ON WEEK NIGHTS?
[Dropdown menu: “Decline to answer,” “Under 5,” 5 to 25 by 1s, and “Over 25”]

2.5 Of the hours you work each week, how many of them (on average) are spent working AT HOME (or another non-provisioned office) ON WEEKENDS?
[Dropdown menu: “Decline to answer,” “Under 5,” 5 to 25 by 1s, and “Over 25”]

DEFINITIONS FOR QUESTIONS 2.6 AND 2.7

Compressed workweek: the ability to work a compressed workweek at least some of the time (for example, four 10-hour days rather than five eight-hour days).

Flex time: the ability to choose your own starting and quitting times within a range of hours

Job share: sharing responsibilities of your position with another individual, in order to accommodate a more flexible schedule

Distributed office: the ability to work some of your regular paid hours at home/remotely

2.6 In the role of the senior-most IT leader/CIO, I have the following job options (check all that apply):
[ ] Compressed workweek
[ ] Flex time
[ ] Job share
[ ] Distributed office
2.7 In the role of the senior-most IT leader/CIO, I regularly use the following job options (check all that apply):
[ ] Compressed workweek
[ ] Flex time
[ ] Job share
[ ] Distributed office

Section 2B: Workplace Climate

2.8 At my institution, I have access to a supportive group of executives:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

2.9 In general, I feel supported by other senior-most leaders at my institution:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

2.10 In general, I have a strong collegial network at my institution:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

2.11 Outside my institution, I have access to a supportive group of professional peers:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

Section 3: Managing Life Outside Work

3.1 On average, how many hours do you spend CLEANING YOUR HOUSE each week?
[Dropdown menu: “Decline to answer,” “Under 2,” 2 to 10 by 1s, and “Over 10”]

3.2 On average, how many hours do you spend SHOPPING FOR GROCERIES each week?
[Dropdown menu: “Decline to answer,” “Under 2,” 2 to 10 by 1s, and “Over 10”]

3.3 On average, how many hours per week do you spend COOKING MEALS?
[Dropdown menu: “Decline to answer,” “Under 2,” 2 to 12 by 1s, and “Over 12”]
3.4 On average, how many hours per week do you spend providing care for your CHILDREN?
[Dropdown menu: “Decline to answer,” “Under 5,” 5 to 25 by 1s, “Over 25”, and Not applicable]

3.5 On average, how many hours per week do you spend visiting and/or providing care for an ELDERLY PARENT?
[Dropdown menu: “Decline to answer,” “Under 5,” 5 to 25 by 1s, “Over 25”, and Not applicable]

3.6 In order to manage my home responsibilities, I hire individuals to assist me with at least some of the hours I spend on HOUSE CLEANING:
( ) Yes
( ) No

3.7 In order to manage my home responsibilities, I hire individuals to assist me with at least some of the hours I spend on GROCERY SHOPPING:
( ) Yes
( ) No

3.8 In order to manage my home responsibilities, I hire individuals to assist me with at least some of the hours I spend on MEAL PREPARATION:
( ) Yes
( ) No

3.9 In order to manage my home responsibilities, I hire individuals to assist me with at least some of the hours I spend on CHILD CARE:
( ) Yes
( ) No
( ) Not applicable

3.10 In order to manage my home responsibilities, I hire individuals to assist me with at least some of the hours I spend on ELDER CARE:
( ) Yes
( ) No
( ) Not applicable

Section 4: Hiring and Promotion Practices

Please choose one answer in response to the following statements.

4.1 When I was hired into the senior-most IT leadership/CIO position at my current institution, I felt the hiring process was fair and unbiased:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree
4.2 When negotiating my salary for the senior-most IT leadership/CIO position at my current institution, I felt the process was fair and unbiased:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

4.3 I feel as though I earn a salary equivalent to or more than my peers (other executives) at my current institution:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

4.4 I feel as though I earn a salary equivalent to or more than my peers at other institutions:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

4.5 At my current institution, I feel as though I am reviewed fairly, according to what I contribute to the organization.
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

4.6 Prior to obtaining the senior-most IT leadership/CIO position at my current institution, I felt as though I was reviewed fairly, according to what I contributed to the organizations for which I worked.
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

4.7 In your career in higher education IT, have you ever felt that you were:
Hired because of your gender:
( ) Yes
( ) No

4.8 Not hired because of your gender:
( ) Yes
( ) No
4.9 Promoted because of your gender:
( ) Yes
( ) No

4.10 Not promoted because of your gender:
( ) Yes
( ) No

4.11 Paid more because of your gender:
( ) Yes
( ) No

4.12 Paid less because of your gender:
( ) Yes
( ) No

**Section 5: Role Models and Mentors**

5.1 I pursued a senior-most IT leader/CIO role because of other executives I admire at my CURRENT institution:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree
( ) Not applicable

5.2 I pursued a senior-most IT leader/CIO role because of other executives I admire at OTHER institutions:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree
( ) Not applicable

5.3 A MALE executive I admire influenced my decision to become a senior-most IT leader/CIO:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree
( ) Not applicable
5.4 A FEMALE executive I admire influenced my decision to become a senior-most IT leader/CIO:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree
( ) Not applicable

5.5 Role models in higher education IT have a strong influence on the next generation of senior-most IT leaders/CIOs in higher education:
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

In this next part, questions about FORMAL and INFORMAL mentors are asked. FORMAL mentors are defined as mentors who are assigned to you as part of a formal mentoring program. INFORMAL mentors are defined as individuals you currently or previously have looked to as mentors in your career but who have not been assigned to you as part of a formal mentoring program.

5.6 I currently have a FORMAL mentor who assists me in my career:
( ) Yes <<Go to 5.7, then 5.8>>
( ) No <<Go to 5.8>>

5.7 Please identify your current FORMAL mentor's gender:
Mentor #1:
( ) Female
( ) Male

Mentor #2:
( ) Female
( ) Male

Mentor #3:
( ) Female
( ) Male

5.8 I currently have an INFORMAL mentor who assists me in my career:
( ) Yes <<Go to 5.9, then 5.10>>
( ) No <<Go to 5.10>>
5.9 If you answered yes to question 5.8, please identify your current INFORMAL mentor’s gender:
Mentor #1:
( ) Female
( ) Male

Mentor #2:
( ) Female
( ) Male

Mentor #3:
( ) Female
( ) Male

5.10 Prior to obtaining a senior-most IT leadership/CIO position, I had a FORMAL mentor or mentors who assisted me in my career:
( ) Yes <<Go to 5.11, then 5.12>>
( ) No <<Go to 5.12>>

5.11 Please identify your prior FORMAL mentor/mentors’ gender:
Mentor #1:
( ) Female
( ) Male

Mentor #2:
( ) Female
( ) Male

Mentor #3:
( ) Female
( ) Male

5.12 Prior to obtaining a senior-most IT leadership/CIO position, I had an INFORMAL mentor or mentors who assisted me in my career:
( ) Yes <<Go to 5.13, then 5.14>>
( ) No <<Go to 5.14>>

5.13 Please identify your prior INFORMAL mentor/mentors’ sex:
Mentor #1:
( ) Female
( ) Male

Mentor #2:
( ) Female
( ) Male

Mentor #3:
( ) Female
( ) Male
5.14 My current institution has a FORMAL mentoring program for executives:
( ) Yes
( ) No

5.15 FORMAL mentoring for the senior-most IT leadership/CIO position is crucial.
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

5.16 INFORMAL mentoring for the senior-most IT leadership/CIO position is crucial.
( ) Strongly agree
( ) Agree
( ) Neutral
( ) Disagree
( ) Strongly disagree

Thank you for completing the survey.
Appendix B: Questionnaire Informed Consent and Instructions

QUANTITATIVE SURVEY CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Women as CIOs in Higher Education:
A Mixed Methods study of Women Executive Role Attainment in IT Organizations

Survey Questionnaire
Consent Form

September 2012

Introduction
Thank you for taking part in this doctoral research study designed to understand critical cultural factors of the IT profession in higher education as they relate to Senior-most IT Leaders (or Chief Information Officers). This survey is the first part of a mixed methods study that will expand the higher education community's understanding of men and women's experiences as executives in higher education IT.

I ask that you read this form and ask any questions you may have before agreeing to participate.

Purpose of the Study:
• This study aims to gain a sense of how Senior-most IT executives have experienced their lives in, and the culture of, higher education IT.
• You were selected as a possible participant because, as a Senior-most IT leader in higher education, you have a unique, important and valuable perspective to offer the higher education IT community.

Description of Study Procedures:
• If you agree to participate in this study, I will ask that you complete a 30-minute survey in which you will be asked to answer questions related to higher education IT, its culture, and your career.

Risks/Discomforts of Being in the Study:
• The study has the following risk: I might pose a question that you find offensive or which, for whatever reason, you would prefer not to answer. If this occurs, you do not need to answer the question.
• Other than the matter of provocative questions, there are no reasonable foreseeable (or expected) risks. There may be unknown risks.

Benefits of Being in the Study:
• In this study I hope to draw on Senior-most IT Leaders’ ideas about the cultural factors that have influenced their leadership success. In brief, I hope that you have a chance to inform our understanding of the cultural benefits and drawbacks of higher education IT as it relates to leadership success.
• When this research is completed, I will provide you with our research findings so they might inform your work as IT leaders in higher education.
• You will probably not get any direct benefit from participating in this study. You may appreciate having an opportunity provide me with information, but I cannot guarantee that you will receive any direct benefit from this study. However, I do hope that the information gathered in this study will help you better understand how to create more gender balanced IT organizations.

Payments:
• There will be no financial payment for participating in this study.
Costs:
• There is no cost to you to participate in this research study.

Confidentiality:
The records of this survey will be kept private. In any sort of report I may publish, I will do all I can to protect your identity and not include information that will make it possible to identify a specific participant, though I will likely need to identify your type of institution, and thereby will provide some idea for your identity. The quantitative survey data will be collective in nature, however, and thus the answers you give are likely to be given by numerous other participants, which should aid in retaining your anonymity. Additionally, research records will be kept in a locked file.

All electronic information will be coded and secured using a password protected file and access to the records will be limited to my dissertation committee members, ECAR staff, and me. Sometimes, however, sponsors, funders, regulators, the Institutional Research Board at Boston College, or Federal Agencies overseeing human subject research may have to review the materials and tapes.

In addition, I want to mention that what proves “significant” in research such as this is not what one individual says or does; rather, the power of such research lies in being able to draw on prominent themes related to what is occurring within a population sample. Given this analytic style, it is much easier to preserve the confidentiality of the source of any response simply by the fact that this point of view will likely be shared by a number of other persons.

Voluntary Participation/Withdrawal:
• Your participation is completely voluntary.
• You need not answer every question that is posed, for whatever reasons.
• You are free to withdraw your participation at any time, for any reason.
• There is no penalty or loss of benefits for not taking part or for stopping your participation.

Contacts and Questions:
• The researcher directing this study is Elizabeth Clark, a doctoral candidate in the Lynch School of Education, and the Director of Instructional Design and eTeaching Services at Boston College. For questions or more information concerning this research you may contact her at: 617-552-6826 or via email at: elizabeth.clark.3@bc.edu.
• If you have any questions about your rights as a research subject, you may contact: Director, Office for Research Protections, Boston College at (617) 552-4778, or irb@bc.edu

Copy of Consent Form:
• Please print a copy of this form to keep for your records and future reference.

Statement of Consent:
• I have read the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study. I have received a copy of this form.

Signatures/Dates (Signature will be a click through to the online survey.)

_________________________  _________________________
Date                    Consent Signature of Participant
SURVEY INSTRUCTIONS

This survey seeks input from you and therefore should not be delegated or forwarded to others, unless you are not the Senior-most IT leader at your institution. In that case, we appreciate your assistance in passing this survey along to that individual. The survey consists of five sections. Survey testing suggests that it will require approximately 30 minutes to complete the survey. If you wish to preview the survey before completing it, a PDF version is available from the ECAR survey instruments Web site, http://www.educause.edu/SurveyInstruments/####

We recommend that you use Internet Explorer to complete this survey. This survey software allows you to:

> **Print blank and completed surveys.** To print a blank copy of the survey, select PDF version of this survey above. Once you complete the online survey, print your responses by clicking Review at the end of the survey. Select Print.

> **Save partially completed surveys.** To save and return to a partially completed survey, set a favorite or bookmark the survey and then click Save. If cookies are enabled in your browser, you will be taken to the place you left off when you return to the survey.

> **Revise, review, print, and save responses.** You may revise your answers until you click Finish. Use the Back button to navigate through the survey. You may review all your answers before submitting them. When you reach the end of the survey, choose Review to review, print, and save your responses. We strongly suggest that you print and save your responses before you submit them.

Please complete this survey by October 31, 2012.

*Key Findings* will be available to all survey respondents once the study is complete. If you have any questions or concerns, please e-mail elizabeth.clark.3@bc.edu.

Click Next to begin the survey. And again, thank you for your time!
Appendix C: Qualitative Interview Protocol

**Research Question:** How do women CIOs in higher education IT explain the organizational-level factors that have contributed to their ability to attain the CIO position?

In particular, I will examine how the following themes affect these women’s experiences: career pathways, the ideal worker norm, home responsibilities, perceived discrimination in hiring and promotion processes, and the role of mentors in higher ed IT.

**Interview: Experiences as a Woman Executive in Higher Education IT**

In this interview, I want to explore and understand your experiences as a woman executive in higher education IT. I am interested in knowing more about the experiences of women in higher education IT in order to better define what cultural factors, policies, and practices might be assisting women in carving out successful careers in IT.

**Introductory Questions – Career Pathways and Ideal Worker Norm**

1. Can you tell me about how you started working in higher education (HE) IT, and how your career has developed?

   **Probe:** What was your first technology-related job? Why did you choose it?

   **Probe:** Can you describe your career progression/pathway in HE IT? Did it progress in a linear fashion, or were there starts and stops, or detours into unexpected positions/places? What is your assessment of why it took the route it did?

2. How did the particular career path you chose affect your ability to achieve the CIO role in HE IT?

   **Probe:** Was the progression into the CIO role a natural one for you? Did you come at it from a “non-conventional” angle?

3. As a CIO, could you please talk about what is expected of you – work intensity-wise – as an executive in HE IT? What are the working norms for someone in your level position?

   **Probe:** Talk about your average work week – what are the hours like? How much work do you do in the evenings? On weekends? While engaged in family activities?

   **Probe:** In the survey, women CIOs reported working significantly more hours in the office (no significant difference in overall hours or ones spent working from home) than
Women as Chief Information Officers in Higher Education

men CIOs. I am hoping you can help me shed light on why I may have seen this trend. How do you make sense of it?

**Home Responsibilities**

In this next part of the interview, I want to explore with you how you have handled parts of your life outside of work alongside the demands of your career in HE IT.

4. Can you talk about how you manage your work and home life? What are your priorities in terms of your home life? What are your non-negotiables?

**Probe:** How would you say the two (work/life) affect one another in general? Is that different for you now as a CIO than at earlier points in your career?

**Probe:** How has working in HE IT affected how you have managed the two? Are there things about your work environment that make it especially easy or difficult to take care of both (the hours, the expectations, flexible work, etc.)?

5. If you have children, can you talk about how you manage competing demands at work and home on your time and attention? Does anything about HE IT and your particular role in it make that more or less difficult?

6. Now, women CIOs reported in the survey spending more time than men CIOs on home-related items like cooking and childcare. What are your thoughts on how to make sense of this?

**Probe:** If you spend a good amount of time on either/both, what is the impact on your life as an executive?

7. The survey also showed that though many HE organizations have flexible work options (flex time, compressed workweeks, etc.), male CIOs are more likely to use those options than women. I am hoping that you could help me shed light on this – what are your thoughts as to why that might be the case?

**Probe:** If you have used those options, have you felt as though they were freely available to all? If not, can you talk about why you do not use any flexible options?

**Probe:** Do you think that HE does a better job than other fields with making work flexible for employees, especially executives?
Mentors in Higher Education IT

I now want to ask you about the mentors you have had in your career in HE IT. Let me start by defining mentors as experienced individuals who actively sponsor and support less experienced, promising aspirants. The survey distinguished between formal and informal mentors, but very few women reported having formal mentors, so I would like to talk about them in general.

8.a. If reported having a mentor during the course of her career: Can you describe what mentorship was like for you in your career? How did you find your mentor(s), what kind of activities did you engage in, how long did the mentor/mentee relationship last?

8.b. If reported NOT having a mentor during the course of her career: You reported having no mentors in your career. That being the case, do you feel as though a lack of mentors affected your career aspirations or ability to attain the CIO position?

9. Many individuals in the survey indicated that mentoring – both formal and informal – is crucial for the CIO role in HE IT. Why would you say that is so?

Probe: What is HE IT doing right in this area? Do you have ideas for improving the situation for aspiring HE CIOs?

Gender and Perceived Discrimination in Hiring and Promotion

For the last section of this interview, I would like to discuss your experiences, as a woman, with the hiring and promotion processes in HE IT.

10. As an executive, can you describe any experiences with hiring practices in HE IT that may have been influenced by gender

Note: Though race and ethnicity also influence hiring practices, for the purposes of this study, I am trying to isolate gender effects.

Probe: Do you feel that your gender played a part in terms of how you were perceived – either positively or negatively – as a CIO candidate? In the salary you could negotiate?

Probe: Do you feel that there are any particular upsides or downsides to being male or female when applying for higher level/executive jobs in HE IT?

11. Let’s move to promotions. Over the course of your career, can you talk about any times when you perceived that your gender helped or hindered your ability to get a promotion?
Probe: If you did/not perceive any bias – positive or negative – based on gender throughout your career in HE IT, why do you think that is the case? Strong/weak hiring and promotion practices? Insightful/poor hiring managers or supervisors? Other reasons?

Probe: The survey indicated that women CIOs perceive that they are NOT promoted because of their gender more often than men CIOs. What are your thoughts on how to explain that?

12. And pay inequity – specifically, feeling as though you are paid less because of your gender – came up as one of the most significant factors for women in the survey population. Can you talk about your own experiences with this and how they have informed your perspective?

Probe: Have your experiences with perceived salary inequity been consistent across your career in IT? Can you talk about this in relation to your current position as a CIO and when you first felt that way? Was it during salary negotiations? After working at your institution for a while?

13. Interestingly enough, the quantitative analysis showed that a significant difference in pay between women and men was NOT present for the survey population. Could you share your thoughts on why such a difference might exist between what women (strongly) perceive and what the data from this survey illustrate?

Probe: Are HR practices transparent and strong, or unclear and inadequate in addressing equal pay? Do hiring managers contribute to the problem? Are there subtle practices or attitudes that perpetuate this problem for women?

Probe: What type of practices have you seen in HE IT that help address pay inequity (or perceptions of it)?

Wrapping Up

14. If women are attaining the CIO role in HE at a much better rate than their corporate counterparts, why do you think that is the case? What might be different about HE IT that is contributing to relatively better rates of gender proportionality for women at the executive level?

15. Is there anything else that you would like to share with me about your experiences as an executive in HE IT that I did not cover?

Thank participant.
Appendix D: Qualitative Interview Informed Consent

QUALITATIVE INTERVIEW CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Boston College Lynch School of Education
Women as CIOs in Higher Education:
A Mixed Methods study of Women Executive Role Attainment in IT Organizations
Researcher: Elizabeth Clark

Interview Consent Form

November 2012
Introduction
Thank you for taking part in this doctoral research study designed to understand critical cultural factors of the IT profession in higher education as they relate to Senior-most IT Leaders (or Chief Information Officers). This interview is the second part of a mixed methods study that will expand the higher education community's understanding of women's experiences as executives in higher education IT.

I ask that you read this form and ask any questions you may have before agreeing to participate.

Purpose of the Study:
• This study aims to gain a sense of how women executives have experienced their lives in and the culture of higher education IT.
• You were selected as a possible participant because, as a woman executive in higher education IT, you have a unique, important and valuable perspective to offer the higher education IT community.
• The total number of people recruited for the interview portion of this study is expected to be between six and ten.

Description of Study Procedures:
• If you agree, I would ask you to do the following things: participate in a 60-minute interview during which you will be asked to discuss your feelings about your career in higher education IT, as well as your role as an executive, be recorded during the interview, and be available via email for follow-up questions (if needed).

Risks/Discomforts of Being in the Study:
• The study has the following risk: I might pose a question that you find offensive or which, for whatever reason, you would prefer not to answer. If this occurs, you do not need to answer the question.
• Other than the matter of provocative questions, there are no reasonable foreseeable (or expected) risks. There may be unknown risks.

Benefits of Being in the Study:
• As you have committed time and effort to higher education IT, in this study I hope to better understand what it is like for women to work inside of higher education IT, especially as executives. In brief, I hope that you have a chance to shape what I examine so that it meets the interests and concerns of you and the community in which you work.
• When this research is completed, I will provide you with my research findings so they might inform your future work.
• You will probably not get any direct benefit from participating in this study. You may appreciate having an opportunity to express your opinion and provide me with ideas for what my research should focus...
upon. I cannot guarantee that you will receive any direct benefit from this study. However, I do hope that the information gathered in this study will help you in your career.

Payments:
• There will be no financial payment for participating in this study.

Costs:
• There is no cost to you to participate in this research study.

Confidentiality:
The records of this interview will be kept private. In any sort of report I may publish, I will do all I can to protect your identity and not include information that will make it possible to identify a specific participant, though I will likely need to identify your type of institution, and thereby will provide some idea for your identity. To counter the threat of disclosure, all participants will be given pseudonyms, as will their institutions. Additionally, research records will be kept in a locked file.

All electronic information will be coded and secured using a password protected file and access to the records will be limited to my dissertation committee members, ECAR staff, and me. Access to the audio file will be limited solely to me. When I complete my dissertation, it will be erased from all locations. Sometimes, however, sponsors, funders, regulators, the Institutional Research Board at Boston College, or Federal Agencies overseeing human subject research may have to review the materials and audio recordings.

Voluntary Participation/Withdrawal:
• Your participation is completely voluntary.
• You need not answer every question that is posed, for whatever reasons.
• You are free to withdraw your participation at any time, for any reason.
• There is no penalty or loss of benefits for not taking part or for stopping your participation.

Contacts and Questions:
• The researcher directing this study is Elizabeth Clark, a doctoral candidate in the Lynch School of Education, and the Director of Instructional Design and eTeaching Services at Boston College. For questions or more information concerning this research you may contact her at: 617-552-6826 or via email at: elizabeth.clark.3@bc.edu.
• If you have any questions about your rights as a research subject, you may contact: Director, Office for Research Protections, Boston College at (617) 552-4778, or irb@bc.edu

Copy of Consent Form:
• You will be given a copy of this form to keep for your records and future reference.

Statement of Consent:
• I have read the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study. I have received a copy of this form.

Signatures/Dates
Study Participant (Print Name): ____________________________ Date __________

Participant or Legal Representative Signature: ____________________________ Date __________