Overview

In our contemporary world, technology is ubiquitous and plays an increasingly important role in our everyday lives. 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. Bureau of Labor Statistics reported by the National Center for Women & Information Technology (NCWIT) in *Women in IT: The Facts* illustrated that in 2009, white women made up just 18% of the overall IT workforce in the United States, while Asian women represented 4%, African American women 2%, and Hispanic women 1.5%. Clearly, women’s presence in the IT workforce lacks population proportionality, regardless of race or ethnicity.

A lack of proportional representation grows even more evident when scrutinizing the upper echelons of IT organizations. CIOs—those at the top of IT organizational hierarchies—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 domain of white men. The recently released Harvey Nash CIO survey reported that women constitute only 8% of the global CIO population (9% in the United States). Additionally, the NCWIT report 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. These data are certainly compelling and raise the question of how well homogenous IT organizations run by a dominant social group can serve far more diverse user populations. This picture of IT organizations 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 raise 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. 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?

IT has become a crucial component of our lives and the workforce. That the IT profession lacks proportional representation of women worries many. Most research and statistics on IT organizations and workers, however, either examine aggregate data or concentrate on a corporate perspective. Although IT organizations in higher education mirror those in the business world in many ways, data suggest that women secure CIO roles at academic institutions at much higher rates than they do in industry. Since 2004, nationwide 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. While still not proportional, 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 for women to the CIO office? With ECAR workforce data reporting that three out of four higher education CIOs come from within the academic network (consistent since 2004), this is an intriguing question to explore.

A mixed-methods study commencing in the fall of 2012 will investigate what is happening in higher education IT at the organizational level that has encouraged better proportionality for women as IT executives. This study will collect data through a survey and interviews. First, an online survey will be distributed to a sample of higher education CIOs. The survey aims to identify and define specific cultural aspects of higher education IT and assess whether any significant differences exist between women’s and men’s experiences of those cultural factors. Second, interviews with women CIOs will help explain their perspective on the survey findings.

**Highlights**

**Framing the Study: The Literature**

Very little research has been conducted on the culture of higher education IT and how its environment affects women’s and men’s presence in the profession. A scholarly framework for such a study requires inquiry into several areas of literature: the history of IT; organizational culture, women, and leadership; and the glass ceiling—or what hinders and helps women’s attainment of executive positions. An historical overview of modern computing lays the foundation for the investigation, while an understanding of culture and gendered organizational norms illustrates 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.

Business scholarship was utilized in a referential way for two distinct reasons. First, IT as a profession initially developed in corporations, and the literature on IT culture and women’s experiences in the profession are well documented. Second, where scholarship on higher education IT organizations is scant—and on women’s experiences inside those organizations even more inadequate—contextual scholarly reference points were necessary.

**IT History**

Information technology as a formal profession can trace its roots back to the historical developments of modern computing, which began in the early 19th century. 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. These individuals were called computers, or as the Oxford English Dictionary used to define them “…one who computes; a calculator, reckoner; specifically, a person employed to make calculations in an observatory, in surveying, etc.” Prior to that time, there were men working to figure out ways to automate the tediousness of computing. Charles Babbage, a Cambridge University—educated mathematician born in 1791, produced designs for machines that would calculate and store data for nautical tables. Though he was never fully able to
actualize his designs, his conceptual models inspired others decades later who engineered the world's first machine-based computers. Later in the 19th century, 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 was an advisor to the Bureau of Census in Washington, D.C. This academic connection gave Hollerith insight into the process behind the census, and he ended up designing a revolutionary punch-card system that was to dramatically change the census of 1890. What Hollerith started grew into IBM and sparked a storm of machine-based developments that evolved into today’s computer industry.8

While the history of modern computing is filled with rich detail, this particular groundwork is laid because it informs two important points about the IT profession. First, from its very early stages, computing and information technology have pivoted around men and their machines. Second, women’s place in the field was secondary to men’s from the start. Because women were not allowed into either the educational or work spaces allocated for men, they had no place alongside them to build computing creations. When women were finally let into the workforce, their jobs were prescribed for them. They were only given supporting responsibilities, a fact that was heavily tied to their socially ascribed roles as caretakers in the 19th and early 20th centuries. Thus, much like other professions that developed during that time period (such as law and medicine), as IT matured, the evolving cultural discourse for the profession was distinctly masculine. By the time organizations imagined the need for a chief information officer, which was not until around 1980, the masculine nature of information technology was firmly entrenched in the profession’s culture.

Organizational Culture

An organization’s culture is its pattern of formulated, shared assumptions and beliefs that influence the ways that individuals within that organization think about and interact with their world.9 The organizational culture literature points out two basic characteristics of culture. One is its resistance to change; the other, its natural tendency to create “insiders” and “outsiders.”10 Because culture defines and creates structural norms around organizations’ operations in ritualistic ways over time, shifting those norms can cause people great anxiety. Scholars note, in fact, that cultural change will not normally occur without a crisis or other motivational reason behind it. Cultures become entrenched.

While the history of modern computing and information technology illustrates that the profession was androcentric from the start, characteristics of organizational culture help explain why disparities between men and women have persisted. Without motivation to change, IT organizations have remained resistant to efforts toward gender proportionality, even as women’s presence in the workforce has grown. According to the 2010 Bureau of Labor Statistics, women now compose 47.2% of the entire workforce, and NCWIT reported that between 2000 and 2009, women made up between 55% and 58% of the professional workforce.11 Despite these changes, women persist as outsiders in the IT profession, remaining vastly underrepresented throughout the profession, but especially at the top.

Glass Ceiling: What Hinders, What Helps

Women’s difficulties in attaining executive roles have never been confined to IT, or even to male-dominated professions. The experience, in fact, was so common that it earned the label
“the glass ceiling” in 1986. Coined in a *Wall Street Journal* article, it was described as an invisible barrier women reached as they strived for executive office. This barrier took the shape of both policies and practices that deliberately discriminated against women when it came to senior positions.

**Pipelines and Pathways**

Scholars have examined those practices over the years, in order to identify what type of obstacles hinder or help women’s advancement. The glass ceiling literature starts with the “pipeline,” a term 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. What research has found is that the strong androcentric culture of IT heavily influences environments that discourage girls at very young ages; the early bias has a devastating effect on their participation in technology disciplines and ultimately on women’s presence in the IT profession.¹²

Women who do pursue technology careers and aspire to top management need to understand what pathways might lead them there. 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.¹³ “Staff” positions, on the other hand, 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 more often placed in staff positions.¹⁴ IT’s professional correlates to “line” and “staff” positions are “technical” and “support” ones. As might be expected, those who have researched IT organizations have noted that as with corporate organizations, roles are often divided along gender lines, with women dominating the support functions.¹⁵ These divisions of labor lead to gender segregation in leadership, as the most powerful executive positions require line or technical experience. Thus, a pathway issue, where women are hired into areas 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.

**Masculine Work Environments**

In addition to pipeline and pathway issues that women face within the IT profession, scholars of the glass ceiling have identified several areas of organizational practices that hinder women’s aspirations: masculine work environments, hiring and promotion biases, and a lack of role models and mentors. Masculine work environments have been a particularly thorny issue for high-achieving women because the environments often operate on outdated notions around home and family responsibilities. Though women have been participating in the labor force for many years, their entry into the world of work 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 women’s presence.

Socially ascribed assumptions around housework and childcare have had 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.¹⁶ 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 when they enter those conflict-ridden years.\textsuperscript{17}

**Hiring and Promotion Practices**

Scholars have also looked at gender bias and discrimination in hiring and 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 an 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.\textsuperscript{18} Where leadership is defined in masculine terms—as bold, assertive, or aggressive—there is a predisposition against women that precludes recognition of their competence. This undervaluing of women’s performance is then linked directly to differences in hiring and promotion rates between men and women.\textsuperscript{19}

**Role Models and Mentors**

Yet another obstacle examined in the literature that is strongly associated with women’s trouble navigating masculine organizational cultures is the absence of female role models and mentors. 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.\textsuperscript{20} As women are seldom present in senior 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 role 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 have noted that a lack of role models and mentors in organizations deters women’s participation.\textsuperscript{21} It is often the case that role models and mentors do not exist in organizations with inhospitable cultures for women.\textsuperscript{22} The 2011 ECAR workforce study reported that only 36\% of CIO aspirants had a mentor, a statistic that was consistent across both Carnegie Class and gender.\textsuperscript{23} The absence of this important resource helps preserve the very cultural elements that keep women out and that have been associated with women’s participation rates in IT declining since 1991.\textsuperscript{24}

**Breaking Through: Helpful Organizational Practices**

Given these organizational barriers, what types of solutions have researchers identified that help women achieve their goals? Flexible work, reforms in recruitment and evaluation, and mentoring have all been noted as ways to increase women’s presence in executive roles. Flexible work takes direct aim at the androcentric cultural values present in many organizations and offers women (and men) opportunities to reshape how they balance work and home responsibilities. Flexible scheduling allows employees some versatility beyond the standard, rigid, 9-to-5 working day. It 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 these options offer working women concrete strategies for managing the work that
they do in the office with their work at home; other options include job-sharing or reduced-hour, part-time jobs. Close related to these strategies, and one that is more and more common in today’s technology-driven environments, is telecommuting, or working from home. All of these strategies provide women with ways to manage the variety of stressors that go along with the often-overlapping career and family obligations and aspirations.

Another organizational 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 these practices need to be assessed and adjusted in order to counteract the unconscious stereotypes that influence our ideas about who ought to be hired and promoted. Descriptive and prescriptive 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 stereotypical terms, the more common it is for women to be treated this way. Organizations can contribute to and actively facilitate these biases when they have ambiguous hiring and promotion procedures but can counter them with practices that carefully and explicitly account for gender.

Finally, scholars 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 get good assignments. The best mentors offer both professional and personal support to those they identify as having leadership potential, and numerous scholars note that mentoring is a helpful strategy for developing top management. In the IT profession, it has been pointed out that women with one or more mentors had better job success; in higher education, both the 2008 and 2011 ECAR IT workforce studies identified mentors as important for CIO aspirants, indicating the value of being groomed for the CIO role.

Though mentoring gets a good deal of positive press for its success as a strategy for retaining and advancing women, some caution that mentoring can be a negative experience, too. A mentor can be too controlling, may not understand the protégé’s strengths, or may manipulate mentees for self-serving political goals. They suggest that organizations develop formal programs and implement them with care. Internal women’s networks and/or support groups are also suggested as a positive source of mentoring, offering women opportunities to communicate with one another in a safe setting. Positive mentoring is encouraged and can nurture productive growth; negative experiences can be devastating.

**What It Means to Higher Education**

Though the glass ceiling literature identifies factors that keep women out of executive positions, as well as ones that help them achieve their career aspirations, no research has been identified that brings together all of the variables identified in the literature to assess their relative strength in explaining women’s presence in the CIO role. Furthermore, very little data on women CIOs in higher education exist, and no studies have examined what factors contribute to their ability to attain CIO positions at better rates than women in corporate environments. Thus, the forthcoming study aims to understand cultural elements, policies, and practices in higher education IT that are contributing to this phenomenon. Until we know more about women’s involvement in higher education IT as CIOs, as well as their experiences in and perceptions of
the organizations in which they work, we will not be able to define why women are making better strides in the higher education IT workforce in getting to the top.

All of that said, why is gender equity in IT important to higher education? 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 high unemployment, a field that expects to see better growth than other areas of the economy. 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 student bodies 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.

Finally, 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 effective policies and practices aimed at gender equity. This is especially important as a first wave of CIOs in higher education prepare to retire.  A more gender-balanced next generation of CIOs is within our grasp.

**Key Questions to Ask**

The key research questions that will be addressed by this study are as follows:

- 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’s and men’s experiences within the culture differ?
- How do women CIOs in higher education IT explain the organizational factors that have contributed to their ability to attain the CIO position?

**IT organizations may ask themselves the following questions:**

- What is the organization’s culture and its impact on gender proportionality, especially in leadership roles?
- What are the institutional barriers (gender-segregated pathways, masculine work environments, the design of hiring and promotion practices, a lack of role models and mentors for women/executives) that negatively impact our ability to recruit and maintain women executives?
• What are the institutional practices that have had a positive impact on our ability to build and maintain a gender-proportional workforce, and are those practices available at all levels of the organizational hierarchy?

Where to Learn More

The endnotes provide a more thorough list of resources for those interested in this topic. Key resources are highlighted here. A full list of references attached to the study can be obtained by contacting the author. A follow-up research bulletin with the results of the study will be published in the spring of 2013.

CIOs in Higher Education


Glass Ceiling


History of IT


Organizational Culture


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Citation for This Work

Notes

3. Ashcraft and Blithe, Women in IT.
6. Arroway et al., The Higher Education CIO.
8. Ibid.
16. Eagly and Carli, Through the Labyrinth.


