

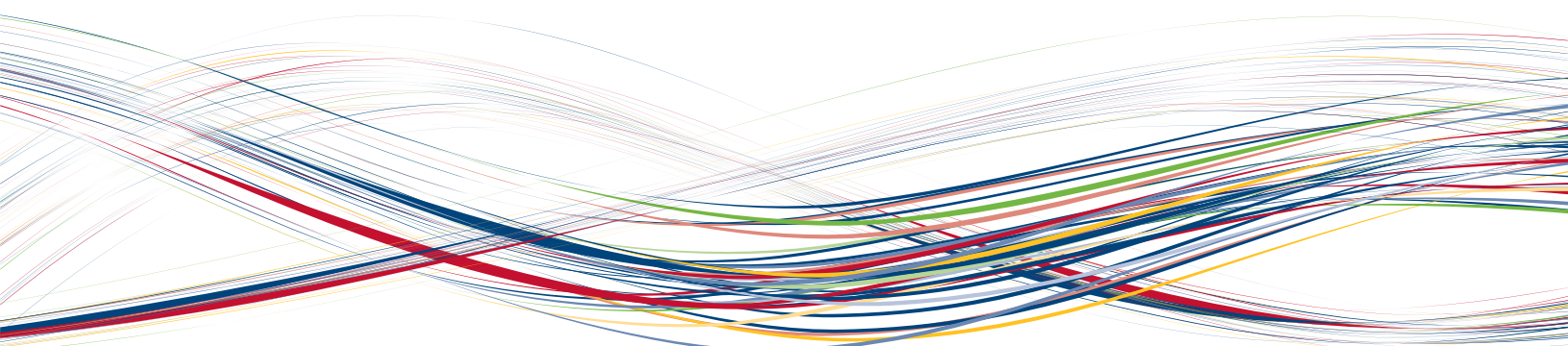
WOMEN

IN IT LEADERSHIP

A Research Study by the AIM Institute
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Executive Summary

The relatively low percentage of women in technical fields has long been an issue of concern and a topic of research globally. It has also been of concern to employers in Nebraska and the surrounding region. In a society that values diversity for economic reasons, if not for equity alone, the disparate representation of women in IT calls for action in addition to conversation. It is our hope that this study facilitates both.

In late 2010 and into early 2011, the AIM Institute conducted an interview-based study focused on one aspect of this issue: women in senior positions in the field of information technology (IT). The research design is based on themes found in the existing research literature on women in technical fields. It explores four areas: 1) early experiences affecting women's later interest in IT; 2) career paths and the influence of IT education; 3) barriers to success within IT environments; and 4) organizational practices that may facilitate women's careers in IT.

This study parallels earlier research in several ways and there are also some interesting differences in design and findings; the focus is on IT rather than technical fields in general; we interviewed people in senior positions; and the study includes both women and men. Because we talked with people who have been in IT for quite a while, several women offered a fascinating contrast between the challenges they faced in the early years of IT and today's much improved conditions. Though there were differences in how women and men perceived women's careers in IT, there were also commonalities in their views of ongoing barriers and opportunities for change. Finally, we found that women are increasingly prominent

as managers in IT organizations; the glass ceiling may not have disappeared entirely, but change is occurring.

Key findings are summarized below in three areas. An expanded discussion of findings and implications for future action is given at the end of the report.

Early engagement and IT education are important.

As with earlier research studies, we found that boys are interested in technical aspects of IT earlier in life than girls. Interviewees stressed beginning early to show girls the opportunities available in IT, since by mid-high and high school many children have formed views of IT that are difficult to change.

Barriers to women's careers in IT remain. Though they are more subtle and occur less frequently than in the past, serious career barriers still exist for women in the IT field today. A common barrier is social exclusion and women can feel alone and isolated in IT environments. Another is that women must prove themselves in IT to an extent not expected of men. Also, both women and men observed that women often are expected to modify assertive behavior that in men can be regarded as positive.

Organizational culture is a core concern. Organizational cultures change slowly, and though the direction of change is positive, it is difficult to speed the process. A progressive approach to the work/life balance and opportunities for mentoring were two important factors that interviewees thought positively influenced women's experiences.

Introduction

THE RELATIVELY LOW PERCENTAGE OF WOMEN IN TECHNICAL FIELDS HAS LONG BEEN AN ISSUE OF CONCERN AND A TOPIC OF RESEARCH GLOBALLY. IN NEBRASKA, TRADITIONAL SHORTAGES OF TECHNICALLY SKILLED EMPLOYEES HAVE ELEVATED THE ISSUE AND CAUSED MANY COMPANIES TO CONSIDER METHODS TO ATTRACT AND RETAIN TECHNICAL PEOPLE, ESPECIALLY WOMEN. IN ADDITION, IN A SOCIETY THAT VALUES DIVERSITY FOR ECONOMIC REASONS, IF NOT FOR EQUITY ALONE, THE DISPARATE REPRESENTATION OF WOMEN IN IT CALLS FOR ACTION IN ADDITION TO CONVERSATION.

Focus of the Study

For decades, the percentage of women in technical fields—science, technology, engineering, and mathematics (STEM)—has been much lower than the percentage of men. This differential has been the subject of what Caroline Simard and Shannon Gilmartin (2010, p. 2) describe as “a growing body of research” that has “documented the underrepresentation of women in technical positions in US companies.” Simard and Gilmartin note that women hold 24% of technology jobs, but represent half the workforce. They write that this occurs in a context of high demand for technical talent and management awareness of the “benefits of diversity for innovation” (p. 2).

Our study, ***Women in IT Leadership***, conducted by the AIM Institute, focuses on part of the overall phenomenon of women’s careers in technical fields. Instead of technical work generally, we concentrate on women in middle- and upper-level positions in information technology (IT). This interest in a particular part of the issue of women in technical fields comes from the AIM Institute’s mission, which includes providing a skilled workforce for the IT field. The AIM Institute thinks providing a skilled workforce involves studying barriers and challenges to constructive change in the IT field. Accordingly, this study was designed both to describe

problems dealt with by women with established careers in IT and to identify life events, such as early interest in IT and the experienced characteristics of IT education, that have shaped these careers.

It is hoped the findings of this study will contribute to better-informed practices in IT education and in organizations that employ IT professionals. Participants in our study noted that views about women in IT have changed within

the field in the past few decades. Earlier in the development of IT as a profession, some people thought women may not be suited for advanced technical positions. Today, our interviewees think there is widespread belief that women are an important part of the IT workforce but some barriers and

challenges remain. This echoes studies such as *Why So Few?*, which found that “Negative stereotypes about girls’ and women’s abilities in mathematics and science persist despite girls’ and women’s considerable gains in participation and performance in these areas during the last few decades” (Hill, Corbett, & St. Rose, 2010, p. 38). Such stereotypes may have serious effects, as pointed out by the authors of *Why So Few?*: “Girls may attempt to reduce the likelihood that they will be judged through the lens of negative stereotypes by saying they are not interested and by avoiding these fields” (p. 38).

“Women hold 24% of technology jobs, but represent half the workforce.”

This research project has been constructed with awareness of these perceptions and challenges. The intent has been to create a research design and carry out the work without preconceptions about the results or a preference for any particular perspective. It is believed that if this report is to serve as a valuable resource for decision-makers in education and in organizations that employ IT professionals, it should reflect on-the-ground conditions and realistic possibilities for change rather than personal views of women in IT.

Purpose and Objectives

Research was begun by reading several studies that have been published about women in technical fields (five key studies are described below). Overall, this earlier research found that the careers paths of women in science, technology, engineering, and mathematics begin to be shaped at an early age. Girls are often discouraged from pursuing technical fields by their male peers and by the expectations of adults and society generally. Those who persist may find the college learning environment in technical fields less than welcoming and they may turn to other areas of study that seem more connected to human relationships. Women who graduate with technical degrees often experience barriers and expectations in the workplace their male counterparts do not experience. Finally, many women who work in technical fields prefer to do so in areas such as sales, marketing, and management rather than in core technical occupations.

The purpose of this study and its research objectives were defined by building upon this body of knowledge about women's careers in technical fields, and the focus was narrowed to information technology. Accordingly, the purpose and objectives of the study are:

“Earlier studies suggest that... many women who work in technical fields prefer to do so in areas such as sales, marketing, and management rather than in core technical occupations.”

Purpose of the Study

To contribute to the research literature on women in IT and offer useful data to support projects that can improve women's careers in IT.

Research Objectives

1. Discover how women came to be interested in IT as a career. Did their interest begin early in life, in high school, college, or later?
2. Examine whether women are receiving the educational preparation they need for an IT career. How does their IT education compare to that of men?
3. Identify common barriers to career success experienced by women in IT management and executive positions. Do these barriers cause women to leave the IT field?
4. Explore possible modifications in organizational practices that could benefit women's careers in IT.

Methodology

In the fall of 2010 and into February 2011, AIM staff members conducted 69 telephone interviews, 43 of them with mid-level and high-level women in private, nonprofit, and public sectors in the Omaha-Lincoln area. We also conducted interviews with 26 men (most of whom are in the same organizations), so we could explore how men perceive these issues. Taken together, the Omaha and Lincoln areas represent a population of over one million, with a complex and dynamic field of IT-related enterprises in the three sectors. The interview questions (shown below as Appendices A and B) were written to address the four research objectives. The interviewing

process began with a set of 15 “pilot” interviews and the results were used to refine the questions. After each interview was completed, a brief demographic questionnaire was sent to the participant by email (Appendix C).

Interviewees were chosen by constructing a matrix of organizations using the AIM Institute’s extensive database of information technology professionals in the Omaha and Lincoln areas. Using this matrix, 101 potential participants were identified for interviews, representing small (up to 200 employees), medium (201 to 2,000 employees), and large (more than 2,000 employees) IT operations, a variety of industries, and a mix of IT business models. Six participating companies have more than 10,000 employees.

The initial pool of potential participants was screened using criteria of fit with the study, and some people on the list either chose not to participate or were unable to do so for various reasons. This resulted in a final list of 46 interviewees. In addition, during the interview process interviewees were asked for referrals, most of whom were added to the interview pool. This resulted in an additional 23 participants, for a total of 69 interviews. 42 of the participants represent more centralized or hierarchical IT operational structures and 27 represent decentralized IT operations.

Solid generalizations about women’s careers in IT regionally cannot be drawn from a hand-selected, non-random sampling such as this, involving a relatively small portion of the potential population of women in senior IT positions. However, an effort was made to include all sectors and organizational sizes to reflect important issues and concerns.

Participants in the study work in the private, public, and nonprofit sectors. They have a wide range of position

titles, for example: IT Manager, Executive Director for Technology, Senior Technical Support Specialist, Owner and President, Dean of Information Technology, Vice President for Information Services, Chief Information Officer, and Senior Manager for Network Services. The female participants supervise from 0 to 250 employees. Several work alone, three own their own companies, and reporting relationships include a chief operations officer (COO), chief information officer (CIO), director, vice president, or president. The male participants supervise from 0 to 1,700 employees; several have from 100 to 450 employees. Reporting relationships include a nonprofit board, a director, a chairperson, a CIO, and a vice president.

“We made an effort to include all sectors and organizational sizes to reflect important issues and concerns.”

Consistent with the intent of the research to study the careers of women in senior IT positions, almost 88% of female participants are 45 years of age or older and more than 92% have worked for 10 or more years in IT. 30% have bachelor’s degrees, more than 52% have master’s degrees, and 7.5% have doctorates. Over 36% of female interviewees have degrees in business or management and almost 39% have degrees in computer science, MIS, programming, or a related subject. (See Appendix C for details on characteristics of participants.)

There are interesting differences in characteristics of female and male participants. The men were younger overall, with almost 31% in the age category 25 to 44, compared to over 12% for women. (On the other hand, no women in the study were age 65 or over, while 2 men were in that category.) More women are single (9 women, 1 man), consistent with the idea that it is more difficult for women to balance family with demanding jobs. Distribution of income was similar for women and men, more women hold master’s degrees than do men (over 52% versus over 38%), and (an unexpected finding, given information from the interviews) more women have degrees in computer science/MIS/programming than do men (almost 39% versus 25%).

In ethnicity, over 85% of participants categorize themselves as White, with almost 88% of women and almost 81% of men in that category. There were 4 participants in the category Black or African American, 2 in the category Hispanic, 3 in the category Asian, and 1 in the category American Indian or Alaskan Native.

Interviews were conducted by telephone by all members of the research team and were recorded with interviewee permission. Interviewers stored audio files and electronic files of interview notes in a central storage area. One of the primary investigators identified themes in each set of interview notes, using the audio files to expand on important ideas and to transcribe useful quotations. The data were aggregated by women's and men's interview questions, then used to write the findings narrative.

Earlier Studies of Women in Technical Fields

Among the several studies reviewed in preparation for our research project are five that proved to be especially useful. These reports cite the work of other researchers so that in the aggregate they represent a significant body of knowledge on women in technological fields. Focus centered on these five studies because, as a group, they seem to capture important themes relating to the early experiences of girls and women with technology as well as the organizational challenges and barriers faced by women as they encounter IT in the workplace. Presented below are brief summaries of concepts from these reports that have been particularly useful in this research.

Senior Technical Women: A Profile of Success

Anita Borg Institute for Women and Technology, 2010
Caroline Simard and Shannon Gilmartin
<http://anitaborg.org/news/research>

This report describes the results from a survey of 65

senior-level women in technical fields and interviews of 27 women and men at all levels. The introductory narrative of the study (p. 2) notes the following facts about women in technical fields:

- "Women hold 24 percent of technology jobs, yet represent half the total workforce."
- "Women earned 18.6 percent of Computer Science bachelor's degrees in the US in 2007, and 18.5 percent of engineering degrees. For computer science, this represents a sharp decline from the 37 percent of women graduating with a bachelor's degree in 1985."
- There are "persistent barriers to retention and advancement," such as "isolation and lack of access to influential social networks and mentors; unwelcoming cultures; work-family conflict and family configurations that differ from those of male colleagues; organizational cultures that do not reward mentoring and employee development; and hidden bias and stereotyping that become embedded in organizational processes."
- The mid-career level is an especially difficult juncture for women, during which: "56 percent of technical women leave their companies, representing twice the turnover rate of their male colleagues" and "half of those women leaving their companies end up leaving technical fields entirely."

The Borg study includes a large number of findings, several of which are directly related to this research. Among other interesting results, they found that:

- A majority of the women surveyed had earned their highest academic degree in computer science or engineering (this was especially true of women at the senior level) (p. 7);
- At the senior level a larger portion of women are in management roles than is true of men (p. 6);
- Senior-level women are not as concerned with

work-life issues as are others and they are more concerned with professional development (p. 22).

Simard and Gilmartin give several recommendations that could help improve career opportunities for women in technical fields. Among other things, they want to increase awareness of the issue within organizations, provide mentoring for women early in their professional careers, and give senior women managers “ongoing internal mobility opportunities” to encourage them to stay with the company.

Why so Few? Women in Science, Technology, Engineering, and Mathematics

AAUW, 2010

Catherine Hill, Christiane Corbett and Andresse St. Rose
<http://www.aauw.org/learn/research/whysofew.cfm>

In this study of women in STEM fields, the authors reviewed existing research and formulated action recommendations in three areas: cultivating girls’ achievement and interest in science and engineering; creating college environments that support women in science and engineering; and counteracting bias. The recommendations shown below are directly related to the AIM Institute’s work with women in IT.

- “Teach girls that intellectual skills, including spatial skills, are acquired” (p. 91).
- “Expose girls to successful female role models in math and science” (p. 42).
- “Encourage high school girls to take calculus, physics, chemistry, computer science, and engineering classes when available” (p. 50).
- “Send an inclusive message about who makes a good science or engineering student” (p. 63).
- Actively recruit women into STEM majors (p. 65).

Counteracting implicit and explicit bias against women in science and engineering (p. 95):

- “Learn about your own implicit bias.”
- “Keep your biases in mind.”
- “Take steps to correct for your biases.”
- “Raise awareness about bias against women in STEM fields.”

Unlocking the Clubhouse: Women in Computing

Jane Margolis and Allan Fisher

The MIT Press, 2002

Margolis and Fisher explored the experiences of women in the Carnegie Mellon School of Computer Science Bachelor’s Degree program. They conducted 230 interviews during the period 1995-1999, as students moved through the program. The participants were 51 female and 46 male computer science undergraduates, and 30 nonmajors. The researchers interviewed some of the participants every semester from the first year through graduation, and some others they interviewed until they decided to leave the major, usually in their sophomore year.

“Senior-level women are not as concerned with work-life issues as are others and they are more concerned with professional development”

Using their research and findings from other researchers, the authors found that earlier in life girls are

discouraged from using computers while boys find them fascinating. In computer science courses in high school, girls feel excluded and sometimes ridiculed, so they don’t continue working with computers. By the time women take computer science courses in college, they sense they are behind male students in knowledge and ability and they change majors, dropping computer science.

Changes were made in the Carnegie Mellon program based on conclusions drawn from the study. Among other things, they created courses and workshops to bring new students without extensive programming experience or

other relevant skills/knowledge up to the level of those who had this sort of background.

The Athena Factor: Reversing the Brain Drain in Science, Engineering and Technology

Harvard Business Review Research Report, 2008

Sylvia Ann Hewlett, Carolyn Buck Luce, Lisa J. Servon, Laura Sherbin, Peggy Shiller, Eytan Sosnovich and Karen Sumberg

This study of women in corporate science, engineering, and technology (SET) positions included four surveys with a total of 4,403 respondents, 28 focus groups, and a number of individual interviews. The findings document barriers to women's careers because of corporate culture and behaviors of male co-workers.

An important contribution of this study is the identification of five "powerful antigens" that contribute to the lack of women pursuing and staying in science, engineering and technology careers. These antigens include: Extreme work pressures and time commitments, social and workplace isolation, hostile macho cultures, mysterious career paths that exclude women, and a system that rewards risk-taking behavior often objectionable to women. Of those who leave, 48% go into other SET positions in outside corporations, some start their own companies, and some go into the public sector. One-fifth drop out of the workforce ("off-ramping").

The concluding portion of the report focuses on specific measures corporations are taking to retain women and encourage those who leave to return later. Initiatives are discussed in areas such as recruitment and retention, attracting women who have taken a break in their careers, decreasing the sense of isolation, and mentoring.

Women & Leadership in Omaha

Women's Fund of Greater Omaha, 2007

<http://www.omahawomensfund.org/Post/sections/31/Files/womenandleadership.pdf>

The objective of this study "was to learn more about views of current leaders on women and leadership in Omaha, their understanding of the nature of leadership and the impact of gender on pathways to leadership" (p. 1). In addition to survey data, the study includes findings from interviews conducted with 83 male and female leaders in corporate, health care, education and not-for-profit organizations. Data gathered for the report were grouped into six themes:

- Leaders share many qualities across gender, but there are still gender differences
- A woman's sense of self is critical to her leadership
- Relationships make and break leaders
- Becoming a leader does not happen by accident
- Leaders recognize the challenges of balancing work and life
- Leaders have concerns about the future

Survey respondents chose their top "barriers to women in the workplace" from a list of such barriers. The report (p. 11) highlights these items chosen by large percentages of respondents:

- Male dominated corporate culture
- Balancing work and family
- Exclusion of women from informal networks of communication
- Glass ceiling
- Belief of management that women are less career oriented
- Few female mentors for women
- Equal compensation

Gender differences were noted in approaches to leadership (pp. 34-35). They suggested that compared to men, women are:

- More consensus oriented
- Flexible on needs and goals
- Interested in hearing other views
- Better at multi-tasking

- More empathetic and compassionate
- Sensitive to people, better listeners
- More intuitive and creative
- Better communicators
- Open to seeing the whole perspective

The report concludes with the following recommendations (pp. 62-63):

- Increase the number of women participating in leadership positions
- Modify organizational cultures to support women, specifically in the areas of recruitment, development, mentoring and work/life integration
- Broaden women's access to the informal settings where leaders often make decisions and form relationships
- Raise community awareness of women leaders
- Encourage individual women in their pursuit of leadership
- Identify community resources that support leadership for young girls and fill the gaps in service

Findings

The findings of this research in many ways parallel those of research studies that address women in technical fields broadly. These findings also show in a detailed way how the concepts identified in other studies—how girls encounter technical fields as youth, what sorts of experiences women have in college, and what it is like to work in fields which are predominantly male—apply to IT and ways in which IT may be somewhat different. Recall that this study was designed to address four

research objectives. The findings from the interviews are presented below, organized using these four objectives.

1. Discover how women came to be interested in IT as a career. Did their interest begin early in life, in high school, college, or later?

In *Unlocking the Clubhouse: Women in Computing*, Margolis and Fisher (2002) found that girls are often discouraged from using computers while boys find them fascinating. As a result, women who become interested in computers may do so later in life than men. When they take IT courses in high school or college, they may find they are behind male students in knowledge and ability,

contributing to the rate at which women switch majors, dropping IT and computer science.

Some of the female interviewees in our study said they had an early interest in computers and technology,

enjoyed math and problem solving as youth, and took computer courses in high school. Most, though, became aware of IT later, in college or during their working careers. Several of the male interviewees developed an early interest in computers, one as early as first grade. Some of the men said that as young people they liked to take things apart, solve math problems, and do programming. As one man noted, "I always enjoyed solving problems, even as a kid...how do you take a complex problem and break it down...looking at how you use technology to break down problems and solve them."

Echoing a theme encountered several times during the interviews, one woman said that young people are not adequately exposed to the career possibilities of IT. She thought it would be good for young people to have:

...a little more understanding of what does it even mean to be a computer science major.



...When you're a kid, you see sort of the user-interface side of things, you see the doctors, you see the teachers, the people you interact with on a daily basis; and you don't generally see the folks who work in the technology arena because they're behind the scenes.

2. Examine whether women are receiving the educational preparation they need for an IT career. How does their IT education compare to that of men?

Continuing a theme from findings on research objective #1 above, women in the interviews tended to think that not many of them get degrees in computer science, that more take IT courses as part of a degree or later after having graduated. However, almost 39% of female interviewees had degrees in computer science or related fields, while 25% of males had such degrees. A few women thought their education was not good preparation for their careers or it was simply unrelated, but several have IT, MIS, or business degrees they believe are well suited to their careers.

Most female interviewees are in management, own their own companies, or have moved into collateral areas such as sales. Only a few are in positions that focus on technical skills such as programming or systems design. One interviewee notes that she is not a technology person, she is a business person who uses computers. Another has always been interested in the technical aspects of IT, but only from the perspective of solving business problems and making processes more efficient.

Among male interviewees, it was noted that barriers begin in high school and fewer women than men are encouraged to explore technological fields; one does not tend to see women in computer labs and computer

science courses. However, though it can be difficult to recruit women into the IT field, one man said "there is some strong headway to make some changes," including "specific types of offerings on college campuses that are more welcoming for women in the technology field."

In the *Why So Few?* study from AAUW, Hill, Corbett and St. Rose (2010) recommend encouraging children "to play with construction toys, take things apart and put them back together again, play games that involve fitting objects into different places, draw, and work with their hands" (p. 56). They also recommend encouraging "high-school girls to take calculus, physics, chemistry, computer science, and engineering classes when available" (p. 50). At the college level, they want to: "send an inclusive message about who makes a good science or engineering student"; "actively recruit women into STEM majors"; and "emphasize real-life applications in early STEM courses" (p. 93).

Young people need to be exposed to a variety of career choices and a better story about IT should be told. We should "Look at catching people younger...college is too late...even high school might be too late."

Both the women and the men in our study agree on the importance of reaching children early with experiences and information related to IT. They think this needs to happen before high school with childhood experiences and education thus, as one woman put it, "keeping curiosity alive." In addition, it was suggested that more emphasis on IT in middle and high school would be good; young

people need to be exposed to a variety of career choices; and a better story about IT should be told. One man put it well in saying that we should "Look at catching people younger...college is too late...even high school might be too late."

3. Identify common barriers to career success experienced by women in IT management and executive positions. Do these barriers cause women to leave the IT field?

If asked to think about women's careers in IT, many people might say there are likely to be significant gender-based barriers. This common perception of barriers in a technological field parallels the findings from earlier studies of women in STEM fields summarized above. Overall, these findings show male-dominated work cultures that exclude women from informal and social communication networks, impose glass ceilings on women's career achievement, and make it difficult for women to balance work and family life. Mentoring is often inadequate and there are too few female role models in technical fields.

One product of this situation is that many women leave STEM fields in mid-career, exhibiting a turnover rate much greater than that of male colleagues. The authors of *The Athena Factor* (2008) found that 48% of women who leave their jobs in technical fields go into other science, engineering, and technology positions outside corporations, some start their own companies, some go into the public sector, and one-fifth drop out of the workforce.

Evidence of these problems was found during the study's interviews and while the data was analyzed. However, most interviewees think that workplace conditions are considerably better for women in IT than they were a decade or two ago, and most see no gender-related barriers that would keep them from achieving their career goals. From the perspective of the majority of our interviewees, women and men, significant challenges remain, but there no longer is a question of whether women will be accepted in the field.

Women's Views

The women interviewed for this study do not, for the most part, fit the profile of people experiencing significant barriers who may leave their positions. Overall, the 43 female interviewees could be divided into three categories: nine women who said they have experienced

no career barriers related to gender, the majority of interviewees who said the barriers they have experienced are not serious, and a few women who have experienced barriers they perceive as significant.

In general, many interviewees share the feeling of a woman who would rather not focus on "the men-women thing."

Many of our interviewees are of an age to remember the beginnings of the information technology era in the 1980s and 1990s, a time when bias against women in IT could make things quite difficult. For example,

one woman said: "I remember being threatened that I would lose my job if I stayed home with my daughter." The majority of interviewees think conditions for women in IT are much better than they were then, as expressed by the comment, "I think we've come a long way..." On the optimistic end of the spectrum, one woman finds being female an advantage, because she thinks men will talk to women more freely. Nevertheless, not everyone agrees, including a woman who said that over her career "not a damn thing has changed." In general, many interviewees share the feeling of a woman who would rather not focus on "the men-women thing," though further discussion reveals ongoing concerns about gender discrimination in the workplace.

Most of these concerns are about informal aspects of the workplace environment and ways that organizational cultures harbor remnants of a more sexist past. These aspects of the workplace are not perceived by most interviewees as directly harmful to what is regarded overall as a merit-based career advancement process, but they can be troubling. As has been the case in earlier research studies on women's careers, social exclusion was a recurring theme in the interviews. Women can be left out of work-related social settings, such as playing golf or going out to a bar. Speaking of the attitude of her male co-workers, a woman said "a lot of them feel like they don't treat you any differently, but you're not included in certain things." One woman was told she wasn't invited to after-work gatherings because the men didn't want to offend her with their language and behavior. Another said

there are “trips I’m not included in because I’m a female.” On a more abstract level, women perceive lingering attitudes that separate them from male co-workers.

One interviewee said “you always have to prove yourself” and another believed that women have to fight for what they get. Sometimes, it seems other people may think women don’t have time to do the job because of their families. People may believe that men know more about technology, so women have to know even more and be better than men to be taken seriously.

Women may not think there are specific organizational changes that could be made to address these problems, because “It’s a cultural thing; it’s hard to change culture.” Instead, they have developed coping strategies. One interviewee said that “I have tried to be a role model for other women.” Another, echoing the commonly known concern about bias against women who are assertive, said she tries to be “softly assertive.” An interviewee said that:

It’s a very fine line between being abrasive and being assertive. Finding that line, I think, is more difficult for a female in a highly male environment than it is for a male. You’re both faced with those decisions. But how to be the assertive leader rather than the pushy broad is a very, very fine line.

In addition to gender, ethnicity is important. It can create uncomfortable feelings; some time ago, one co-worker asked a woman of color, “why the hell are you here?” A woman in upper management noted that she is the only person of color at that level, and she said “it’s lonely.” Though there were only a few people of color in our study, it was apparent that differences in ethnicity can be a source of friction.

Some problems of gender-based discrimination go beyond social exclusion or perceived attitudes, connecting directly with personnel decisions and career advancement. One woman said of career opportunities, “if I don’t go that extra mile, it’s not going to come to me.” Another said of career barriers, “nobody comes right out and says, ‘it’s because you’re a woman.’” There continue to be male-dominated organizations in which women feel somewhat out of place, especially in settings such as meetings in which most participants are

male. And, there is “still imbalance in salary;” to avoid equal-pay requirements, apparently some companies will reclassify a position downward if it is filled by a woman.

There can still be something of a glass ceiling for women who want to move into upper management, at the level of vice president. One woman said that as a woman in a male-run field, she feels she gets passed over for promotions, pay, and recognition though she has worked as long as her male colleagues—she thinks women have fewer opportunities than male colleagues.

These problems will likely not be resolved quickly or easily, because they are related to organizational culture and human nature. One interviewee observed that:

Sometimes we promote women just because we want to put the numbers in there, without actually understanding the culture, what they can bring, and embracing that, and then almost setting them up for failure. I see that in diversity too; businesses want a diverse community, but yet when you watch their actions, they’re not willing to accept someone that’s different, they want to bring in someone that’s different from them and change them to become like them. We

don't fully open up and embrace the dynamics that they can bring because it takes time and it challenges our own beliefs as a community and as a culture of a business.

We want to say on paper we have just as many women or just as many...you know, diversity, but we really don't, we really don't want to change, and I think that's human nature, I don't think it's good or bad, I just think the world is a lot easier if it just stays the same. It makes me uncomfortable to get out of my...and think something could be different.

"I don't see women getting in it and leaving, I just don't see women going there in the first place."

This discussion of women's views of career barriers ends with observations about women who have left the field of IT. First, though, it may be helpful to summarize key points shared by our interviewees:

- To the extent bias against women occurs in the IT field today, it is usually more subtle and indirect than in years past.
- A common barrier for women is exclusion from social activities or travel during which business relationships are formed. Such activities include golf, after-work gatherings, and business trips.
- It remains true that some women feel they must prove themselves in ways that men do not. To be taken seriously, they must know more and be better in their jobs than men.
- Women often must avoid appearing to be pushy; behavior that in men can be regarded as clear and direct can in a woman be seen as too aggressive.
- In heavily male-dominated organizations, women can feel alone and isolated in business meetings.
- In some settings there may be a glass ceiling in promotion to the higher levels of management; unequal pay based on gender also continues to occur, if not commonly.

- Organizational cultures change slowly; the direction of change is positive, but it is difficult to speed the process.

Some interviewees know of women who have left the field and some don't, but our interviewees overall do not think large numbers of women, at least at their career level, are leaving IT. One said that once you're in IT, you tend to stay—if someone is going to leave, "they do it sooner rather than later." Those who do leave may do so because of the stress of the job, long hours, burnout, or lack of opportunities.

Women want time with families and it can be difficult with the long hours, nights, and weekends in IT.

Some who leave go into "softer, less technical areas" such as training, marketing, sales, or human resources. One woman thinks some have left because people view them as not as strong as a man in the position, or it is perceived that if they get training it's because they don't understand something, while men are viewed as growing their knowledge base. One woman said, "I don't see women getting in it and leaving, I just don't see women going there in the first place."

Men's Views

On the whole, male interviewees thought things are not bad today for women in IT. They see few or no barriers to women's career advancement in IT and they think promotion processes are based on merit so that everyone is treated equally. They recognize this is a change from the situation some years ago; one interviewee expressed this as he said, "There was a time when women struggled to be taken seriously as a technical person...I don't see that at all anymore.... There is no barrier from a sense of, 'Is it something that there is a natural tendency for a male or a female?' "

The interview question about why there are so few women in IT drew interesting responses from men. One

man disagreed with the premise of the question, arguing that it is untrue there are few women in IT, since there are now more than 30%. Another said there isn't a problem with inequality now, since more women are moving into IT. Others thought there might be few women in IT because there are so many career fields available to women now that are more accessible than IT, women prefer social rather than individual work, many women leave IT to be at home with children, and difficult hours and all-nighters could be a problem. One man said the gender ratio will never be 50/50, and the nature-nurture issue appeared in a comment that the reason for fewer women in IT might be genetic—there may be physiological differences between men and women that make women less suited to working.

A number of men thought that more women are going into management. They believe that women don't tend to be geeks working in cubicles, but instead serve in areas such as business analysis, security, or training; they are interested in helping, teaching, giving. Men don't think of this trend as negative; instead, some regard women as better at identifying with and managing people, while men may be better suited to situations that require an aggressive response. One man said he is more comfortable working with women, because their approach is different—softer, yet they have high demands.

To the extent gender-related barriers remain in IT, some men thought they may be self-imposed. Women may think of themselves as less capable in math and science and, speaking of female college students, one interviewee noted that the "challenge is for them to see this is a field they want to go into."

Though men didn't think there were gender-based barriers to women's career advancement, they identified challenges. These included:

"A number of men...believe that women don't tend to be geeks working in cubicles, but instead serve in areas such as business analysis, security, or training; they are interested in helping, teaching, giving."

- It can be difficult for women who are soft-spoken to make their ideas known.
- It can be harder for women to take control in meetings, unless they are "businesslike" and "rigid" [as a man would be].
 - Women need to be above average for the field to do well; they must prove themselves in a way men don't.
 - There are not enough female role models for women and until recently there were few if any.
 - Diversity may be an issue; one man observed there have not been many African-Americans in places he has worked. This is reflected in the characteristics of study participants.
- There is the stereotypical problem of balancing family with an IT career—this is a matter of time and energy.
- Speaking of stories of successful women in IT, "Without those stories, there's not a framework for being thoughtful about seeing yourself in that position."

There was not a general sense that women are leaving the IT field because of gender-related problems in the workplace, though some may move to another IT job because there might be a better organizational culture. Of women who leave, some go into the business side, but they still use IT. Some entry-level people may leave because the job is too difficult, but experienced people stay.

Nevertheless, the men were aware that some women do leave IT. They think some women may be frustrated with their career progress and some may leave for a different career, such as law. Others may leave because of childcare issues. It could be that for some, IT is temporary; one man said, "for women, IT is a stepping stone but not the end game."

4. Explore possible modifications in organizational practices that could benefit women's careers in IT.

More than a few women in our study thought that progress in women's careers depended on changing attitudes and organizational cultures rather than specific workplace policies and practices. As one woman put it, "I firmly believe it is just simply a culture." Also, when bias occurs, women may think it is not intentional, as shown in this quote: "I believe there is no ill will intended in not acknowledging or promoting... I just do not believe the values that women bring to the workplace are values that my male counterparts see as critical to the business thriving." It may be that open discussion of these issues would help; one woman said that organizations "could potentially benefit from a male-female training."

Consistent with the research literature we reviewed, these women in senior positions were not as concerned about work-life balance for themselves as younger women would be. Nevertheless, they stressed it as an issue to which organizations should be attentive. Organizational measures that were mentioned as important to work-life balance included sick leave to care for children, on-site day care, job sharing, and telecommuting.

A number of the male interviewees thought that organizational cultures and practices are already good for women and have improved considerably in the past 25 years. Nevertheless, like the women, some mentioned that work-life flexibility is important and greater use of telecommuting would be helpful. One man said that his organization has "maternity" parking spots, lactation rooms on site and maternity leaves.

Along with this apparent progress, challenges remain.

Both female and male interviewees said that more role models and women in leadership positions are important, as is the increased use of mentoring. One woman said, "I still think you see a pretty small ratio of women in the upper, the VP, CIO, CEO ranks," and another argued that women "have just as much potential to earn and excel in IT if they want to." An interviewee said that mentoring need not be restricted to the workplace, but

can begin with high school and college students. This extended quotation from an interview summarizes the importance our interviewees attached to the concept of mentoring:

"...we don't spend a lot of time mentoring each other... We just don't do a good job about saying this is something...we need to take time to do.... We need to make sure that people are getting the right support and the right resources."

The other thing that I think we are very poor at—and I think it's almost as much women's fault as anybody, is that we don't spend a lot of time mentoring each other... We just don't do a good job about saying this is something...we need to take time to do.... We need to make sure that people are getting the right support and the right resources.... Women often take things personally and it would be helpful to have a mentor suggest ignoring what is being said about you or keeping your job so you can just do the job.

Summary of Findings, With Suggestions for Constructive Change

All the participants in this study are directly connected with the use and management of information technology. Many, though, are not involved in developing or maintaining IT applications or systems, but use them in their work. This can be a difficult distinction to make; though some people are "real" IT professionals and

others instead use IT in their work, in many cases this is a matter of positioning on a continuum instead of all one thing or all the other.

This study is somewhat different from related research. It focuses on IT rather than the broader area of science, technology, engineering, and mathematics (STEM). In addition, this study includes men along with women; the researchers wanted to know how men in the same organizations perceive the issues discussed with women in senior IT roles. The findings on senior managers in IT largely parallel research on women's careers in STEM fields and reveal many of the same themes of career barriers and women's early interest in technology. This study also found interesting differences, such as perceptions of change in women's careers in IT over the past two or three decades and the commonalities between women's and men's views.

There are topics the researchers would have stressed in our interview questions had they known how important they would be to interviewees. Work-life balance is an example; it was assumed people would mention it if they felt strongly about it. In retrospect, it would have been interesting to ask about it as a secondary "prompt" question to gather greater detail about perceived needs. However, it is rare to accomplish everything one desires in a single research project. Many topics of interest and importance remain for future research, and the researchers are pleased to share with the IT community the results of this study.

These findings and suggestions for constructive change are summarized below in four key areas. This summary represents a distillation of the fascinating conversations the research team had with interviewees. It cannot do justice to the richness and complexity of those conversations, but it captures themes that appeared

across interviews, concepts that connect with related research and with AIM's focus on developing the IT workforce. It is hoped these findings will serve to reinforce current efforts or encourage new or additional efforts in each area noted in bold type, improving over the long term opportunities for women to contribute to the IT field.

"Additional effort would be worthwhile in helping girls engage with IT systems earlier rather than later, in hands-on ways that create lifelong interest and show girls that success is a matter of choice and effort, not gender."

- 1. Early Engagement.** As with other research studies of women in technical fields, the researchers found boys are engaged with and interested in technical aspects of IT earlier in life than girls. Though by definition, this study did not interview women who stayed away from IT because they weren't involved with it as children, the researchers can reasonably assume that early exposure would lead more women to choose an IT career. This suggests additional effort would be worthwhile in helping girls engage with IT systems earlier rather than later, in hands-on ways that create lifelong interest and show girls that success is a matter of choice and effort, not gender.
- 2. IT Education.** Interviewees stressed the value of showing young people earlier rather than later the opportunities available in IT, since by mid-high and high school many children have formed views of the field and IT careers that are difficult to change. In a separate study of youth perceptions of IT, AIM researchers have heard girls and boys express their lack of knowledge about career possibilities in the IT field. It appears there is more to be done to acquaint youth with the variety of rewarding IT careers. This is important, because youth perceptions of career options in IT can influence choices later in life.
- 3. Barriers in IT.** Women and men in this study largely agree that the era of open, direct discrimination against women in the IT field is largely over (though instances still occur). It

appears from these interviews that three key areas of differential treatment remain. The first is social exclusion and failure to acknowledge the value of diverse voices, which can cause hurt, discomfort, and subtle or occasionally substantial damage to careers. Second, it continues to be true that women in IT have to prove themselves to an extent that men do not. Third, there is sometimes a tendency to accept strong, direct communication and leadership in men, but to find it uncomfortable or inappropriate in women. Overall, additional efforts to increase awareness of the effects of these barriers would be worthwhile.

4. Organization Culture and Practices. Progress in IT careers for women and ethnic minorities depends on organizational cultures changing over time. This study's interviewees have seen

the culture of acceptance of diversity improve during their careers, but they also think that much remains to be done. Training, education, mentoring and role models are crucial to progress. Organizational practices that offer alternatives and creative solutions are an essential component of successful management of women in IT—among other things, these practices will address balancing time-intensive IT jobs with home and personal needs. This is not only a matter of altruism or moral action, it is a matter of effectively using valuable human resources to benefit the organization. All these things can translate into daily workplace behaviors, practices, and role modeling by leadership that are within the power of individuals and organizations to shape, change, and implement.

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Appendices

Appendix A

Interview Questions for Women

- Thanks for agreeing to be interviewed today.
 - I work with the AIM Institute.
 - We're conducting a study of women's careers in the information technology field.
 - The results could assist educators from the region in attracting women to IT, and it may help employers recruit and retain employees. It could also contribute to knowledge nationwide about women in the information technology field.
 - The interview should take about 20 minutes.
 - Your answers will be used for research purposes only as part of AIM's study of women in IT.
 - No individual names or identifying information will be used in our report's findings.
 - If it's acceptable to you, I would like to record our interview so I may accurately summarize your thoughts later on. Is that ok?
 - After the interview, if you have any questions or concerns, please contact me at 345-5025, ext. ____, or at my email address, _____.
 - We will send a copy of our final report to each person we interview.
 - Also, after the interview we would like to send over a brief demographic data sheet for you to fill out and return—it will just take a couple of minutes.
 - Ok, my first question is...
1. How did you happen to become interested in information technology? What was the career path that brought you to your current position?
 - Did your interest in IT begin in high school, college?
 2. What are your responsibilities in this current position?
 - Position they report to.
 - How many employees report to them.
 3. Was your educational background good preparation for your career?
 - [If yes, ask:] In what ways?
 - [If no, ask:] What could have been better?
 4. During your career in IT, have you experienced barriers or challenges that might not have affected your male colleagues? Could you describe them to me?
 - [If no, optional prompt:] Other research suggests that women often experience these kinds of career challenges
 - Specific issues to explore:
 - With people in what sorts of positions?
 - Over what issues?
 - With what effects?
 - What actions did they take to resolve the problem?
 5. Do you know of women who have left the IT field? Why do you think they left?
 6. Thinking about the challenges to women in IT that we have discussed, are there things that could be changed in organizations to make things better?
 - Job descriptions.
 - Organizational structures and reporting relationships.
 - Behaviors of supervisors and/or co-workers.
 - Training, rules, organizational ethics.
 7. Do you have any last thoughts for me, things we should think about as we study the results of our interviews and draft a report?
 8. Are there other people like you who are making an impact in technology that you think we might want to talk to?



Appendix B

Interview Questions for Men

- Thanks for agreeing to be interviewed today.
 - I work with the AIM Institute.
 - We're conducting a study of women's careers in the information technology field.
 - The results could assist educators from the region in attracting women to IT, and it may help employers recruit and retain employees. It could also contribute to knowledge nationwide about women in the information technology field.
 - The interview should take about 20 minutes.
 - Your answers will be used for research purposes only as part of AIM's study of women in IT.
 - No individual names or identifying information will be used in our report's findings.
 - If it's acceptable to you, I would like to record our interview so I may accurately summarize your thoughts later on. Is that ok?
 - After the interview, if you have any questions or concerns, please contact me at 345-5025, ext. ____, or at my email address, _____.
 - We will send a copy of our final report to each person we interview.
 - Also, after the interview we would like to send over a brief demographic data sheet for you to fill out and return—it will just take a couple of minutes.
 - Ok, my first question is...
1. How did you happen to become interested in information technology? What was the career path that brought you to your current position?
 - Did your interest in IT begin in high school, college?
 2. What are your responsibilities in your current position?
 - Position they report to.
 - How many employees report to them.
 3. Have you worked with women in technical IT roles? Have you seen barriers or challenges for women in IT that might not have affected their male colleagues?
 - Explore types of barriers and situations, outcomes.
 - [If no, optional prompt:] That's interesting; women often experience career challenges that men don't...
 4. Do you know of women who have left the IT field? Why do you think they left?
 5. Overall, Why do you think there are so few women in IT?
 6. What could be done in organizations to make things better for women in IT?
 - Job descriptions.
 - Organizational structures and reporting relationships.
 - Behaviors of supervisors and/or co-workers.
 - Training, rules, organizational ethics.
 7. Do you have any last thoughts for me, things we should think about as we study the results of our interviews and draft a report?
 8. Are there other people like you who are making an impact in technology that you think we might want to talk to?

Appendix C

Characteristics of Participants

[Totals do not add to 69 because not all participants provided information in each category.]

Age						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
25 to 44	13	19.4	5	12.2	8	30.8
45 to 64	52	77.6	36	87.8	16	61.5
65 and Over	2	3.0	0		2	7.7
Total	67		41		26	
Marital Status						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
Married	56	84.8	32	78.0	24	96.0
Single	10	15.2	9	22.0	1	4.0
Total	66		41		25	
Number of Children						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
0	12	20.3	9	24.3	3	13.6
1	3	5.1	3	8.1	0	0
2	23	39.0	11	29.7	12	54.5
3	16	27.1	11	29.7	5	22.7
4 or more	5	8.5	3	8.1	2	9.1
Total	59		37		22	
Approximate Annual Income						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
Up to \$99K	14	21.2	9	22.0	5	20.0
\$100K to 149K	27	40.9	17	41.5	10	40.0
\$150K +	25	37.9	15	36.6	10	40.0
Total	66		41		25	
Years in the IT Field						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
Under 10	5	7.6	3	7.5	2	7.7
10-19	30	45.4	19	47.5	11	42.3
20-29	23	34.8	14	35.0	9	34.6
30+	8	12.1	4	10.0	4	15.4
Total	66		40		26	



Years in Current Position						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
Under 3	21	31.3	13	31.7	8	30.8
3-9	30	44.8	15	36.6	15	57.7
10-19	12	17.9	10	24.4	2	7.7
20-20-29	4	6.0	3	7.3	1	3.8
Total	67		41		26	

Ethnicity						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
Amer Ind/Alaska	1	1.5	1	2.4	0	0
Asian	3	4.5	1	2.4	2	7.7
Black/ Afr Amer	4	6.0	3	7.3	1	3.8
Hispanic	2	3.0	0	0	2	7.7
Hawaiian/Pac Isl	0	0	0	0	0	0
White	57	85.1	36	87.8	21	80.8
Total	67		41		26	

Education						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
High Sch/Equiv	2	3.0	2	5.0	0	0
Associate	3	4.5	2	5.0	1	3.8
Bachelor's	23	34.8	12	30.0	11	42.3
Master's	31	47.0	21	52.5	10	38.5
Doctorate	7	10.6	3	7.5	4	15.4
Total	66		40		26	

Major Field of Highest Degree						
	All Interviewees		Women		Men	
	#	%	#	%	#	%
Business/Mgt	24	40.0	13	36.1	11	45.8
Comp Sci/MIS/Prog	20	33.3	14	38.9	6	25.0
Other	16	26.7	9	25.0	7	29.2
Total	60		36		24	



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