

IT Education and Workforce Participation: A New Era for Women in Kenya?

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Abstract

While Sub-Sahara African women have historically assumed the roles of both housewives and subsistence farmers, they have had few opportunities to participate in the modern economies of the region. However, this trend is changing with the exponential growth of information and communications technologies (ICT), giving many Sub-Sahara African women access to computers, the Internet and other related technologies. Based on the work of a four-member research team from Kenya and the US, this paper examines the integration of female college students into the formal ICT work sector in Kenya. We do so by examining major bottlenecks and enablers to such integration from historical and contemporary perspectives. Using an interpretive approach, we conducted thirty-two interviews with women in an ICT program offered by a university in Kenya. Our findings indicate that women were highly optimistic, embracing ICT as a practical mechanism for achieving entry into the labor market. However, they perceived significant structural barriers, such as public policies that failed to facilitate the development of the ICT sector, gender discrimination by employers, and training that provided them with insufficient technical skills to enable them to effectively perform in the workplace. These findings largely confirm the gendered perspectives found in similar studies conducted in other countries. However, what appear as global perspectives are informed by the local causes.

Keywords: Women, Information and Communications Technology, Information Society, Sub-Saharan Africa, Kenya.

Introduction

ICTs are important tools that provide the [Sub-Saharan African] women access to lifelong learning and training, to productive assets, and to credit. Neglecting to give women access to these tools not only deprives them and their families of income, but reduces the skill-level of a nation's human resource, limits national productivity, and bars a country from being competitive in the global market (International Telecommunications Union, 2003).

In this paper, we begin to examine the extent to which women in Kenya are realizing the potential benefits of information and communication technologies (ICT). In a special issue of *The Information Society* on ICTs in developing countries, Sahay and Avgerou (2002) stated that ICTs “are expected to play a key developmental role” (p. 73) in low-income countries. They also noted, “many see in these technologies the potential for turning around uncompetitive industries and dysfunctional public administration, and for providing unprecedented opportunities for the information-intensive social services, such as health and education” (p. 73). In the same study, they lamented the acute lack of research focused on developing countries. This absence is extremely troublesome given that developing nations are home to at least two thirds of the world’s population (South Centre, 2006). The Sub-Saharan Africa (SSA) region, which is home to 34 of the 50 poorest nations of the worldⁱⁱ, is almost nonexistent in much of the mainstream ICT research (Mbarika et al., 2005; also see Appendix A).

The concept of the “digital divide” has been useful in articulating disparities in access to ICT (Payton, 2003; Kvasny and Truex, 2001), particularly in the developing world, and it has informed the development of policies and programs to promote social inclusion and economic development (Mbarika et al., 2005). More recently, the digital

digital divide discourse has broadened to include not only issues relating to access to ICT, but also the capability and capacity to leverage ICT for the advancement of historically underserved populations, the development of local content on an ICT platform, and the creation of appropriate policy measures to cultivate an enabling environment for ICT use (Isaacs, 2002; Kvasny 2005; Meso, Datta and Mbarika, 2006).

In the developing country context, digital divide policies and programs typically utilize ICT to advance modernization, promote social and economic development, and improve the status of women. Gender inequality tends to slow economic growth, according to Christiaan Poortman, World Bank Vice President for the Middle East and North Africa:

No country can raise the standard of living and improve the well-being of its people without the participation of half its population. Experience in other countries have shown over and over again that women are important actors in development—to hold them back is to hold back the potential for economic growth (World Bank, 2004).

There are several reasons for this link. Women can play an instrumental role in lifting their families out of poverty by participating in the labor force. Women are more likely to invest their earnings in their children, and to assume critical, life-sustaining responsibilities. Research further suggests that development policies and programs that assist women and girls can have a major impact on a country's overall development (World Bank, 2004; Hafkin and Taggart, 2001; Liu and Wilson, 2001).

In using the term “development”, we borrow from the work of Sen (1999). Sen argues that development is a process of expanding the real freedoms that people enjoy. This differs from theories of economic development, such as growth in gross national product (GNP), technological advances, and rise in personal incomes or social

modernization. While GNP and personal income provide means to expand freedoms, Sen goes beyond economics to include other determinants of freedoms such as health care, education, political, and civil rights. Development requires the eradication of sources of oppression, such as gender and racial discrimination, social and economic deprivation, neglect of public facilities, intolerance, and over-activity of repressive states.

International aid organizations and Western corporations are increasingly focusing on ICT as a means of facilitating development and empowering women, especially women in the “Fourth World”. In addressing gender discrimination as a worldwide phenomenon, Castells (1998) defines the “Fourth World” as the socially excluded sectors of the populations all over the world, First to Third, which lack connectivity to the global economy. The Fourth World, which includes Sub-Saharan Africa, rural South America, parts of South East Asia, and inner cities in the U.S. (where some suffer poverty worse than many parts of SSA), stands as an underclass. Fourth World women, even in the developed world, live at a substantially lower economic state compared to their male counterparts.

While the market for ICT-related jobs has dwindled in recent years in the developed world, the same is not true for the SSA region. In most African countries, ICT is still in the early stages of diffusion (Mbarika et al., 2005), and skilled human capital to leverage ICT continues to be in high demand (Aynu, Okoli and Mbarika, 2003). Yet, a large percentage of skilled male ICT workers migrate to other countries, especially Europe and the US. This creates a large window of opportunity for women to play an important role in the burgeoning ICT workforce in the SSA region. To leverage

such opportunities, a growing percentage of Kenya's women are now obtaining some form of ICT education to enter ICT careers by either filling positions in the many companies that urgently need technology workers, or by starting their own businesses.

Our research therefore sets forth to examine the question: *How have women responded to and have been empowered by ICT-focused educational initiatives/programs?* To examine this question, we seek to understand the specific differences that ICT training has made socially, economically and politically for urban-based women in an ICT educational program at Strathmore University in Nairobi, Kenya.

In what follows, we describe the longstanding barriers, such as access to education and traditional divisions of labor, which help explain the low participation rates of women in ICT careers. Next, we describe our research approach along with data collected from women in Kenya. We conclude by offering our analysis and interpretation of this data.

Literature Review

In this section, we discuss gender equity issues in terms of SSA in general and then narrowing the focus to Kenya alone. On the one hand, the SSA region experiences gender inequalities in the work place in many sectors, including technology (Kifle, Solomon, Mbarika and Okoli, 2004). Even though ICT has become a global industry, there are traditional bottlenecks that have hindered SSA women from participating effectively in the formal technology labor force. On the other hand, because the women in this region have always been active in agriculture, local trade, and other economic pursuits, most working women are employed in the "informal sector," which is defined

as “economic activity that takes place outside the formal norms of economic transactions established by the state and business. It is not clearly illegal in itself. Generally, the term applies to small or micro-businesses that are the result of individual or family self-employment” (Cross, 2001, p. 512).

For instance, SSA women grow 80% of the food produced, and yet few are allowed to own the land they work. They work twice as long as men, often 15 to 18 hours a day, but often earn only one tenth of the wages of their male counterparts. Our claims that SSA women experience discrimination should in no way be taken to mean that women in developed countries do not experience discrimination. Similar to their American counterparts, SSA women experience a gender gap in both economic and social contexts, which negatively impact the degree to which they are able to participate in the workforce and attain comparable compensation (Hafkin and Taggart, 2001). According to the Dice 2004 Annual Salary Survey, the pay gap between U.S. women and men remains in the double digits at 11% (Dice Inc., 2005). Among Kenyan and other SSA women, this disparity is perhaps even greater.

As SSA women attempt to move into contemporary forms of employment and finance, they face a variety of legal, economic, and social constraints. For instance, it is often more difficult for women to gain access to ICT resources and credit. Agricultural extension and formal financial institutions are biased toward the male and against the female clientele, despite women's major role as producers. In fact, some laws in many SSA countries still treat women as minors. In Zaire, for example, a woman must have her husband's consent to open a bank account. As a result, they are less equipped than men to take advantage of the income-generating opportunities that have emerged in the

region. On the positive side these factors have spurred the growth of women's groups and co-operatives that provide loans, health care, educational, and other relevant services to women (See the Federation for American Women Educationalistsⁱⁱⁱ, and FLAMEE^{iv}). They also provide wage-earning activities for many women who are excluded from formal sector work and credit services. While we are excited by the potential of micro-credit and informal sector work to uplift women in the Fourth World, we must remain cognizant of the familial, social, legal, and cultural constraints within which these women continue to function. We must also consider the constraints that diminish their agency and power. Moreover, we should not ignore the huge gap which remains between the lives of these women and the lives of more privileged women and men (Narayan, 2004).

Traditional Bottlenecks Specific to Kenya

With a population of about 30 million people, Kenya is one of the most populous SSA countries. Nearly 53% of Kenya's population is under the age of 20. Demand for education by this demographic group is extremely high, but access to education is limited. As is the case with most SSA countries, the roots of the problem lie in the colonization of Kenya. The colonial masters were focused on exploiting low-cost labor and rich natural resources, not developing human capital. When educational opportunities were provided, priority was given to the sons of chiefs. Eventually, a growing number of families started to send their children to school. In most Kenyan families, the boys were given priority over girls to attend school. The women were basically seen as housewives and child-bearers (Lewis, 1999).

As years passed, Kenyans began to have more opportunities to learn, and the government of the country, the private sector, and foreign investors/donors invested substantially in education at all levels. While education in Kenya has grown significantly since the colonial era, still only 68% of children are enrolled in primary education programs. Enrollment in secondary education drops to 23.1% (World Development Indicators Database, 2005). The percentage of secondary school graduates who attend college is 17.5%, with more men attending than women. However, many men do not complete their college education (AllAfrica, 2003). Although greatly improved, adult literacy rates are still at about 70% in Kenya (Encarta, 2003). Despite Kenya's approximately 20 universities, a large number of high school graduates still cannot secure admission due to intense competition for limited seats.

Competition has grown more intense because women who were once excluded from higher education are now enrolling in these institutions. In fact, female enrollment has now surpassed male enrollment in private institutions (See Appendix B for Kenya's government statistics). Similarly, as presented in Figure 1 below, the literacy gap between males and females in Kenya is closing rapidly. Gender does not appear to be a significant barrier to women's access to educational institutions.

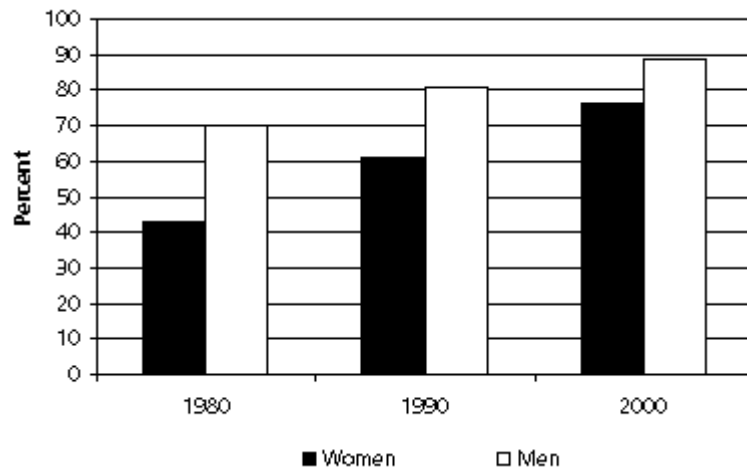


Figure 1: Kenya's Gender-Based Adult Literacy Rate for Years 1980, 1990 and 2000

Source: World Resources Institute

<http://earthtrends.wri.org/text/population-health/country-profile-96.html>

Despite these statistics, which largely support the fact that Kenya has made great strides in female education, women remain under represented in technology related fields. Interestingly, while female students make up only 30% of total enrollment in the public universities, the corresponding figure at private universities is 54.5% (See Appendices B and C). Most women enroll in private universities because they fail to secure admission into public universities which have stringent requirements for the hard sciences such as physics and mathematics. Kenyan girls may avoid the hard sciences for several reasons including their perception that these subjects are 'hard', lack of study time as they often have more family responsibilities than their male counterparts, and lack of focus on future careers such as computer science which require both physics and mathematics. This lack of career preparedness may also be attributed to career counselling which deters girls because it is assumed that they will either get married or pursue traditional careers.

These factors contribute to the relatively poor performance of girls on the Kenya Certificate of Secondary Education (the equivalence of the U.S. high school diploma) (Ngome, 2003). A limited number of Kenyan women (less than 2%) study in science, technology, and engineering curricula, according to Hafkin and Taggart's (2001) study of ICT education among women in developing countries. Figures from Kenya's Ministry of Education, Science and Technology show that even within the last five years, female enrollment in technical institutions such as in National Polytechnics and other tertiary technical institutions is about 3/5 of male enrollment (See Appendix C). For example, in 2003, the ratio of male to female enrollment in technical institutions was 19,831 to 12,887. While this ratio mirrors those found in the developed world, there is need for research on how current Kenyan female students enrolled in these technical programs feel about technology in general and ICT in particular. Any attempt to use findings from the developed world to draw inferences for Kenya (and other SSA countries) will not only be limiting but may also portray an erroneous picture that is far from reality, given inherent socio-economic and cultural dissimilarities between the two worlds.

Anand and Sen (2003), however, provide a gender-equity-sensitive indicator (GESI) to analyze gender deprivation among countries. The model mathematically depicts systematic and large differences between groups based on factors such as regional populations, racial ethnicities, gender, and socio-economic status. Anand and Sen (2003) assess gender inequality in achievement based on distinct dimensions such as literacy, biological life expectancy, earnings, and employment. Generally, in developing countries like Kenya, literacy averages are higher among men than women. Life expectancy, on the other hand, is higher, by about 5-years, among women. Wage

disparities between men and women are asymmetrical in nearly all societies, including developing countries. Women work as hard, or perhaps harder, than men, but their work is often uncompensated. Therefore, it is difficult to quantitatively measure women's economic contribution.

Parting with Tradition

Breaking down the traditional barriers for SSA women presents a challenge to the government agencies, international development agencies, educational institutions and companies working to broaden the participation of women in ICT-related fields. However, SSA also presents many opportunities. Despite their relatively low involvement^v, women represent a potential economic force in the region, partly because they constitute a larger part of the population and partly because of the sheer size of the female workforce (Hafkin and Taggart, 2001; Liu and Wilson, 2001).

Women are under represented in well paying, professional positions and this restricts their ability to contribute substantially to the burgeoning ICT workforce. The few women engaged in ICT-related employment typically hold clerical positions, which often do not lead to promotions. Hence, women are often limited to data entry and other low pay and low status jobs (Liu and Wilson, 2001). The few women who have reached the managerial and consultant ranks are likely to have been trained privately by their employers. There is also a small number of women who have obtained their computing qualifications abroad, mainly in the USA, Canada, and UK.

Given that women were not able to participate fully in the industrial economy, it is important that we examine women's participation in the developing information

economy. With growth of ICT in Africa in general and Kenya in particular, women are being afforded increasing opportunities for participation. For example, women own many telecenters (cyber cafés), and a growing proportion of women are joining ICT education and literacy programs. Our study examines one of such program at Strathmore University in Nairobi, Kenya.

Selecting an ICT Project

When we began this project, we considered many types of ICT initiatives aimed at increasing the involvement of women in ICTs. For instance, the Cisco Learning Institute (CLI) and the Cisco Systems, Inc. established the Gender Initiative in 2000 to increase women's participation in the field of information technology by making ICT training and career opportunities more accessible. Successful participants receive Certified Networking Associates (CNA) and the Certified Networking Professionals (CNP) credentials which are highly recognized in the IT industry (CISCO, 2004).

We also considered ICT programs being offered by international aid organizations, such as the World Bank's Global Information & Communications Technologies (GICT) department. GICT serves as the World Bank's core department for ICT programs, projects, and policies directly aimed at helping women become more socially and economically independent in SSA and other developing countries (Global ICT Department, 2004).

After careful deliberation, we decided against these types of organizations. We do not view the involvement of multinational interests such as Cisco Systems and World Bank as inherently empowering. Quite the contrary, we see the current discourse

around development and ICT as tools for women's empowerment as somewhat worrisome because gender equality tends to be narrowly constructed around ICT skills and access. It furnishes a neat, technical solution to the complex, longstanding and pervasive problem of gender equity. Therefore, we found it crucially important to examine ICT in relation to the needs, rights, and perspectives of women. Moreover, we wanted to gain these insights by engaging with the women who are subjects of the discourses produced by these large and powerful multinational entities.

To the best of our ability, we wanted to "hear" the voices of the women. In this regard, the possibility of working with women who were fluent in English was enticing, as this was the common language among the research team. Considering all of these factors, we decided to study students enrolled in the Bachelor of Business Information Technology program at Strathmore University in Kenya. We realize the price of making this choice, however SSA women have hardly been studied. Our study will be a first step in that direction. In future projects we plan to study other groups of SSA women, especially those living in rural areas.

Research Approach

The question guiding our research is, how have women responded to and been empowered by ICT-focused educational initiatives/programs? Given traditional bottlenecks, empowerment relates to women's capacity to make meaningful education and employment choices which result in transformative outcomes. Central to the notion of empowerment is agency – the ability to define one's goals and act upon them. Agency encompasses observable action as well as meaning, motivation, and purpose

that individuals bring to their activity. Our notion of empowerment is primarily concerned with the women's sense of agency to define ICT and pursue career-related goals, even in the face of opposition from others.

We believe that empowerment means more than just getting computer hardware and software, Internet access, and IT skills to women who previously had no access to these resources. Women should be afforded opportunities to play an integral part in the emerging digital environment. Gender discrimination in the workplace and in schools, social class, illiteracy, and geographic location are structural barriers to women's empowerment. ICT is then overlaid onto an existing landscape of entrenched gender, class, ethnic, economic, and other geopolitical power divisions. Given these structural obstacles, we seek to understand how women fare in ICT-related educational programs and employment fields.

However, a danger associated with writing about disadvantaged groups is that the researcher may contribute unwittingly to the oppression of the group by making statements which could be interpreted to support popular prejudices (Herring, 1996). Accordingly, we are careful to avoid generalizations that could contribute to the pessimistic discourses about women in SSA. We are also cautious about romanticizing technology and seeing only its positive and beneficial impacts. The notion of ICT as empowering women is situated in the logic of technology determinism. Such forms of determinism give far too much weight to technological change in explanations of social change. ICT is, therefore, not considered as inherently empowering for women. Instead, we are interested in examining the ways in which these technologies are being absorbed into existing gender politics.

Finally, we acknowledge that our reading of the data is informed by our position as scholars of African-American and African descent residing in the US. While geographic location separates three of the researchers from the women in our study, we do share commonalities that we believe help us to provide a culturally sensitive analysis of the data. We, like the women in our study, are members of the African Diaspora engaged in ICT-related professions. The African Diaspora represents the global experiences of people of African descent who are dispersed throughout the world. We have held ICT-related positions in both industry and academia. Based on the challenges we face as members of a profession in which we are woefully under represented (Payton, White and Mbarika, 2005), we share in the experience that comes from being an outsider, an Other. We have firsthand experience of being seen as incompetent simply because of gender, race, and/or country of origin. Further, we continue to contend with the devastating effects this psychological and institutional violence imposes on our self-esteem and confidence. We genuinely appreciate the inner strength and integrity of Kenyan women who, despite these obstacles, continue to fight for a place in this profession because we, too, are engaged in a similar struggle.

The unveiling of our backgrounds and statement of solidarity with our informants is an important philosophical orientation underlying this research. Feminist scholars argue that academic and other knowledge are always socially situated, and are always produced by positioned actors mediating various research locations and relations (Haraway, 1988; Hooks, 1989; Collins, 1998). These positions shape the conceptualization, conduct, and dissemination of research. Hence, the practice of constructing academic knowledge is a relational rather than a straightforward process.

Although no point exists from which to objectively evaluate the merits of any particular knowledge, what has usually been taken to be legitimate knowledge has been based primarily on the lives of men in dominant races, classes, and cultures (Allen, 1998). In locating our social position, we explicitly express our connection with the African Diaspora. In doing so, we seek to produce an account which is embodied, locatable, and makes it possible for readers to make critical and politically progressive connections to the findings.

Data Collection

In July 2004, we conducted structured interviews with 63 students (32 women and 31 men) enrolled in the Bachelor of Business Information Technology program at Strathmore University in Kenya. In this paper, we focus exclusively on the 32 female respondents. All of the women were in their third or fourth year of study, and were enrolled in the “Social Impact of ICT” course which was being taught by the fourth author. All the women are of Kenyan nationality, recent graduates from secondary schools, 20 to 22 years of age, and mostly single. The women were primarily fee-paying students who financed their education through work, loans, and scholarships. Most of the women have completed or are currently engaged in an internship with a company. These characteristics of the informants are summarized in Table 1.

Table 1: Characteristics of Informants and Interview Process

Number of interviews	32
Gender	Female
Age	20-22
Year of undergraduate study	3 to 4 years
Industry attachment (internship)	Completed or in-process
Date of interviews	July, 2004
Length of interviews	20 – 25 minutes

Informants	Adhiambo Badu Chanya Eshe Kaya Marjani Nyamu Thairu	Anyango Becca Dalila Fola Kesia Nazi Saada Wanabui	Arusi Bibi Deka Hasina Loiyan Ndila Selam Zahara	Aza Burhani Desta Issa Makena Neema Sharik Zalika
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We constructed an interview guide based on a prior study of the conceptualization of ICT by African American women in a technology education program in the US (Kvasny, forthcoming). We believe that the questions contained in this interview guide are appropriate because they seek to uncover how women in the African Diaspora think about ICT, the values they ascribe to ICT, their strategies for appropriating ICT to improve their life chances, and the barriers that they face in doing so. The themes and representative questions are included in Table 2^{vi}, and are consistent with prior studies in developing countries as documented by the Women's ICT-Based Enterprise for Development^{vii} and the site's well-regarded case studies by scholars such as Morgan, Heeks and Arun (2004).

Table 2: Research Themes and Questions to Study's Participants

Themes	Interview Questions
Motivation for learning about ICT	In your opinion, why do women participate in this ICT program? What is at stake if you do not learn about ICT?
Challenges & barriers to learning about ICT	What barriers and challenges did you face today as you prepared to come to class? As you move forward to leverage the ICT skills that you've gained, what roadblocks or challenges do you face?
Attitudes / Beliefs about ICT	What were some of your initial beliefs about computers when you first came to class? How have these initial beliefs changed as a result of your experience in this course?
Value of the ICT training and access	In what ways did the training meet and/or fail to meet your expectations?

	<p>How will you use your ICT skills to improve your quality of life?</p> <p>What aspects of the program would you change?</p> <p>What aspects of the program would you not change?</p>
Definitions of the Digital Divide	<p>In your own words, what is the digital divide?</p> <p>Some people say that the divide has been bridged since we have provided people with computer and Internet access and training. Do you think so?</p>

The fourth author administered the interviews, with each interview lasting approximately 20-25 minutes. During the interviews, each woman was instructed to reply to the questions by anonymously writing her response in a booklet. The booklets were then sent to the co-authors in the US for analysis. This interview process resulted in an average of 4 pages of hand-written responses for each interviewee (approximately 128 pages of interview texts). The interviews were highly structured with each woman receiving exactly the same questions in the same order. While there were no opportunities for follow-up questions or clarification, the US researchers conducting the analysis did consult with their colleague in Kenya. Together they negotiated their understanding of terms and other unfamiliar cultural aspects. For instance, two US-based researchers did not understand the term “attachment” (an internship). The US researchers also found that while all the women discussed gender, only one woman explicitly talked about race. This led the US researchers to inquire further about the demographics of the interviewees and racial / gender identity in Kenya. These discussions helped the US researchers to better understand the Kenyan context, which led to a more culturally sensitive analysis of the data.

Data Analysis

We employed well-established techniques for analyzing qualitative texts by finding illustrative themes which emerge across interviews (Glaser and Strauss, 1967; Miles and Huberman, 1994). Two US researchers began by independently reading and coding five interview texts. The coding utilized a grounded approach that was not informed by *a priori* theory. Weekly meetings were held to discuss the interim analysis. The codes were synthesized and refined, and an additional batch of five interviews was selected for analysis informed by the codes. This process was continued for two months until all of the interviews were coded.

Next, the texts with similar codes were typed and grouped together for more focused analysis. We began clustering low-level codes into more abstract themes and finding relationships among the higher level themes. During this phase of focused coding, the entire research team met to share perceptions about the data and to build consensus on the analysis. It was important that we accurately captured the women's perspectives, and provided a credible account of the research.

Findings

The findings presented in this section are organized around five themes which guided the interview process – motivations for learning about ICT, challenges and barriers to learning about ICT, attitudes and beliefs about ICT, value of ICT training and access, and definitions of digital divide. To protect the identity of informants, we fabricated the names used to identify each of the quotations. In what follows, we use these quotes to discuss each theme.

Motivations for Learning about ICT

Nearly one-third (10 out of 32) of the women who participated in the ICT educational program at Strathmore University did so because they perceived the field to be new and exciting. Some like Ndila were simply “participating since it seems like a very marketable course”. Others like Marjani were drawn by a “curiosity of IT which is a new field in Kenya and a very dynamic field which affects all aspects globally.”

Women also believed that there were substantial employment opportunities upon graduation because there were few ICT professionals competing for jobs. For instance, Dalila remarked, “IT is a fairly new industry in the country. Thus when Strathmore University designed the program, it was well respected in the country. The main motivation for me, as a woman, was due to the opportunities it would open for me in the future. By the time I was joining this program, there were very few IT positions in the country, but this is gradually changing.” There was also the perception that “not many people in Kenya have this sort of information [and] this is because currently Kenya lacks professionals in this field” (Issa). Not only were jobs seen as plentiful, they were seen as well paying. Makena, for instance, thought that “IT programs have proved to be more well paying careers than other technical careers in the country. This is due to the wide usage of IT in various sectors such as banking firms. This provides a good basis for the women to work in a different sector while applying their IT knowledge.”

Thirteen of the women were motivated by the instrumental desire for career success. They wanted to be more competitive in the job market. Aza believed that “Women participate in the program in order to gain IT skills that they will be able to use in the outside world. IT tools are becoming a necessity in the business world and thus by taking this program, women will be able to gain more skills that are applicable in the

job market.” Some women were more entrepreneurial and saw ICT as a way to start their own businesses. According to Arusi, “I want to be a business person in the future. I want to own my own business in Kenya so I need business and management skills. However, I also realize the role of IT in today’s society. I want to know how to link the two – business and IT –and how I can use the two to develop my ideas of a business I hope to start”. In a similar fashion, Deka noted that “Since I have the basics of IT and my course provides a grounding I can build up on my own, I could start my own enterprise using this knowledge”. For women such as Zalika, business ownership was once a dream that now can potentially be achieved. “Given that I would like to learn IT so that I run my own IT firm in future. If I do not take this chance to learn IT, then my dream will not be accomplished”.

However, the majority of the women (23) were motivated to attend the ICT programs due to reasons related to gender equality. For instance, Badu reflected, “Since the initiation of gender equality, women have been able to overcome all sorts of challenges and exploit their potential to the fullest. As a result of this there has been more of women participation”. For her, ICT offered an opportunity for overcoming oppression and competing head on with men. Neema stated, “Gone are the days when there were specific jobs/careers for men and women. Women now want the challenge.” Similarly, Saada believed that “Women want to be able to compete equally in this profession that has been considered a man’s profession for a long time.” ICT represented a vehicle that would enable women to engage in a profession which has been historically perceived as a male domain. Chanya observed, “The reason for participating in this program is to broaden the job skill and not stick to the stereotype

that certain jobs are for women. IT has impacted many areas and even women realize that there are job opportunities that come with this vast growth. They therefore want to be part of it.” Women wanted to break out of stereotypical roles and take advantage of perceived employment opportunities. For instance, Tamu remarked, “The simple reason why women participate in this IT program is because men do the same thing. Equality is something that women have all been fighting for and have accomplished their goal. If a man can participate in IT, why shouldn’t a woman do the same thing?”

Women also appeared to be strongly influenced by national policies and public discussion which promote gender equity. There was the belief held by women such as Adhiambo that “women have a better understanding of the technological world so that when we begin our career we will be able to successfully represent other women in our country”. The desire to represent Kenyan women was also salient in Eshe’s reflections on changing societal norms on parenting girls. “Due to the empowerment of women in recent years, more and more parents are becoming interested in the girl child and encouraging the girl child to become active in society. More and more women want to play an active role in their society and in the world, and this being the information age, women want to be involved in the ICT sector (not to be left behind their male counterpart).” There was a sense of societal change in the women’s discourse; challenges may exist, but gender relations were improving. For instance, Becca stated, “As a Black Kenyan woman, it is my decided opinion that women participate in IT programs due to the rising gender awareness in the country. It is as a result of the awareness that women can compete on an equal platform with men, and the Gender Equality Act that we have been empowered to participate in IT”. Badu also reflected on

women's increasing involvement and participation. "Since the initiation of gender equality, women have been able to overcome all sorts of challenges and exploit their potential to the fullest. As a result of this there has been more of women participation". Nazi also acknowledged the growing opportunities for women - "these days it's not a matter of this is for women and this is for men."

In summary, women's participation in the program was motivated by two strategic factors. First, women sought to achieve gender parity and assume an active role in changing society. Second, women were motivated by more tangible economic and entrepreneurial aspirations for participating in the formal workforce. The responses were future oriented and predicted a variety of grave outcomes for those lacking knowledge of ICT.

Value of ICT Training and Access

All of the women we interviewed held beliefs about the training that centered on very practical and production oriented uses of ICT. Theory was greatly devalued while practical experience was prized. Ndila lamented, "I expected a more practical course and more in-depth coverage in areas such as programming, systems development, web design, etc." The women desired a strong technical competency in a wide variety of skills. Anyango noted, "I expected to emerge as an IT expert with knowledge of the foundations and development of technology. I expected to be up-to-date on the technology trend and be able to manage information systems, develop them, code, implement, manage, and have ICT at my fingertips".

The practical orientation extended beyond the notion of skills. Overall, a dozen women stated that they expected to easily gain employment upon completion of their

training. Issa simply stated, “It will guarantee an instant job.” Most were more conservative like Loiyan, who stated, “My expectations were to gain IT knowledge and skills that will prepare me for the job market and enable me to get a well paying and fulfilling job.” Technical skills were seen as mandatory in the job market and in everyday life. Deka avowed, “IT is becoming a basic need for people in their various careers and day to day life. Not having some knowledge of IT means difficulty in even accomplishing simple tasks such as using an ATM. Not having the basics of IT could close doors to jobs that are not essentially about IT”. Seventeen of the 32 women mentioned severe employment consequences for those without technical skills. Dalila notes:

Every employer is currently demanding that you have basic IT skills. And as many more people study IT, this demand is increasing and its no longer surprising to be asked to have additional networking skills even for us graduates (to be). Employers are asking for additional professional qualifications, e.g. Oracle, Cisco, etc. Thus currently it is actually a requirement to possess IT skills in any meaningful job that you apply for. So its either you learn IT or risk your future.

The focus was clearly on technical skills and competencies, with non-technical skills seen as complementary. When asked what aspect of the program would they not change, most women agreed with Selam’s response—“the business aspect of it, the management part”. Arusi also noted, “Through the mix of business/management and finance course with IT courses, I now see my dream coming true.” Women such as Chanya thought that the project assignments were useful. “I would not change the project assignments that are given be it individual or group. I think they are a helping tool to better learning for any student in IT.” The industry attachment was also highly regarded by the women such as Hasina who expressed, “Industry attachment gives us

chances of employment after completion of the course". In this sense, both the projects and internships supported the practical, hands on orientation which motivated the women's participation in the program.

Nearly every woman used terms like "expert", "competence", and "competitiveness", which reflect the practical business orientation of the education that they are receiving. Dalila captured these themes in her response:

When I enrolled I hoped that by the time I would be graduating I would be a competent IT professional able to integrate my IT knowledge into a business environment. That I would be able to streamline an organization's process effectively with IT so as to increase their competitive advantage. In short, I hoped that I could be an IT expert with sufficient business knowledge. I also expected to be more competitive than other students who are pursuing computer science as I would have all the knowledge that they had plus business knowledge thus I could be more marketable than them.

Several women mentioned a lack of confidence which tended to result from a negative experience during the industry attachment. Nazi shared her experience:

It [the program] failed in that non-availability of computer hence little exposure to the IT world. I didn't learn a lot in response to attachment i.e. during attachment one realizes that they really don't know, lectures not delivering that well enough i.e. student read to pass not understand. No confidence. It has met this expectation in that we know more than we did when we first came. I can handle few but not all problems with computers.

Dalila reiterated this view:

The training failed to meet those expectations as I am in my fourth year but I still don't think I have the required technical skills that the market is demanding. My business unit was well taught but my IT classes lacked to impart the knowledge that I had hoped to acquire. I learned about networks, databases, websites but it was too theoretical. I cannot immediately apply this knowledge, something I proved when I went for my attachment. We are hired to be managers but nobody will employ us directly into management positions. We have to start as techies then climb the ladder. I feel we lack the technical skills.

Thus, while women placed high value on technical skills and business prowess, the translation of these competencies from the classroom to the workplace was difficult. Class projects and lectures were helpful but did not provide sufficient practical skills. This resulted in a lack of confidence when women went out into the workforce.

Challenges and Barriers to Learning about ICT

The women mentioned a number of challenges and barriers which they believed limited their ability to translate their classroom learning into paid employment. Wanabui, for instance, suggested the lack of specialization and depth as potential barriers. “[The] challenges we face is that we are equipped with skills of all areas of IT but not experts in those areas while other people in the field from other universities specialized in an area of which they are good at and are employed for.” Neema made a similar point when she noted, “To a certain extent it did meet my expectations as it gave me an insight. But on the other hand, it is so wide that it only gave basics of the IT world which proved to be disastrous out in the field. We have very basic knowledge of some IT skills.” Anyago added, “Unfortunately, I think the training is too theoretical and application of it in an actual working environment is difficult”. Desta observed that the training failed to meet her expectations “because it has been based more on theory than on practical or pragmatic situations. Thus I am not able to really relate what is actually happening in the real world with what I have actually learnt in class.”

Perhaps most importantly, from the standpoint of empowerment, the women acknowledged several structural barriers that limited their ability to realize their goals. These barriers occurred at three levels: policy, societal and organizational. At the policy level, three women remarked that unclear government regulations resulted from policy-

makers' lack of appreciation for ICT. These unclear regulations were believed to stymie growth in the IT sector. For instance, Makena stated:

The government regulation of IT issues is not clear, therefore making it difficult for IT growth in Kenya. This makes it costly to apply IT knowledge in the field. The lack of appreciation of IT for policy makers creates a roadblock as the policies in place do not adequately give IT professionals a fair ground to work as bureaucracy is still in place. The IT roles are not defined in the ministries therefore ICT management in the country doesn't give a good basis for policy makers to make decisions.

Aza also asserted, "The major challenge would be lack of technical skills due to the lack of practical training and also the government regulations on IT may limit the growth of IT in the market."

Nearly every woman discussed issues related to the societal context. The most common response was that many people in Kenya still don't understand ICT. Zalika lamented, "The main challenges are that in Kenya, IT has not gained as much popularity as the Western countries. To educate the population first is one big roadblock". Similarly, Fola observed, "A major challenge I face is lack of the IT awareness among other people. Most people who do not undertake the IT training have no idea what it's all about. It is therefore hard on people in this field since not many people are conversant with it." Costs were seen as a major roadblock. "Financial challenges as most of the IT skills require a lot of money"(Kaya). There were also large personal costs of time and money associated with the rapid level of technology change. Saada's experience is typical of the women interviewed. "I have to keep up with the ever changing technology through reading the latest journals, searching the web for new discoveries and also listening to any IT news be it on radio or television".

Finally, at the organizational level, Zahara used the metaphor of a pioneer to describe women's experience in labor market. "Since we are pioneers of this course, most organizations and companies out there really don't understand what this course entails and according to them they don't know what positions we can hold in their companies." Zahara further posited, "Most organizations in Kenya do not fully appreciate the value of good IT in managing business processes". Eleven women echoed this pessimistic stance on employment opportunities based largely on companies lacking the wherewithal to take advantage of the skills that they possessed. Adhiambo's quote is fairly representative—"Not many companies in Kenya see the need for people who can mix IT with management of business, they are still expecting technical people, so my experiences are going to be hard to get." Makena expressed similar sentiments. "IT popularity is growing at a slow rate and most organizations are at early stages of developing their IT department. Thus part of the knowledge gained in this training may not be useful as organizations may not be willing to invest fully in IT..." Eshe sensed that organizations have a limited understanding of the role that computers and technology professionals play in organizations. "People in this country do not know much of IT. When they see you are an IT person, they think that your job is to fix their computer whenever it crashes." Dalila further noted that "there is a discrepancy between what we are taught and what the market wants. Thus the main challenge is to define what I am capable of in the market and still be able to fulfill the market's requirements of an IT professional". Dekka also expressed apprehension with "taking IT where there has never been IT might be difficult. If I got hired in an organization that isn't far advanced in IT, I could meet resistance."

Three women mentioned employers' lack of trust in graduates with little experience. Loiyan reflected on limited experience from the perspective of the employer. "People in the job market are not willing to take on students who lack experience in IT. Not many people are willing to give students a chance to gain the experience needed to enhance their IT skills". Ndila said, "People (employers and others) are not willing to trust IT graduates who have no experience and also being quite young is a challenge to me." Deka talked about limited experience from the perspective of the job seeker. "I have some experience but this could be insufficient to compete with those who have been in the industry longer. Hence, finding a job has bright prospects but might prove challenging."

Desta was one of two women who expressed concerns regarding gender discrimination. "As I move forward, the challenges that I foresee is that being female in a male dominated field, then it requires me to work hard and even have more qualifications." Saada thought:

I am uncertain about whether or not I will get a job in the field I have studied in. This is because unemployment is a large problem in Kenya. There is a problem that because I am a woman, employers may not think that they should give me a job working in IT, so I may never fully get to use all that I have learned to do, work that I want to do.

In summary, women identified barriers related to practical technical skills, national IT policies and society's overall lack of knowledge of and experience with ICT. Business organizations in Kenya were also seen as lacking the capacity to take advantage of the mix of business and technical skills possessed by the women. Organizations were also perceived as not hiring inexperienced employees and a small number of women raised concerns about gender discrimination.

Attitudes and Beliefs about ICT

Technology was seen as a fundamental imperative by nearly all of the women. Ndila and others believed that, “IT is the wave of the future, the worker heading towards a completely digitized era. By not learning IT, one will be at a loss in the not too far future since the majority if not all aspects of your life will have to collide with IT applications.” Marjani expressed similar sentiments at both an individual and national level. “IT affects most areas of our lives – communication, business, health – and is therefore an area hard to ignore. Not learning IT means we will lag behind in developing our country.” IT was also seen as the driver of social change because, as Bibi stated, “IT is the driving force of the world and the current environment. In order to get a job and a good job one needs to have IT knowledge”. The national implications of ICT were also seen in Wanabui’s response. “If you do not learn IT then the business world will be hard to participate in due to the lack of understanding...And if the people do not learn IT, the future of Kenya will be at stake as it is a developing country that needs to fully adopt IT in all systems.” According to Becca, “those with IT knowledge will be the power-brokers”.

Eleven of the 32 women discussed the idea of lagging behind and being marginalized and oppressed if you lack computer skills. Desta warned, “If you don’t learn IT then one will not be able to grasp various opportunities that it provides. Without knowledge in IT, one is marginalized as the rest who are keen on IT are able to use what they know to their advantage”. Similarly, Eshe cautioned, “If you do not take part in IT then you get left behind. And the world is moving at a very fast pace because of IT and one has to know IT so as not to get left behind”. Women, like Deka and Eshe,

perceived new forms of oppression and exploitation for those lacking IT knowledge and skills. “Those who know about IT will oppress us who do not know by overcharging us for services. For example, when cyber cafes started, they were charging 5 shillings (about \$.06 US dollars) per minute of service but [now] that people know the costs they charge 1 shilling per minute”. Arusi also believed that without IT skills, “It gets more costly to reach my goals since I’ll have to depend on others who know, have the info. This means that there is a risk of being taken advantage of because of my ignorance.” While some see new forms of oppression, others perceived new forms of freedom and opportunity. For instance, ICT may be beneficial “because it has enabled women to multitask i.e. work at home while still nursing their babies via the use of portable computers” (Fola). Nazi suggested, “IT makes life easier, faster and at times cheaper.” Makena contended, “the competitive edge that IT knowledge gives to job seekers makes it worthwhile for people to learn more about IT. The wide usage of IT in all sectors has made IT an essential tool to have in order to get work in most of these sectors.”

Meanings and Impacts of the Digital Divide

The final group of questions focused on women’s self-defined meanings of digital divide. With this question, we were interested in seeing how the women connected issues of social inequality with ICT. It provided a way to hear them talk about their family members and peers who were not engaged with technology. What was most salient from this discussion was that only one woman believed the problem had been solved. Everyone else emphatically stated that the divide has not been bridged. Looking closer

into their reasons for coming to this conclusion, we found that the divide still existed at the personal, national, and global levels.

On a personal level, the divide was seen as a gap in both access to technology artifacts as well as the know-how to make effective use of these artifacts. Nineteen of the women adopted this standpoint and defined the divide as the big difference between “computer literate and computer illiterate people” (Issa), “those who have easy access to technology and those who don’t” (Selam), and “those who have some IT skills and those who don’t have” (Thairu). Each of these definitions was structured as binary oppositions, which is consistent with the simplified constructions found in much of the prevailing digital divide discourse (Kvasny, 2005; Kvasny and Payton, 2005).

This same dichotomy was used to structure the national and global levels. Women used language, such as the gap that exists between “third world nations and industrialized countries in terms of IT” (Hasina), and “developed nations and developing nations in terms of knowledge about IT and how it can be used to better living standards” (Nyamu).

At the national level, Aza expressed this dichotomy as “the way that some parts of the country that is the rural areas lack information technology tools while the urban centers have most IT tools”. This formulation of rural versus urban areas was consistent across the responses.

At the global level, the divide was defined by Ndila as:

The difference between the level of technology in the more developed countries and that of the developing nations. Yes we at this learning institution have been provided that but all this is mainly concentrated in the major towns. The rural areas have been left far behind such that the average for the country is quite low compared to that of the developed nations. Thus we cannot say it has been bridged based on the numbers/statistics of the cities.

In addition to these dichotomies, which are typically used in digital divide discourses, the women used terms that suggested a human rights perspective. For instance, Eshe affirmed that “the digital divide is whereby you have in one region people know and get to have first hand experience of technology while in another area (in the same region) people do not even have a clue as to what technology is and how it can revolutionize their lives for the better”. This quote clearly brings out the inequities that exist among people who co-exist in close geographic proximity. Dalila noted, “A lot needs to be done because as of right now there are so many bright Kenyans who have had no access to any of these IT components. It will be a while before it can be completely bridged”. Implicit in all of these definitions is the assumption that greater ICT access and know-how will lead directly to improved living conditions.

Moving on to the question of why the divide has not been bridged, sixteen women noted that access to technology alone is not sufficient. Becca stated, “The digital divide is not merely about providing computers or software but having the necessary know-how to apply these software and hardware. Hence the digital divide can only be bridged if the people know and apply IT concepts to their lives”. Desta also believed that, “having access to free computers, software and Internet-based services does not necessarily mean that the gap has been bridged. There has to be understanding of this technology and using the technology to obtain benefits. Until there is access to these resources and its understanding even in remote places then the digital divide hasn’t been bridged.” This consideration of literacy, resources and spatial dimensions is essential because it denotes the way that digital divide overlays existing systems of inequality (Payton, 2003).

In the final quotes, we see a rather fatalistic narrative that speaks to the frustration of being situated in a nation which is always being measured according to Western criteria. Selam lamented, “It will be hard to catch up with the West. In fact, it will be impossible. This is because IT works in levels. You move from one level to the next. And since IT is always changing, by the time we move to another level, the industrialized countries will be yet at another level”. Marjani also noted, “The digital divide has not been bridged because the IT field is very dynamic and advances in IT are rapid. Some places in Kenya don’t have access to Internet or telephones while other parts of the world there is e-government.”

Discussion

In this study, we examined women’s responses to an ICT education program as well as the extent to which this experience was viewed as empowering. In terms of responses, it is interesting to note that many women offered insights that mirror the perspectives held by women in other parts of the world. For instance, ICT was seen as a male-dominated field which offered numerous, highly desirable and well paying jobs. They believed that women could perform equally as well as men, and the only significant barrier would be their individual ability to acquire skills and knowledge. Women also believed that ICT and gender equity were inextricably linked to the broader development goals of the nation. The practical skills and instrumental value of ICT were highly prized, as were competencies in both business and technical skills.

What is different is that these perspectives were arrived at from very different reference points. We noted, for example, that the perception among Kenyan women

that ICT expertise could lead to a promising career may stem from scarce training opportunities available in that country. We also observed that the women portrayed themselves as active agents in several different ways including their capacity to acquire technical skills, their capacity to compete with males in the classroom and in the workforce, and their capacity to assist in the national development efforts. Thus women were to play a central role not only in the development of individual career outcomes but also in the elevation of the entire nation. We suspect that the current perceptions of ICT as a career with promise may be due to both a sense of scarcity and the public discourses on gender equity and development.

Margolis and Fisher (2002) note that female computer science majors continue to underestimate their abilities. We see this same disturbing trend in our data. When the Kenyan women entered the workplace, they questioned their competence. This questioning seemed to emerge from their inability to actually leverage their classroom learning in a real organizational setting. They favored practical, hands-on knowledge and yearned to become experts who could tackle real life computer-related problem. They sensed that those without ICT would be left behind. They had hoped that the skills provided by their program would allow them to escape this trap.

This perspective is similar to the dominant digital divide discourses. From the women's narratives, we found that the digital divide was generally viewed as a technological phenomenon. Women talked primarily about differences in skills, knowledge and access which occurred at individual, regional, and global levels. The point that stood out in these narratives was that these differences were not random; the most economically, educationally, and spatially disadvantaged people were also those

most likely to experience the ill effects of the digital divide. Van Dijk and Hacker (2003) argue that new technology reinforces social inequalities because of the cumulative nature of IT skills and technological innovations. There is an unending need to retool and learn, and this places additional burdens on the most disadvantaged groups who already exist at the brink. Familiar recitations of dichotomies such as rural / urban and developed / developing countries in the formulations of the digital divide emerged from the Kenyan women's collective voice.

Kvasny and Truex (2001) studied how the objectification of the "have-nots" can be used to structure the social world and to encourage oppressed people to believe that social hierarchies are natural and inevitable. In doing so, the digital divide discourse may reinforce racist attitudes by overlooking uses and adoption of ICT by people of color (Payton, 2003) and by citing people of color as continuously lagging behind others (Kvasny, Sawyer and Purao, 2004). This discourse contributes to a negative self-fulfilling prophecy (Hacker and Mason, 2003). Indeed, a few women in our study commented on the impossibility of developing countries ever catching up with the West.

This perception may have been reinforced when the women gained the technical skills yet could not find desirable employment. As noted by Sen (1999), technical aptitude alone will not address the freedoms of women in the society at large. Thus, ICT is not "the solution;" it is a skill-seeking, potential income earning alternative. In the absence of structural changes in rights for women—including inheritance and property, reproductive health, education, poverty alleviation, safety from violence in all forms—ICT will most likely do little to significantly impact women's lives in a positive manner.

These findings suggest that there are continual needs for organizational, individual, and national policy remedies. Moreover, the absence of these policies are not isolated to developing countries and, in fact, continue to plague women in highly industrialized nations, such as the US and Finland (Berki and Payton, 2005). Despite these global similarities (Kenya, US, Finland and other nations), policy interventions can result in different outcomes for women in IT workforce participation. For instance, if organizations cannot absorb these newly trained graduates into the workforce, then several questions come to the fore. Do companies in Kenya have a real need for technology workers, or is the training of technology works unnecessarily being pushed by well meaning corporations and international aid organizations? How does the gender and empowerment agenda habituate the politicians, educators, and citizens of Fourth World nations to embrace the progressive discourse related to ICT development? How does this discourse lead women to establish exaggerated beliefs about technology and empowerment?

When thinking about empowerment, concepts, such as autonomy, self-determination and emancipation come to the fore, and lead us to think about empowerment as a good thing that would help create a more humane and just world. Empowerment can be seen as operating between the strategic and practical levels (Molyneux, 1985). Practical gender interests are enacted when women try to fulfill the roles assigned to them by virtue of their gender. Very few women in our study talked about their stereotypical gender roles, and this is perhaps because we interviewed young college students who have yet to assume the roles of mother and/or wife. Only

one woman talked about the ability to use ICT to multitask between childrearing and work outside of the home.

Strategic empowerment occurred when women attempted to challenge these stereotypical roles and associated responsibilities. For example, women often talked about equality as being “something that women have all been fighting for”, and “if a man can participate in IT why shouldn’t a woman do the same thing?” ICT was seen as beneficial to women because “it will enable us as women to compete fully with men in jobs”. Taken from these responses, it seems that women were being empowered from a strategic level as they saw themselves as autonomous, emancipated individuals fully aware of their rights. ICT is generally seen in very material, instrumental ways which directly affect their participation in the formal workforce and the modernization of their country. This is positive because strategic gender concerns are seen as more empowering than practical gender interests (Giffin, 1998).

A third and more pessimistic understanding of empowerment is that of a zero-sum game in which gains to women are inevitably losses to men. This last understanding is a potential obstacle to the participation of women in the IT workforce. This zero-sum conceptualization of empowerment did not materialize in our data. Women saw themselves as peers who were able to compete with men in a male- dominated profession. They wanted to help in the development of their country and never spoke of advancing women at the expense of men.

However, as we move beyond individual responses, we must consider how women will act on these feelings of empowerment. Technology alone cannot act as a direct cause of women’s empowerment. Therefore, we do not support the argument that

ICT will change women's lives in a profound and positive way. Instead, we find that strategic empowerment can only occur in the context of broader social change, and even Western, technologically advanced nations continue to grapple with the roles of women in the ICT workforce (Berki and Payton, 2005).

Moreover, in developed nations where access to ICT training appear plentiful, women tend to opt-out of IT careers after a short period in the workforce or after reaching a career plateau, often due to the increased demands associated with family/work balance and organizational barriers. This happens in spite of increasing possibilities of telecommuting. Despite these findings from the Western world (CIO Magazine, 2000; Black, et al., 2004; Berki and Payton, 2005), our data suggest that Kenyan women welcome training and educational opportunities. The practical challenges associated with family, work-life balance and 24 x 7 career demands seem to be issues that Kenyan women will contend with as consequences of ICT careers. We suggest that these consequences can have different outcomes than those which occur in the Western world – as family dynamics and national infrastructure vary in SSA countries. Hence, while we observed similar global perspectives and report them in the findings, these local conditions can result in diverse outcomes.

At a national level, even when women enter into IT careers, issues of pay equality persist and impede workforce participation. As Elisabeth Rehn, Minister for Equality Affairs in Finland, observed:

There was quite a lot of hope that new technology could break down the gender division in the labor market and narrow the wage gap between women and men, especially when we learned in the middle of 80's that more than half of those using new technology in their work are women. However, it seems that the rapid technological change has so far had the

opposite impact in promoting equality in these essential aspects (Rehn, 1991, p. 280).

In sum, the work of Arun, et al. (2004) suggests that advances in the ICT workforce for women in developing countries rest on livelihood assets. Among these are social, human, natural, physical, and financial capitals. The absence or presence of these capitals influences the creation of and access to transformation structures and processes (e.g., policy, societal and organizational aspects) among women, in general, and SSA women, in particular – given that gender influences livelihood.

Conclusion

In this paper, we examined the extent to which broader ICT educational opportunities are being translated into women's empowerment and opportunities to participate in the IT work sector. Interviews with 32 female students enrolled in Strathmore University in Kenya indicated that women were highly optimistic, embracing ICT as a practical mechanism for achieving entry into the male dominated, technology workforce. However, their narratives also displayed the complexities inherent in these ICT educational efforts. Women desired cultural change, on the one hand, that provided them with educational and employment opportunities equal to those enjoyed by men. ICT access and training was seen as an imperative for their individual career success as well as the development of the entire nation. On the other hand, they perceived significant structural barriers, such as public policies that failed to facilitate the development of the ICT sector, the unwillingness of employers to hire inexperienced workers and women, and ICT professionals with skills that exceeded the capacity of

organizations to take advantage of them. They also viewed the technology profession as male oriented. Our findings largely reiterated the gendered perspectives found in similar studies conducted in other countries, but they also provided insights into the localized causes into what appear as global perspectives.

While women in our study showed very positive attitudes towards gaining an IT education, despite expressed challenges, more research is needed in this area. Given that we concentrated our study on an urban university, our findings cannot be generalized to the rural parts of Kenya which constitutes over 70% of the country's population. Our study, like most studies that portray a positive view of ICT in sub-Saharan Africa, tells the story of the urban African "elites." Future studies should concentrate on these rural "forgotten" parts of Kenya and other developing nations. This will not only extend the debate on the disenfranchisement of certain groups from access to ICT, but also the disenfranchisement of given regions, such as these rural areas. Taken together, these studies would present a more comprehensive and viable platform for sustainable ICT growth. Lastly, researchers may use this work to inform subsequent studies of ICT, African women and empowerment. The meanings and values ascribed to ICT, strategies for appropriating ICT and barriers to ICT-related careers must be understood from and contextualized in the situated knowledge of people who are subjugated in relation to the dominant Western view. These oppositional ways of knowing and experiencing ICT can contribute to socially just remedies for alleviating the digital divide and gender inequality.

Appendix A



Figure 1. Map of Africa
Sub-Saharan Africa is south of the Tropic of Cancer (23½° N)

Appendix B

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY Student Enrolment by Gender in Universities, 1999/2000 - 2003/2004

INSTITUTION	1999/2000		2000/2001		2001/2002		2002/2003		2003/2004*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Public Universities										
Nairobi	8,419	3,523	8,383	3,341	10,638	4,345	10,737	4,623	9,603	4,406
Kenyatta	4,188	3,008	4,510	3,019	10,638	4,314	10,737	4,998	10,753	5,023
Moi	3,483	2,312	4,753	1,960	5,469	2,310	6,275	2,638	5,804	2,812
Egerton	7,131	2,842	5,998	1,968	6,816	2,284	6,975	2,387	6,908	2,444
Jomo Kenyatta(JKUAT)	2,511	626	2,992	1,288	2,565	1,115	3,184	1,404	3,203	1,454
Maseno	2,338	1,385	2,596	1,538	2,531	1,518	3,505	2,130	3,429	2,178
Total	28,070	13,696	29,232	13,114	38,656	15,887	41,412	18,181	39,699	18,317
Private Universities										
Private Accredited	3,186	3,816	3,093	4,050	3,122	4,089	3,476	4,163	3,650	4,371
Private Unaccredited	777	346	876	472	949	511	748	742	763	757
Total	3,963	4,162	3,968	4,521	4,071	4,600	4,224	4,905	4,412	5,128
TOTAL	32,033	17,858	33,200	17,636	42,727	20,486	45,635	23,086	44,111	23,445
GRAND TOTAL	49,891		50,836		63,214		68,721		67,556	

* Provisional

Enrolment data includes parallel programmes of the respective universities

Source: Ministry of Education, Science and Technology

Appendix C

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY Student Enrolment by Gender in Technical Institutions, 1999 - 2003

INSTITUTION	1999		2000		2001		2002		2003*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
National Polytechnics										
Kenya Polytechnic	2,720	1,739	2,979	1,228	4,523	1,385	4,586	1,984	4,488	2,016
Mombasa Polytechnic	1,784	1,141	1,943	801	3,567	1,092	3,149	1,401	2,647	1,390
Kisumu Polytechnic	689	441	646	266	785	240	947	410	937	421
Eldoret Polytechnic	664	425	833	343	647	515	1,527	660	1,523	684
Total	5,858	3,745	6,400	2,639	9,522	3,232	10,209	4,455	9,595	4,511
Other TTIs										
Technical Training Institutes	5,942	3,799	4,960	3,280	5,295	4,160	5,547	4,539	5,436	4,448
Institutes of Technology	4,875	2,040	4,380	2,895	4,674	3,672	4,898	4,007	4,800	3,927
Total	10,817	5,839	9,340	6,175	9,969	7,832	10,445	8,546	10,236	8,375
TOTAL	16,675	9,584	15,740	8,814	19,491	11,064	20,654	13,001	19,831	12,887
GRAND TOTAL	26,259		24,554		30,555		33,655		32,718	

Source: Ministry of Education, Science and Technology

* Provisional

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ENDNOTES

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ⁱⁱ Kenya is [not among the 34 poorest nations](#).

ⁱⁱⁱ <http://www.advanceafrica.org/index.html> Accessed: August 2006.

^{iv} <http://flamme.org/index.html> Accessed: August 2006.

^v We acknowledge that many African countries have made major improvements in women's involvement in their governments, but the reality is that those are just

exceptions, and not the rule. These countries still have a long way to go in the area of gender discrimination.

^{vi} The complete interview protocol is available by request to the authors.

^{vii} <http://www.womenictenterprise.org> Accessed: August 2006.