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Gender-based analysis of Information Technology skills Development among Business Computing Students

Bada Joseph Kizito
Department of Business Computing, Makerere University Business School, P.O Box 1337, Kampala Uganda
jbada@mubs.ac.ug

ABSTRACT

This research focuses on gender-based analysis in information technology skills development among undergraduate students in a University. In the first part of this research we performed literature review to find out expectations of female students in computer science curriculum and to establish factors that hinder women from practicing IT profession. From literature, we discovered several factors that block women from practicing Information Technology profession. These include: poor attitude towards technology profession, gender discrimination by employers, social issues such as family commitments, and believe that IT is a male profession. We then administered questionnaires to 90 University students offering courses in Information Technology and Business. Our survey results show that there is no significant difference between male and female students' interest in programming courses and perception that business courses are easier than information technology courses. However, there were some exceptions from qualitative results in which some female students described IT profession are male career and time-consuming for mothers. We developed gender-based guidelines for teaching IT courses in a University. More research is needed in this area in gender-based analysis of challenges facing IT practitioners in industry.

Keywords— *Information Technology curriculum, Gender-based analysis*

1. INTRODUCTION

Gender-based analysis is the study of particular policies, practices, programs and materials in order to better understand their impact on the different sexes [1]. The purpose of gender-based analysis is to learn how the experiences of males and females might or might not differ under similar circumstances and to give guidance and direction when developing or designing such policies, programs and materials [1, 2]. Naturally, any initiative or program is expected to benefit both sexes, but in practice, they are unconsciously designed so that the value derived is unequal. When there is a substantial under-representation or absence of one gender, a gender-based analysis looks specifically to determine why this might be the case and what could be done to address this differential [2].

The two key concepts that underlie the goals of a gender-based analysis are equality and equity: equality considers equal access to resources irrespective of an individual's sex, and equity considers that what is fair is not necessarily equal since removing barriers to access for females does not automatically address inequitable treatment once they are given access, nor the culture which created the inequalities [3]. ICTs are expected to play a key developmental role in poor countries [4]. These technologies have 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. Education is perhaps the primary enabler of women's ability to participate in the development and growth of nations, but education has not historically been accessible by women in Sub-Saharan Africa. Under colonial rule, for instance, access to education was restricted as African children were prepared for the roles deemed appropriate by the imperialist power brokers [5]. Schools were accessible to sons of chiefs; the type of education these children received prepared them for both religious and political motives that mainly benefited the imperialists. These practices set precedents that were subsequently followed by African families, thereby giving priority to the education of boys, leaving girls uneducated to later serve as housewives. Prior to independence, few African children attended school beyond the primary education level and by 1960, only 25% of primary school-age children were in school, compared to twice that number in Latin America and Asia. Consequently, one of every two women in the region is illiterate. In the last decade, technical education necessary to gain computer and related ICT skills still remained hard to get for many Sub-Saharan African women [5]. Women who enroll in technology education programs are often prepared for lower paying careers as secretarial work, garment manufacturing, home economics, and hairdressing. The report published by Information Technology association of America [6] indicated that the IT field demands technical expertise that requires a strong educational background in mathematics, science and technology. Degrees in computer science, engineering, and related fields are among the most common requirements for IT jobs. The report also indicated that in United States the number of women earning

undergraduate degrees in computer science and engineering are far much less than the expected. This under representation can be explained by the following impediments that many women face in their STEM educational and career paths: a lack of role models and networking opportunities, an education gap coupled with the digital gap, a lack of access to a technology related career, a lack of commitment from industry and academe, and perception of IT as a white male career.

It is evident that globalization has given women in developing countries greater opportunities in formal education and careers in STEM related disciplines. United Nations focused on IT as the third most important issue facing women globally, after poverty and violence against women [7]. Accessibility to IT and its potential in income gap reduction between men and women was documented in tele-education initiatives in sub-Saharan African nations including Cameroon, Tanzania and Botswana [8].

Most women in the developing countries are at the lowest part of the digital divide, further removed from the information age than the men [9]. This is as a result of women's lower levels of literacy and education, as well as negative attitudes towards girls' achievement in science and mathematics. ICTs are powerful tools that can assist to bridge disparities and support socio-economic development. In this research, we first investigated the differences in interest and attitude male and female students have towards Information technology courses they do in a University. We then investigated the attitudes of the two sexes towards practicing Information technology profession after graduating from a university in a degree that equips them with skills in Information technology (50%) and business (50%). Lastly, we investigated the problems students face in learning information technology courses, this was done to find out the factors that frustrate students in information technology courses and profession.

Our investigation results show that most female students have positive attitude towards practicing Information Technology (IT) profession as their male counterparts. We observed few cases where some female students acknowledged IT profession as male career; they cited the problem of balancing family issues with time-consuming IT jobs as obstacle in IT profession. The rest of this paper is organized as follows: chapter two gives review of related literature in ICT for women emancipation, chapter three presents research methodology, chapter four gives data analysis results, and finally chapter five is the conclusion and discussion of the paper.

1.1 Major objective

To investigate gender difference factors among male and female students offering business and computing courses in a university program; and hence develop framework for creating gender-sensitive environment for imparting IT skills to university students.

1.2 Specific objectives

1) To investigate gender difference factors and general challenges students face when learning IT courses in a University.
2) To establish relationship between gender and IT learning among university students.
3) To develop guidelines for designing and implementing gender-sensitive IT curriculum in a university.

1.3 Research Questions

a) What challenges do students experience when learning Information Technology courses?
b) What gender-based differences exist in students' attitudes towards information technology profession?
c) How can we design and teach gender-sensitive IT courses in a University?

1.4 Research Hypotheses

We next formulated the following research null hypotheses to investigate research objective b) above

a) $H0_1$: Student's motivation to participate in computer programming is not associated with gender
b) $H0_2$: Perception that computing is not easy to learn is associated with gender
c) $H0_3$: Perception that business courses are easier than IT courses is not associated with gender

2. GENDER-BASED ANALYSIS OF IT PROGRAMS

In this chapter we have presented gender-based analysis of ICT programs in high schools and universities. This is followed by presentation of the potential of computer networks to link women for intelligence building. The review also covers obstacles that hinder women from using information technology effectively.

2.1 Gender-based analysis of ICT program in high schools

Research results show that there are gender differences in ICT career choice between girls and boys. These differences include:

a) The lack of supportive environment in ICT classes. Male teachers, a male-designed curriculum, and boy-dominated classrooms are intimidating to young teenage girls. The teachers associate boys with excellence in computing courses [10].

b) Girls learning styles. The boys have the passion to learn computing but the girls are not in most cases interested to learn computing subjects. Girls dislike computer hardware assemble and other long-hour courses in computing [10].
c) Computer science curriculum in high schools has traditionally reflected interest of men. Women have been less or not at all involved in curriculum decision-making.
d) Limited understanding of ICT work and ICT career in the "real world". Students and parents do not understand computer science as profession. Computer training has been seen as a way of acquiring vocational skills.

The points expected by the high school girls in a computer science course include [11]:

a) More supportive teachers and counselors. Girls expect to see better education and resources for technology teachers, and more female role models and teachers.
b) Enriched pedagogy. Girls expect their interests to be incorporated into technology courses and activities
c) Broader technology curriculum, more clearly linked to the real world and to the jobs. Girls expect special attention on courses like database, Web, project management and technical writing. They expect to learn linkages between the relevance of IT and the real world of work and applications.
d) Greater collaboration. Girls expect collaboration between secondary schools and universities in adapting their curricula to female needs and interests.
e) Better labor market and career information. Girls pointed out that they need online information that describes the nature of jobs and opportunities in ICT. They further emphasized the need to develop their soft skills for certain ICT positions such as systems analysis, project management and technical writing.

2.2 Gender-based analysis of ICT program in University

The summary of research findings that explain why female students get discouraged in computer science courses is presented in the following section [10]:

1) Pre-College computing experience

Women have less computing experience before joining college compared to men. However, the success in computer science in a college is not determined by the prior computing experience acquired by students before enrolling in a computer science course. Boys develop interest in computing much earlier in their lives compared to girls who normally get computing experience from high schools. The significant gender differences in attitudes and experiences in computers that appear at the earliest ages are crucial for understanding the roots of the gender gap in undergraduate computer science program and for devising effective interventions.

2) Changing curriculum: computing in context

It is important to design curricula that exploit the connection between computer science and other disciplines; and diverse problems and teaching methods that appeal to a broad variety of preferences and styles. Some of the approaches that have been adopted at Carnegie Mellon include:

a) Interdisciplinary courses that unite students of different backgrounds to work on multifaceted problems;
b) An undergraduate concentration on human computer interaction;
c) A course that engages students with non-profit groups in the local community and initiates students to solve community problems.

3) Support: more attention to good teaching

The relationship between teachers and students is particularly significant to female students. Researchers have observed that more women than men arrived in the college with the expectation of establishing a personal relationship with faculty. To be faced with prospect of four years of isolation and male hostility on the one hand, and abrupt withdrawal of familiar sources of praise, encouragement and reassurance by faculty on the other is, in our view, the most common reason for loss of self-confidence that makes women particularly vulnerable to switching [12] (p. 271)

2.3 Gender-analysis of Information Technology in Employment

Fewer women work in or achieve the same job levels as men in corporate America today, however, in the IT profession women make only 26% of IT professionals in the United States with men outnumbering them in the ration six to one in leadership positions [13]. There are few facts available to explain why women are underrepresented in IT profession. Some of the reasons for under representation of women in IT jobs include: poor attitude towards technology related jobs, women having less love for technology and computers as compared to men, and women prefer flexible work hours with job

security as compared to men, and difficulty in balancing work and family [13].

Although many women study science, technology, engineering, and mathematics (STEM), those in IT focused discipline such as information systems and computer science have often renounce the field before graduating or fail to persist in academic or corporate positions in the field upon graduation [13, 14]. For example, in the study of the United States female students it was discovered that one third of the respondents acknowledged that IT profession would not be welcoming while 20% reported incongruence between personality and career fit. More so, women reported that IT field would not offer them the ability to balance work with family responsibilities [15].

Women are highly optimistic, embracing ICT as a practical mechanism for entering into labor force and empowering them. The participation of women in organizational developmental activities is negatively affected by gender discrimination, organization's inability to recognize their mix of technical and business competencies, and the overall national ICT policies which are not supportive to technology development.

In the last decade, a growing number of Non-Government Organizations, international donor agencies, and private corporations have actively participated in alleviating the digital divide and promoting gender justice in developing countries. These institutions create and disseminate optimistic discourses about ICT and its positive impact on both economic development and social inclusion for women [14]; The International Telecommunications Union (ITU) summarized the benefits of ICT as follows:

> *"ICTs are important tools that provide the [Sub-Saharan Africa] 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 [16]."*

In developing countries, digital divide policies and programs make use of ICT for advancing modernization, promoting social and economic development, and improving of the status of women. Gender inequality slows 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, Gender and Development, 2004).*

Selected women from Kenya were interviewed on Information Technology education and employment potential for women. The results show that women acknowledged ICT as a practical mechanism that gives them entry into labor force. However, women still perceived significant structural barriers such as discriminatory hiring practices where IT jobs are given to men in preference to women who have the same qualifications, ineffective government regulations, and lack of organizational experience in hiring and managing ICT [14].

2.4 Women and ICT for Intelligence Development

Women of Uganda Network (WOUGNET) is a non-governmental organization initiated in May 2000 by several women's organizations in Uganda to develop the use of information and communication technologies (ICTs) among women as tools to share information and address issues collectively. Ugandan ICT Minister emphasized seven key issues that will need to be addressed by the ministry in its ICT policy priorities and implementation of the e-Government of Uganda. These are: gender-responsive ICT environment, gender disaggregated data (GDD) when generating and reporting information on ICTs, need to address other socially marginalized societies, e.g. those with disabilities, inclusion of e-government in the school curriculum, strong public-private partnership, need to address the issue of relevant and timely e-content, and need for e-leadership to champion the process for change in the public sector and to promote e-Government [17].

One resource for liberating people from poverty and empowering them is knowledge. Possessing knowledge is empowering while the lack of knowledge is incapacitating. Knowledge and its widespread dissemination in an absorbable and usable form are therefore essential to initiate the change process for women's development [18]. Historically, women were isolated from the mainstream economy and they lacked access to information because of societal, cultural and market constraints and that distanced them from the global pool of information and knowledge. In some developing countries the women are very conservative. This distance is reflected in the levels of empowerment and equality of women in comparison to men, and has enormously contributed to the slow pace of development in the South. It is now a well-understood fact that if women are not empowered, any attempt to raise the quality of lives of people in developing countries would be incomplete. It can be substantiated that societies discriminating by gender pay a high price in terms of their ability to develop and to reduce poverty [18]. ICT for Knowledge Networking brings new opportunities for Women that include:

- Spaces for women – ICT have potential to link women entrepreneurs, educationists to networking purposes.
- Empowerment – through networking, women can voice their concerns in areas of development to the external agencies and international bodies.
- Employment opportunities – ICT brings new areas of employment such as telemarketing, data entry and analysis, medical transcription, etc. These jobs open up ways for women to develop.

The above opportunities can be blocked by the following factors [18]:

- **Lack of awareness -** Governments, civil society organizations and practitioners have done little in absorbing the full potential of ICT in gender development and therefore are far from the stage of creating enabling frameworks for the growth of engendered ICT models. The use of ICT in knowledge networking is a fairly new process and requires a little of sensitization and belief in the technology, a factor of time as well as a willingness to adopt it.
- **Access Issues -** The new technology is expensive, the cost can hinder its penetration to the individual and sometimes even to the community. The problem is obvious because women in developing countries have little control over the household income and do not have the decision-making power to invest in these technologies.
- **Capacity and Skills -** Fostering knowledge networking processes and benefiting from them requires trained human resource power to handle technology and networking issues. Women, because of their low levels of literacy and lack of access to technical education, are therefore even more disadvantaged than men in developing countries to fully benefit from knowledge networking.
- **Language Barriers -** Surprisingly, much of the knowledge present in the global pool is in English language that is not understood by the poorest rural/tribal communities. There is very little content in the vernacular language of non-English speaking communities. This makes the amalgamation of local knowledge of women with the global knowledge a difficult task.
- **Changing Power Equations -** Knowledge is power and knowledge networking leads to distribution of knowledge, which in effect leads to redistribution of power in the society. There is redistribution of power between men and women, and between communities and government at all levels. Thus, there are clear losers and winners in these changing power equations. Relinquishing power is a difficult process, especially when the power has been closely held by a few for a long time.
- **Innovations -** ICT models thrive on innovations, customization and people's participation. The stress in the design of ICT models has so far remained restricted to mere digitization of available information and automation of processes earlier done manually. This is certainly a welcome step but there is also a need to explore the specific tasks which can only be performed through such ICT models and which would directly benefit women.

2.5 Summary of literature review

ICT is an important tool for women emancipation in developing countries. ICT for women empowerment has become an important area of focus in many countries. ICT can be strengthen as a tool to empower women by addressing the expectations of the female students in ICT curriculum, that is, design gender-sensitive ICT curriculum in schools for motivating female students in ICT programs. The courses of particular interest to female students include: soft skills such as project management, etc. Women should also be part of curriculum design and implementation. However, there are still existing challenges that weaken the adoption of ICT for women empowerment; these include: the perception of IT as male career; an education gap coupled with digital gap; lack of role models and networking opportunities; and poor attitude of women towards technology related jobs.

3. RESEARCH METHODOLOGY

The questionnaire was selected as the best instrument for collecting data. It was developed based on the objectives of the study. A pilot survey was carried out. The content validity index (cvi) was calculated and was found to be 0.83. This value reflected the validity of the instruments. The design of the fixed-questions in the questionnaire was done using Likert scale with predefined responses (Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree). This was because the subjects of the study were university students who are well educated and can easily understand questionnaire and give appropriate responses. It also saved time which is limited, since it was easy to administer to a large population and to score. In addition to this, it simplified the task of categorizing, tabulating and summarizing responses. Open-ended questions were included to allow the respondents a chance to express and clarify their views.

The actual sample size that participated was 90 students from one university. I selected second and third year degree students offering bachelor of business computing and bachelor of office and information management programs. These were right students to answer questionnaires as they have built experience in computing and management for at least two years from

university courses they study. Questionnaires were distributed personally by the researcher to the students of Makerere University Business School (MUBS). This helped in minimizing wastage of questionnaires and loss of time. Parts of the questionnaires were analyzed quantitatively using the statistical package for social scientists (SPSS) for Microsoft Windows. Chi-square was used to analyze data. Open-ended questions were qualitatively analyzed using coding method. The overall analysis commenced by coding and categorization of information. The description was done on the basis of tabulated frequencies and percentages. Inferential statistics was used to compare motivation towards IT courses and profession between male and female students of bachelor of business computing and bachelor of office and information management. The findings were presented according to the themes of the research questions. We next present research results in chapter 4 below.

4. RESULTS OF QUANTITATIVE DATA ANALYSIS

Participants' Background

Of the 90 students, who participated in the survey, 52.2% (47) were female students and 47.8% (43) were male students. These were university students of second and third years doing courses in bachelor of business computing and bachelor of office and information management.

4.1 Hypotheses testing

Hypothesis One

Contingency table 1 shows the result of *chi* square testing at 95% significance difference between male and female Undergraduate students' active participation in computer programming courses. The test was done at 0.05 level of significance, the obtained chi-square value of 1.230 is less than critical value of 9.49; the null hypothesis is retained, therefore students' motivation in programming is not associated with gender.

Table 1: Gender * Active Participation in Programming Cross tabulation

		Active Participation in programming					
		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Total
Male	Count	3	9	4	19	8	43
	Expected count	2.5	7.4	4.0	20.3	8.9	43.0
Female	Count	2	6	4	22	10	44
	Expected count	2.5	7.5	4.0	20.7	9.1	44.0
Total	Count	5	15	8	41	18	87
	Expected count	5.0	15.0	8.0	41.0	18.0	87.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.230[a]	4	0.873
Likelihood Ratio	1.236	4	0.872
Linear-by-linear Association	1.099	1	0.294
No. of valid cases	87		

Not significant at 0.05 level

Hypothesis Two

In contingency table 2 below, we used *chi* square to test 95% significance difference between the male and female undergraduate students' perception of the ease of learning computing courses. In the Chi square test, the computed value 6.779 is less than the critical value of 9.49, hence student's perception that computing is easy to learn is not associated with gender.

Table 2: Gender * Computing easy to learn Cross tabulation

		Computing easy to learn					
		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Total
Male	count	3	7	7	20	6	43
	Expected count	5.3	8.1	4.3	21.0	4.3	43.0
Female	Count	8	10	2	24	3	47
	Expected count	5.7	8.9	4.7	23.0	4.7	47.0
Total	Count	11	17	9	44	9	90
	Expected count	11.0	17.0	9.0	44.0	9.0	90.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.779[a]	4	0.148
Likelihood Ratio	7.038	4	0.134
Linear-by-linear Association	1.882	1	0.170
No. of valid cases	90		

Not significant at 0.05 level

Hypothesis Three

Contingency table 3 shows the *chi* square test result at 95% significance difference between male and female Undergraduate students' that business courses are easier than IT courses.

The computed chi square value of 2.183 is less than the critical value; therefore students' perception that business courses are easier than IT courses is not associated to gender

Table 3: Gender * Business courses easier than computing Cross tabulation

		Business courses easier than computing					
		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Total
Male	count	10	15	5	7	6	43
	Expected count	8.1	17.2	3.8	7.6	6.2	43.0
Female	Count	7	21	3	9	7	47
	Expected count	8.9	18.8	4.2	8.4	6.8	47.0
Total	Count	17	36	8	16	13	90
	Expected count	17.0	36.0	8.0	16.0	13.0	90.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.183[a]	4	0.702
Likelihood Ratio	2.192	4	0.700
Linear-by-linear Association	0.167	1	0.683
No. of valid cases	90		

Not significant at 0.05 level

4.2 Qualitative data analysis

Next we present the results of qualitative data analysis. Here we first present the views of female students on IT and management career, followed by the views of male students on the same issues. We finally present the challenges students face in IT courses

Career Choice by female and male students

In this section, we have presented the responses given by undergraduate students of business computing and office and information management when they were asked to give their views on whether or not they would choose to be practitioners in Information Technology profession after graduating from University. The male students gave a number of reasons for their interests in Information Technology profession. These include: the contribution IT makes to the development of the world in the 21st century; the high demand for IT professionals; the practical aspect of IT implementation; better remunerations and the possibility of becoming a job creator. Likewise the female students gave the following reasons for wanting to join IT profession: the value addition by IT in business services; IT enables office work to be done at home with networking facilities; and the ability to get IT jobs when you have the right skills. The students responses based on gender are summarized in table 1 below.

Table 1: Reasons for choosing computing/IT profession

N0	Theme	Explanations based on gender			
		Female (N_1 = 47)	Percent	Male (N_2 = 43)	Percent
1	Digital era/revolution	Computing is dynamic and transforming the world, the world is developing because of computerization of services in business enterprises, most economies rely on IT for development, most businesses use computing technology for running their activities, and technology is the order of the world in the 21st century.	40	Most services are computerized, computing is evolutionary, IT is fast spreading all over the world, we live in global village, computing develops every day, and the world is rapidly growing technologically	47
2	Nature of computing profession	Computing does not put one under pressure, computing is practical, and you can do your work from home if you have a computer	12	The world needs IT professionals, most of IT work is practical unlike business which is crowded by theory, use IT to do business, I like programming, and it is prestigious to be computer expert	23
3	Employment, job creation and remuneration	Job can be easily got when you have the required skills, the IT profession is marketable, organizations need IT professionals, more international jobs, and easy to do and well paying jobs.	38	Better payment for IT jobs, create your own job and market yourself, and easy employment with good money.	29

We next asked the students to explain why they would choose business and management courses instead of information technology profession. Female students gave a number of reasons for wanting to be business and management profession. These include: the confidence they have in business skills, success in business is determined by creativity unlike knowledge and skills acquisition for success in IT jobs; the university imparts little IT knowledge and more business skills to them; the ease of doing a business job as compared to an IT job; and the belief that IT jobs are best done by men. The male students gave the following reasons for choosing business and management jobs: desire to be a business manager; small capital for starting business setup; succeeding in business without investing in computer hardware equipment; and spending less time in business jobs compared to IT jobs. The students' responses are summarized in table 2.

4.3 Gender difference factors

We observed gender difference factors from table 2, some female students gave reasons why they would choose management profession and leave Information Technology profession. These responses address research question 3. The reasons are quoted from their statements below:

- "*Computing jobs take a lot of time especially for mothers who have commitments at home."*
- *"I am a lady and there are more jobs in business for ladies unlike in computing where many jobs are best done by men."*

The above responses call for special attention and we need explanations why the second lady feels inferior to do IT work and describes IT job as a job that can be done well by men.

Table 2: Reasons for choosing business/management profession

No	Theme	Explanations based on gender			
		Female (N_1 = 47)	**Percent**	**Male (N_2 = 43)**	**Percent**
1	Practitioners in business and management domain/field	Management is in line with my profession, I have skills in business, I am already in field of management, and I am already running my business	21	IT can come in business, and I want to be a decision maker	8
2	Gender difference factors	*Computing jobs take a lot of time especially for mothers, who have commitments at home, and I am a lady and there are more jobs in business for ladies unlike in computing where many jobs are best done by men.*	4		0
3	Entrepreneurs	I want to manage my own business, I want to start my own business in the future, and in business success comes from creativity and innovation unlike in IT where success comes from knowledge and skills.	17	I want to run my own business, I want to manage my business in the future, and The initial startup capital is small to start a business	15
4	Nature of Business, management and computing courses	Most of the time we are taught business courses, and business has wider scope, and we are trained as professional managers and only half-backed in computing	24	In business you only need books to revise and practice unlike computing courses where you buy a personal computer, and According to our lecturers in business courses, we can easily start business when we graduate from business school.	21

5	Nature of business job	You build skills and confidence when you interact with people, it is easier to finance yourself and start a business, business jobs are easy to do, and you do business job according to your will unlike IT where you must adjust to changes in technology.	19	Business jobs do not consume much time, being an accountant is marketable, and in business you directly interact with your customers	17

We next present difficulties experienced by both male and female students in information technology skills development in the university. These include: inadequate computer hardware equipment and poorly equipped computer laboratories; little time for laboratory sessions; persistent software problems; inadequate textbooks for learning IT courses and slow Internet speed. The students' responses are presented in table 3.

The list of challenges listed below is manifestation of the problems experiences by both male and female students in IT skills development.

Table 3: Challenges faced by students in learning computing/IT courses

N = 90

No	Themes	Explanation	Percentage
1	Inadequate computer hardware infrastructure and computer laboratories	Computers are few compared to the number of students. The computer: student ration ranges from 1:4 to 1:10 in most cases, many students are admitted to use few resources, and computer labs are few with uncomfortable chairs	12
2	Nature of lectures/instruction	The facilitators/lecturers are very fast when handling practical, and more time is needed – our lecturers try all their efforts, some lecturers do not have patience with students, and inadequate staff for evening lectures	10
3	Software problems	Most computers are not updated with software, complexities in using software such as Pastel and lack of updated software in labs.	15
4	Access to computer labs.	Labs are not accessible for doing creative work at ones free time, labs are lacked when not in use for classes, and congestion in labs during lecture times	20
5	Nature of computing courses and lectures	Expensive and difficult to pass without your own computer at home, courses are difficult to understand, basics of courses are taught without details, some important courses are left out, IT terminologies used by lecturers are not understood, I don't fully understand IT lectures as many of the things are new to me, computing languages are complicated and this makes learning of IT difficult, the learning atmosphere is not friendly, lecturers are fast and I am left behind, lessons are difficult as lecturers abbreviate technical terms, I don't understand what the lecturer teaches, one semester is not enough to teach programming and systems analysis and design, too many students for few lecturers, lecturer: student ratio is very high, computers in lab are usually attacked by viruses, and some of us were not used to computers and it is very difficult to tell a lecturer "Where can I click to go to the next step" hence being left behind thus making learning computer courses difficult.	26
6	Inadequate resources for learning computer courses	Few computing text books in the library for use by students, slow Internet speed, and unavailability of Internet for research	16
7	Time for computing courses	Limited time to practice computing course practical, and study period is not enough to cover detailed content.	9

4.4 Guidelines for gender-based Information Technology skills development

We finally present guidelines for gender-based IT skills development. These guidelines were formulated based on the data we collected from the students and some perspectives of literature review. Figure 1 below give the diagrammatic view of factors that affect gender-based ICT skills development:

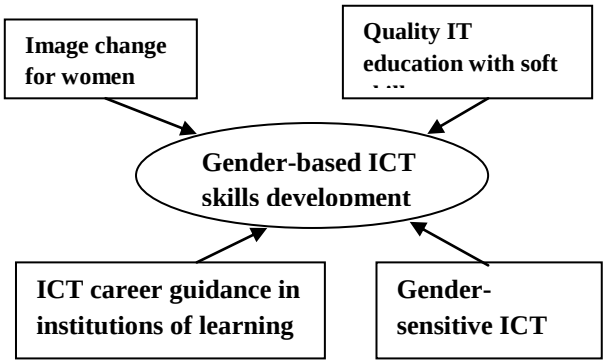

Figure 1: Diagrammatic representation of factors influencing gender-based ICT skills development

The following are the points in the guideline; this set of guideline is response to research question 4 above:

1) Emancipate and empower women through image change. We need to build mechanism that enables women to build self-confidence in IT profession. This can be done by improving computer studies curriculum in high schools.
2) Improve on the quality of IT education in tertiary institutions. This can ensure quality and confidence in skills the students acquire which in turn prepares them to face work related challenges in IT without fear.
3) There is need for government to enact gender-sensitive ICT policy that advocates for equal chances of employment in IT profession for male and female graduates.
4) Include soft skills in IT curriculum. Course for soft skills include IT project management, and human computer interaction, and involve female instructors in curriculum development process.
5) Provide career guidance and development in IT. Most students and parents look at IT as a vocational course and they do not have a clear vision of what IT profession holds for the future of the students.
6) Let the community understand the importance of giving special consideration to women in promoting them through ICT education and skills development. If the public is not aware, the community may misunderstand women empowerment as discrimination against boys.
7) Provide computer hardware and software for students to use in the computer labs. When the practical courses are taught theoretically the students will not implement them in industry upon course completion.

5. DISCUSSION AND CONCLUSION

In this research we established the factors that limit women in IT profession; these are namely: negative attitude to technology, family issues, employer preference for male IT professionals; and inferiority complex (calling IT male job). We administered questionnaires to selected second and third year undergraduate students. Our results of data analysis show general acceptance of IT by both female and male students. Male and female students gave similar responses for their preferences for IT profession. They expressed computing as dynamic technology that directs other professions in the present World that is characterized by digital communication and automation. They also admitted that computing jobs can be got when you have the right skills and they are well paid. On the side of business, male and female students also had some similar views. They expressed interest in management profession because most of the students are already working in it and they don't need to change profession. Some students prefer to practice business profession because they want to become entrepreneurs in the future and hence manage their own businesses. Other reasons they gave were the easy nature of management work and the desire to interact with customers when in management position. However, there were cases of female students opposed to IT profession with some reasons such as computing taking much of one's time at workplace and creating problems of having no time to attend to one's motherhood responsibilities at home and also describe computing professional as best for men and business profession as more convenient for ladies.

Another aspect of Information technology we investigated was the learning process in the university. This was investigated because its quality can influence the students' decision either to take management profession or computing after graduation from university. Here both male and female students gave the same reasons as concerns the difficulties in learning IT courses. These included: high student to computer ratio ranging from one to four, to one to eight; pedagogical approaches that do not create good learning environment especially in computer labs., lack of text books for students to access for reference, old computers with old programs not updated, inadequate staff for evening programs and lack of patience from lecturers for their students during lecture times. Based on findings from literature and students responses to challenging issues in IT career building, we formulated guidelines for gender-sensitive IT career development. These guidelines should be used by course facilitators and policy makers to create an enabling environment where female students can study IT gender related problems. Our suggestion is for this research to extend to industry. The next step is to investigate and compare the number of women and men practicing ICT profession in Uganda and find out challenges women face in IT industry.

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