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Full Length Research Paper

An assessment of factors that affect choice of IT degree at undergraduate level: a case of Zimbabwe

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The study seeks to establish critical stages in degree choice through the exploration of factors related to an IT degree choice in a low developing country context, in order to carve effective strategies to ensure industry-ready entrepreneurial graduates suited to the local context. The study sample was 216 introductory IT students across 6 state universities. Structured questionnaires were administered to the sample to establish the major motives and the extent to which the following factors impact on a student's choice to study IT: access to computers at school, access to computers at home, activities of exposure to computers, parents, gender, type of school (rural/urban) and influential people such as parents, teachers, siblings. Results shows that the most predominant motive for choosing an IT degree are self-interest (68.57%), followed by job market prospects (19.04%), university imposing the degree (8.57%) and other/no particular reason (3.80%). Whilst the majority (61.9%) of respondents made the choice of degree by themselves, unstandardized coefficient analysis indicates that if a person is exposed to computers at home, they are less likely to choose a computer degree (-0.328) whilst those exposed at school are more likely to do a computer degree (0.334). Exposure at home makes computers ordinary day-to-day tools whilst at school computers become new tools offering different career avenues. These results encourage the increased exposure to computers and the Internet by high schools in an effort to improve the quality, attitude and availability of trained IT professionals that can grow the local IT industry.

Keywords: Factors, IT, choice, undergraduate, Zimbabwe

INTRODUCTION

The issue of brain drain has affected all sectors of the Zimbabwean economy most significantly since the year 2000. At a time when several developed and developing countries were experiencing a boom in the IT sector, in 2000-2008, Zimbabwe was facing a massive loss of its few IT professionals to neighboring and overseas countries. Due to direct massification strategies by universities, Zimbabwean universities have on average experienced aggregated annual enrolment increases in excess of 20% for the period 2009-2011. IT degrees enrollments have also increased; for example, Chinhoyi University of Technology has increased IT degree student enrollments by over 90% during the same period. This implies a direct increase in the number of graduates available for the IT sector. The economic meltdown of 2000-2008 meant a massive exodus or shut-down of IT companies within Zimbabwe. The slow but steady recovery of the IT sector since then is calling for a steady supply of IT graduates with the right entrepreneurial drive to open up companies that will sustain and grow the IT industry. As of June 2011, Internet usage statistics show an increase from 50 000 users in 2000 to 1.422 million

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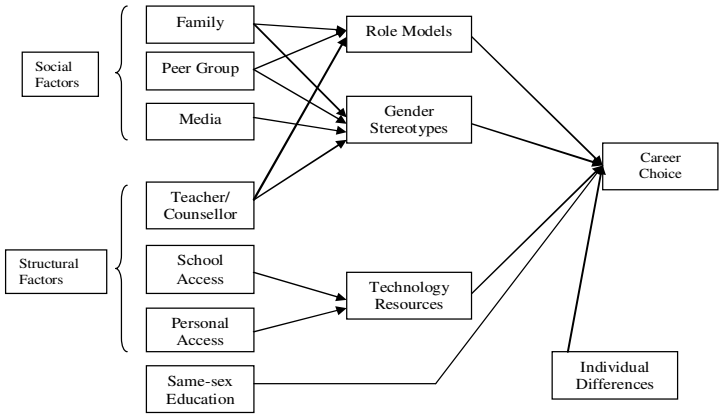

Figure 1 Factors influencing girls' career choices (source: Adya and Kaiser, 2005)

users representing 13% of the population (Internet World Stats, 2011). This is suggestive of the growth in the number of companies offering Internet services. The figure is also suggestive of the increased sophistication of the user/consumer and the increase in the demand for IT related services. The IT sector offers many opportunities for entrepreneurship since it deals with intangible goods and does not require expensive office space. The government's relaxation (0% duty) of duty on ICT equipment helps creates a favorable environment for the growth of the IT sector. With a prolific supply of graduates the targets for achieving a knowledge economy can be met. Putting things together, the increased supply of IT graduates may not necessarily sustain and grow the IT sector especially if the graduates got into IT for the wrong reasons, are wrongly motivated, are misinformed about the status, challenges and opportunities of the IT sector and do not possess a strong entrepreneurial drive for a sustained interest in the field. It is thus imperative to understand the impact points where high school students choose IT as a degree of choice so as to guide the IT industry, policy makers and government in their endeavor to create experts to drive a knowledge economy. Our study seeks to understand the point of impact (i.e. critical stages) where high school students experience the greatest turning point to take up IT as a career so that efforts to create sustained interest, the right attitude and adequate preparation are emphasized there. In order to establish this point of impact, it is therefore important to establish the reasons for choosing an IT career and to what extent each of the following factors impact on student's choice of IT as a career:

- Environmental, social and cultural context (education background, prior exposure to computers, economics at home)
- Influential people such as family, counselors, teachers and parents
- Individual perceptions about IT.

The choice of degree major is often interpreted as the career choice, especially where a science career is concerned, because very few divert and change to non-science careers after graduation or a few years in the field. Hence our interpretation of career choice is equivalent to degree choice.

The rest of our discussion is as follows: section 2 presents a review of related literature, section 3 the methodology, section 4 is the discussion of the findings. Section 5 concludes our paper with a discussion of the implications of the study for Zimbabwe. Numerous studies have been done in trying to establish the reasons for people's career choice. The choice of subjects for study at high school and aptitude, i.e. science or non-science, greatly influences the general career path (Gabay-Egozi et al., 2009; Tolsma et al., 2010). Experiences whilst at school (Mugonzibwa et al., 2000; Wilkinson, 1996) and interactions with influential people (Davies et al., 2005; Mellors-Bourne, 2008) also determine the choice of career path. For some careers, in particular Information Technology (IT), the major influencing factor has been parents, family and influential experiences (Meszaros et al., 2009; Runciman, 2009; Issa and Nwalo, 2008; Munro and Elsom, 2000; Turner et al., 2002; Trauth et al., 2008). Adya and Kaiser propose a model of factors influencing girls' career choice and their interactions (see Figure 1). In this model, the family, peers and media constitute social factors and the teacher/counselor, school access, personal access and same-sex education constitute the structural factors. These factors can either manifest their influence in the form of role models, gender stereotypes or technology resources.

Social Factors

Family, in the form of parents and siblings can have a positive or negative influence on career choice. If a child looks up to one of the members as a role model, they are likely to make the same career choice. Parents exert heavier influence than teachers and counselors (Adya and Kaiser, 2005; McInerney, 2008; Hunter, 2006; Meszaros et. al, 2009; Denner, 2009; Munro and Elsom,

2000; Creamer and Meszaros, 2009; Turner et. al, 2002). Parents can provide positive influence through the provision of an enabling or encouraging environment, for example, providing computers within the home. Parents also exert influence through the provision of career information. However, in some instances parents have been shown to exert very little influence on career choice (Mellors-Bourne, 2008; Issa and Nwalo, 2008; Mugonzibwa et. al, 2000; Wilkinson, 1996).

The effects of peer groups on career choice are both positive and sometimes detrimental. Media has often been seen to promote gender stereotypes resulting in less females taking up science-related careers such as IT (Adya and Kaiser, 2005). Another reason for the imbalance is the general perception that science subjects are harder and therefore most suited to boys than girls (Gabay-Egozi et. al, 2009; Tolsma et. al, 2010; Hunter, 2006). This belief can also be transferred by teachers to students (Hunter, 2006). However the proliferation of women's magazines featuring those that have broken the gender stereotype boundaries and the promotion of women empowerment programs are likely to remove the gender-stereotype boundaries. We thus expect that there are very insignificant gender differences in relation to Information technology career choices.

The interdependence of family, school and community culture influences the youth's perceptions of career choice. In a study of young adults' career choices in Rural Pennsylvania, perceptions of the ideal job, barriers such as lack of financial resources and prospects of high pay were critical in influencing career choice. Those in poorer or less advantaged communities had a smaller pool of career to choose from because of less school and family support and social and economic barriers (Ferry, 2006). While there is an increased general affordability of computers in Zimbabwe due to the dollarization of the economy and relaxation of duty, such technology is not easily afforded by the rural poor. Less than 2% know about computer technology and the role it would play in their lives. In essence, their current lifestyle and activities may not see any use for computer technology. It is therefore expected that few youth educated under rural backgrounds would enroll for IT degrees.

Structural Factors

Institutional support in the form of teachers/counselors, technology access both at home and at school and the educational environment can influence career choice decisions both positively and negatively.

Whilst teachers and counselors are often expected to provide solid career foundations and inspire certain career directions within schools, research results show to the contrary that the influence of teachers and counselors is quite insignificant (Adya and Kaiser, 2005; Mugonzibwa et. al, 2000; Wilkinson, 1996; Meszaros et. al, 2009; Davies et. al, 2005). Meszaros et al. (2009) confirm the role of parental support in their study; when all other things are considered, interactions with others, such as counselors and teachers, about career options did not have a significant effect on career interest that overrode the direction provided by parents. In some cases, teachers do not see themselves as a source of information on advice about careers in science and technology but rather a job for the "careers person" (Munro and Elsom, 2000). In a developing country context, where very little information is usually available from parents concerning the varied careers available, and where students spend a greater part (8 out of 12 hours) of their day at school, such a scenario would result in the student choosing conventional or stereotyped careers common within their community or prevalent among family members

The issue of access at home or at school is largely dependent on the economic standing of the family and the school, and the environment (whether urban or rural). More and more families in the urban environment are now able to afford a computer. However, a recent World Bank report shows that the number of personal computers per 100 people in Zimbabwe is 7.6; this represents a very low home access ratio (World Bank Report, 2010). However, the mass computerization of schools through various initiatives such as the Computers for Zimbabwe and the Presidential Schools Computerisation programmes has increased the potential role that schools could play in shaping careers in information technology.

Adya and Kaiser (2005) posit that social factors are much more influential in shaping the early perceptions of children because young people are not exposed to the structural factors to the same as adults in professional settings. We however argue that with the increase in ICT access within homes, schools and even in community centers, young children are now even more exposed to the structural factors than the social factors and this can thus tip the scales in influencing their career decisions.

Exposing girls and boys at a young age to equipment and/or concepts related to a particular career removes stereotyping barriers and reduces intimidation. Transforming experiences, which entails the influence by role models and mentors, and enriching experiences such as involvement in lab projects at school or home, independent studies and exposure to a broad range of career choices, usually exert positive influence on career choice. They "may yield the confidence and perseverance necessary for the initial choice towards science to be made and acted upon" (Besecke and Reilly, 2006). Continuous exposure builds confidence in them and is often expected to steer a preference to taking up a related career.

Participation in science-related activities has been shown to be quite significant in influencing science-related career choice (Yoon and Pak, 2001; Munro and Elson, 2000; Hunter, 2006). Since the bulk of these experiences are provided by teachers, the attitudes of the teachers and gender-stereo-typed perceptions are often likely to affect the gender balance and attitudes of those with an initial interest in science-related careers. In the case of Information technology, early exposure has been shown to reduce intimidation with technology and thus increase the acceptance or use of that technology even later in life (Adya and Kaiser, 2005; Technology Acceptance models). Turner et. al (2002) revealed that one of the main influencing factors influencing women to study for IT were influential experiences such as programming class, working on IT projects whilst in school and being provided unique opportunities by teachers. However results as to whether such exposure translates to taking up a career in IT are rather inconclusive (Adya and Kaiser, 2005).

Some researchers are of the view that social, structural and economic factors exert more pressures in influencing career choice than attitudes towards technology (Adya and Kaiser, 2005). We posit that access to technology such as computers in homes presents a social networking and gaming environment to children; this does not expose the child to careers in information technology, but rather to the computer as a necessary tool for everyday functions. The best environment to show the computer as an avenue for a career in IT is the school environment. Therefore, the manner in which computers are used will definitely influence "beliefs and attitudes about technological careers" (Adya and Kaiser, 2005:238). Encouraging positive experiences in high school will thus lead to choice of an IT degree major (McInerney et.al, 2008/9). Early access to computers must be provided to reduce intimidation and same sex education strategies must be used in order to reduce the career bias against IT (Adya and Kaiser, 2005).

Children usually imitate the behavior and tastes of those they interact with, especially their peers, parents, family and role models. Children's perceptions about careers are based on early perceptions (Adya and Kaiser, 2005).

Issues dealt with on a marginal level are factors such as individual differences and personality characteristics because of their complex nature. Besecke and Reilly (2006) have shown that innate personality variables such as high mathematics/science proficiency, a high need for achievement and high social esteem also play a significant role in influencing career choice. Nevertheless, these are very important factors that require in-depth study as they may offer better insights in understanding the complex nature of making choices (Adya and Kaiser, 2005).

Expectations about the job

Job prospects, for example salary expectations and perceptions about the job market, have shown to have little encouragement in influencing career choice (Mugonzibwa et. Al, 2000; Wilkinson, 1996; Issa and Nwalo, 2008). The rankings of the importance of factors influencing career choice differ according to whether one is in a developed or a developing country context, regardless of the profession. In Tanzania, a developing country, the ranking from most important was image of a profession; work/profession characteristics; course characteristics; direct gains and advice from important persons (Mugonzibwa et. al, 2000). In contrast, in the United Kingdom, the top five rankings for factors influencing career choice for both male and female civil engineering students are: opportunity to do interesting work, opportunity to do varied work, organizations' training programmes for graduates, salary is important, opportunity for quick advancement, and involvement in new developments (Wilkinson, 1996). In both findings, the influence of other people such as friends and family ranked low.

Whilst most research on IT career choice focuses on females (Trauth et. al, 2008; Creamer and Meszaros, 2009; Turner et.al, 2002; Denner, 2009; Adya and Kaiser, 2005), the findings generally agree with non-gender-biased research (Mellors-Bourne, 2008; Runciman, 2009; Davies et. al, 2005) on the following major factors for IT career choice:

- Socio-cultural: Parental influence, Strong academic background/ Aptitude, Socialization
- Perceptions: Prestige for parents by entering an esteemed field, Idea of pursuing clean work, Prospects of high pay
- Structural**:** Importance of role models, Access to and Experience with computers

Davies et al. (2005) also identified additional factors that influence both boys and girls, namely personal interest and personal abilities. Factors that ranked lowest for both boys and girls were friends, teachers and counselors (Davies et al, 2005).

Another factor that appears to be stronger in the choice of an IT career is personal. Mellors-Bourne (2008) carried out a study of UK undergraduates (both male and female) studying computer science or an IT degree. The results suggest that the undergraduates are generally pleased with their degree choice. Of the less than ten percent (<10%) that would choose differently, given the chance again, most would seek a course with more intrinsic interest or enjoyment. The most common reason for the choice of IT as a career path was personal interest and aptitude. Other reasons, ranked from most common to least common are:

1. Enjoyment of the computing subject at Advanced Level.
2. The desire to keep lots of careers options open.
3. The belief that an IT degree is a necessary pre-requisite to a career in this sector.

Again, parental influence and personal contact with professionals and career advisors were ranked lower (Mellors-Bourne, 2008). Research thus suggests that less parental/counselor influence and more exposure activities will generate increased interest in the IT profession.

The model for career choice

The discussion above shows the suitability of the Adya and Kaiser's (2005) model in explaining the IT career choice of both males and females. We adapt the model to find out to what extent each factor influences IT career choice. We however leave out the following factors from our study for the following reasons:

- Media: whilst most media promotes gender stereotypes, we postulate that this factor is quite insignificant in influencing career choice in IT as opposed to other fields. The issue of gender stereo-typing will most likely influence the choice of lifestyle as opposed to the career choice that can afford that lifestyle. For a developing country context, general observations suggest a separation of the two (choice of lifestyle and choice of career) with the former influencing the latter. Further research work in this area needs to be carried out.
- We also suggest that the proliferation of women advancement and profiling in the media will actually provide role models and not gender stereo-types as suggested.
- Same-sex education: this would require a comparison of two schools as suggested by Adya and Kaiser (2005) and is thus not within the scope of this research.

Our research will thus consider the following factors:

- Structural factors (access to computers at school, access to computers at home, activities of exposure to computers)
- Socio-cultural factors (gender, type of school environment (rural/urban), and influential people such as parents, teachers and siblings).

METHODOLOGY

A survey was carried out at 6 state universities in Zimbabwe namely University of Zimbabwe, Chinhoyi University of Technology, Midlands State University, Bindura University of Science Education, National University of Science and Technology and Harare Institute of Technology. A total of 216 students were interviewed through a structured questionnaire. The structured questionnaires were administered to first semester students studying for IT related degrees such as Computer Science and Information Technology. First semester students were chosen since they are most likely to give an unpolluted response to questions. In order to ensure a 100% return rate of questionnaires, they were administered during lectures. A univariate general linear model was used to assess the factors that affect choice of IT degree programme at the university. Cross tabulations were also used to classify students into groups that related reasons for choosing IT programmes.

RESULTS AND DISCUSSION

In our research 216 IT students were interviewed. It was found out that 30.6% are females and 69.4% are males (see Table 1). More males study IT programmes as compared females. The interviewed females argued that the other females do not like to do IT courses because they presume the area as male oriented.

The computerisation programme launched has yielded effects to the number of students studying IT who studied at rural schools. A significant percentage (14.4%) of the students studying IT are from rural schools, 25.9% are from urban government schools while 11.1% are from private and 48.8% attended boarding schools. The reason for lower number of students who studied their advanced level at private school may be that a considerable number of students from private schools often choose to study abroad for their degrees.

Our results show that most of the interviewed students were not influenced by anyone to do computer studies at advanced level as shown in Table 2. Least number of students from different secondary school background studied the subject due to influence from parents. This might be due to the computerization programme launched by the President of Zimbabwe. The students who learnt at rural school said that they did not have computers at home. This may have affected their choice at advanced level. Since most schools were not computerized when the interviewed people were at secondary level, it may have affected also their combination at advanced level though any science subject is acceptable for admission for IT-related degrees.

Most students who studied at boarding schools were influenced by their teachers to study computer science at advanced level. The current secondary school curriculum results in the teacher spending the most time of day with school children. With the parental role overridden by that of the teacher, students at boarding school therefore have ample time to seek advice mainly from fellow students or teachers. The greater influence with regard to boarding school students is thus from the teacher.

Table 1 Summary of gender distribution for students studying IT

Gender	Frequency	Percent
Female	66	30.6
Male	150	69.4
Total	216	100.0

Table 2 Influence at A level to study computer science

			Gender		Total
			female	male	
Parents	type of school	Rural	0	2	2
		urban govt	2	1	3
		private	0	1	1
		boarding	0	2	2
	Total		2	6	8
teacher/ school	type of school	Rural	1	1	2
		urban govt	1	3	4
		boarding	4	4	8
	Total		6	8	14
Self	type of school	Rural	3	21	24
		urban govt	14	33	47
		private	6	16	22
		boarding	31	60	91
	Total		54	130	184
Other	type of school	Rural	2	1	3
		urban govt	0	2	2
		private	1	0	1
		boarding	1	3	4
	Total		4	6	10

Table 3 Choice at University

	Type of School		**Sex**		**Total**
			Female	**Male**	
Interest		Rural	3	14	17
		urban govt	11	25	36
		Private	4	11	15
		Boarding	26	46	72
	Total		44	96	140
University impose	type of school	Rural	0	2	2
		urban govt	1	3	4
		Boarding	4	5	9
	Total		5	10	15
Job market	type of school	Rural	2	7	9
		urban govt	4	10	14
		Private	3	4	7
		Boarding	6	14	20
	Total		15	35	50
No choice	type of school	Rural	1	2	3
		urban govt	1	1	2
		Private	0	2	2
		Boarding	0	4	4
	Total		2	9	11

Table 4 Correlations between factors

	Gender	School type	Influence at A level	Exposure at home
Gender	1	-.096	.004	-.011
School type	-.06	1	.046	.247(**)
Influence at A level	.004	.046	1	-.090
Exposure at home	-.011	.247(**)	-.090	1

Table 5 IT choice factor interactions

Variable	Degrees of freedom	P- Value
Previous School Attended	3	0.035
Number of computers at school	36	0.043
Gender – number of computers at school	9	0.03
Previous school attended – number of computers at school	19	0.004
Number of computers at school - availability of computers at home	16	0.005
Experience at home	1	0.031

Table 6 The model of choice of IT career

Factor	Beta	P- value
Constant	1.653	0.000
Gender	0.08	0.573
Influenced at A level	0.194	0.147
Exposure at home	-0.328	0.728
Exposure at School	0.334	0.024
Activities of exposure to computers	-0.076	0.05

Most of the respondent's study IT programmes at university due to personal interest (see Table 2). The fact that most university students, irrespective of their area of study, already owned personal computers may have caused most students to have interest in IT. The job market of IT career had limited effect on the choice to study IT. Few students study IT as a result of lack of choice to pursue other areas. Those who study IT as a result of universities imposing are also very few and the students highlighted that this happened as a result of wrong choice of the programme study basing on subjects studied at advanced level. The dominance of the self in making and taking up the first choice in IT points to the underlying importance of self-authorship when making career choice, echoing the findings of Wilkinson (1996), Mugonzinbwa et al. (2000), Wilson (2005) and Mellors-Bourne (2008).

There is a negative weak correlation (-9.6%) between gender and the type of school attended on the choice to do IT (see Table 3). School type attended at secondary level and exposure to computers at home is 24.7% related at 1% significance level as shown in Table 4. There is least relationship between gender and exposure. Both females and males had equal chances of exposure to computers though males spend most of their time playing computer games while females less time on games but more time on e- mails and social sites. The area of gender inclinations in modern-era ICTs requires further investigation.

There is considerable interaction on some variables that were investigated to ascertain reasons why the interviewed population chose to do IT. Type of school attended by the student to choice of the IT programme was significantly different with p- value of 0.035 (see Table 5). This is also reflected in Figure 1. Total number of computers that were available at the schools where the interviewed students did their advanced level had an effect on the choice of the students. Obviously fewer computers will deter students from doing computer science. There is a relationship between gender and total number of computers at school to the choice a student will make in terms of pursing IT as a career. Females were deterred from doing IT due to limited number of computers at schools as compared to males. Having a limited number of computers at school while the student has a computer at home negatively affected the student's choice. Issues of accessibility are significant in influencing choice to study IT and encouraging more

females to take up IT. Possible factors influencing females not to take up IT where there is a shortage of computers are to do with non-aggressiveness of females in securing access.

Most of students interviewed could not access computer at home but studied Computer Science at school. As such the results show that the personal computers at home do not have any effect on the IT career of students under study. These findings are contradictory to those of Turner et. al (2002), Adya and Kaiser(2005), Creamer and Meszaros(2009), Meszaros et. al (2009), and Runciman (2009) who found that parents play a critical role in shaping their children's career choice by exposing them to various technologies. Instead, teachers and schools play a central role.

The effect of gender on the choice to study IT at university is insignificant (p- value = 0.573). Whilst most gender-IT researches (Adya and Kaiser) show gender differences in the choice of IT as a career, our results indicate gender as an insignificant factor, thus suggesting that gender stereotyping is diminishing. Influence at advanced level, exposure at school and type of activities of exposure are significant on the choice of IT as a career. Contribution of exposure at school is higher (high beta value) to choice of IT as a career.

CONCLUSION

In an effort to sustain a vibrant growing IT industry, Zimbabwe needs to address the issue from a school perspective. Since our results clearly show that access to computers at school is the most prominent factor influencing an IT career choice, the issue of access in both rural and urban schools needs to be addressed. The un-affordability of computers at home, especially in rural areas, makes this factor even more significant. Of particular interest is the need to create conducive conditions for students in rural areas to afford an informed choice to make career decisions. There is a clear need to provide pupils with a lot of stimuli and exposure to a variety of activities (learning and play) linked to their future careers. This will enable them to choose careers based on self-authorship. Stakeholders such as teacher, technocrats and development agents can play a crucial role in this respect thus exposing children to a broader view of the world at the inter-linkages at play. Schools are thus central in rural communities in bridging access and affordability.

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