Inclination of Scholars to Major in Information Systems or Computer Science

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Abstract: This paper describes a survey of 497 final year scholars at schools in the Western Cape, South Africa. They were asked about their inclination to study information systems(IS) or computer science(CS), their knowledge of the areas, and their opinions of salaries and job opportunities. Unlike much past research, significantly more interest came from those previously 'deprived' in the IT area. Those from schools previously disadvantaged by the apartheid school system and without access to computer or Internet access at home were more inclined to study CS or IS. These categories also expressed most optimism about IT job prospects and starting salaries, as did female scholars. Perceptions of the activities of IS students were far less accurate than of CS students. Males were more predisposed to study IS than females, and black students and those without school computer access favoured CS. Possible reasons for this are discussed.
Categories and Subject Descriptors: K.3 [**Computing Milieux**]: Computers and Education
General Terms: Human Factors
Additional Key Words and Phrases: Education, learning

1. INTRODUCTION

The broad aims of this research are to identify the factors that may influence scholars in pursuing information systems (IS) or computer science (CS) as a field of study, and to determine whether these factors do in fact affect scholars in their choice. The study furthermore attempts to gauge scholars' understanding of IS and CS degrees.

According to the National Plan for Higher Education (NPHE) the demand for workers with a tertiary qualification in South Africa has increased substantially [Ministry of Education 2001]. More specifically, there has been an increased demand for graduates with an education in Maths, Science and Technology [Bitzer 2002] and according to Kekana [2002:54] an 'unmet' demand for ICT services in the country. Accordingly, the Ministry of Education has stated its intent to shift the balance in enrolments between the humanities, business and commerce and science, engineering and technology from the current ratio of 49%: 26%: 25% to a ratio of 40%: 30%: 30% respectively over a 5 to 10 year period. In the case of science, engineering and technology, the Ministry is particularly keen to increase enrolments in the broad field of information and communications technology, which has been identified by the Cabinet as a key focus for skills development [Ministry of Education 2001].

The gender profile across tertiary institutions in South Africa is: 53% Females and 47% males. Meanwhile African students make up 62%, White students 24%, Coloured students 6% and Indian and Asian students 6% [Census 2001]. Despite these figures, African and female students remain clustered in the humanities, with low enrolments in science, engineering and technology (SET), business and commerce and in postgraduate programs [Ministry of Education, 2001]. There is therefore pressure on tertiary institutions to implement their own policies on equity issues, as illustrated by the following quote:

> …if institutions do not develop their own race, gender and disability equity targets and put in place clear strategies for achieving them, the Ministry will have no hesitation in introducing quotas in the future [Council on Higher Education 2000: 48]

When examining possible reasons for this situation, past and current inequalities in the school education system are largely held responsible. As a result many African students do not meet university criteria. When viewed in the light of the proposed increase in the number of African and Coloured students in SET and in Business and Commerce, this poses a serious problem.

This paper commences with a brief survey of relevant literature, which includes the impact of gender, race and computer access on enrolment in IT (used here to include both IS and CS), and IT career knowledge. While doing so it proposes several hypotheses. Methodology of the research is outlined, and results described and illustrated. After further discussion of the findings, limitations and recommendations, conclusions are drawn.

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2. LITERATURE SURVEY

2.1 Racial Groupings and the Digital Divide in South African Schooling

Former racially and ethnically organised departments of education embodied substantial inequalities in per capita spending on schools [Morgan 2001]. The Department of Education [1995] describes this inequitable distribution of education facilities and learning resources in the schooling system inherited from the previous government. Despite attempts to redress past differential access to quality education, the South African schooling system continues to operate in a dualistic mode and schools are still divided on ethnic-socioeconomic grounds [Morgan 2001; Collins et al. 2001].

Currently South Africa has two school categories. The public schools category comprises all schools formerly known as community schools, farm schools, state schools, and state-aided schools, including church schools, Model C schools, mine schools, and others. The independent schools category comprises all schools currently known as private or independent schools [Department of Education 1996]. It can be reasoned that a more relevant way to group schools for research of this nature is in terms of which schools have had access to computer facilities and resources in the past. Thus for the purpose of this paper schools termed as 'previously disadvantaged' are made up of former DET schools, including schools for African, Indian and Coloured scholars. 'Previously advantaged' schools are made up of former Model C schools and private schools, occupied mostly by White scholars in the past. This means that some public schools as they exist today will fall in the previously disadvantaged category, while others will fall in the previously advantaged category.

According to CensusAtSchool [2001:22] only 23.6% of schools in South Africa have access to computer facilities and 12.7% have access to the Internet. While 83.5% of scholars have access to television, only 16% have access to computers at home, and 8.8% have access to the Internet at home. Having prior computer experience allows scholars to have less anxiety and to be more comfortable when it comes to working with computers at a later stage in life [Necessary and Parish 1996; Hart et al. 1999]. Although having prior experience of some sort with computers is usually a positive influence [Gos 1996; Hart 2002] a pleasant or unpleasant experience may determine the possibility of taking a career in a computer-oriented environment or not [Gos 1996; Colley 2003].

Many previously disadvantaged schools still have limited access to computer facilities and other educational resources. When considering scholars' access to computers and the Internet, the preferable location of access is at home. The reason is that there are fewer time constraints and more freedom as to which sites one may visit when using the internet at home. For these reasons, several hypotheses were set up, specific to the racial grouping, school status or particular type of computer or internet access of the scholar. These flow from the research aims, and previous studies. The alternative rather than the null hypotheses are stated here, to indicate the expected direction, based on past research.

- *H_1: Scholars attending previously disadvantaged schools are less inclined to study IS or CS than scholars attending previously advantaged schools*
- *H_2: Scholars with no access to computers at school are less inclined to study IS or CS than scholars with access to computers at school*
- *H_3: Scholars with no access to the Internet at school are less inclined to study IS or CS than scholars with access*
- *H_4: Scholars with no access to computers at home are less inclined to study IS or CS than scholars with access*
- *H_5: Scholars with no access to the Internet at home are less inclined to study IS or CS than scholars with access*
- *H_6: African and Coloured scholars are less inclined to study IS or CS than White scholars*

2.2 Gender Inequalities

The under-representation of women in computing has been reported by Castells [1998] and Crews and Butterfield [2003]. According to Hart [2002], although there are similar numbers of male and female students commencing a Commerce or Business Science degree, there is a much lower percentage of females than males that chose IS as a major. Female scholars have been shown to be less inclined to follow more technically oriented degrees, such as CS [Durndell and Lightbody 1996].

Gender has been identified as a discriminator at school level on the attitudes and use of computers in different situations [Hart, 2002]. According to Statistics South Africa, boys between the ages of 15 and 19 spend twice as much time using computers than girls [Chobokoane and Budlender 2002]. Young [2000] notes that upon reaching the critical years of development, where adolescents are faced with making adult decisions, the perception that IT is the domain for males is more pronounced among both boys and girls. Gender imbalances in technical areas have been attributed to the sex-stereotyping of technical careers, thus putting off girls from choosing such a career [Durndell and Lightbody 1996].

Taking government policy into account, it is in the interest of tertiary institutions to investigate the levels of interest in IT study amongst female scholars. The following hypothesis is now proposed:

- *H_7: Female scholars are less inclined to study CS and IS than male scholars*

2.3 IT Career Knowledge and Motivators to Pursue IT Careers

In a study by Moy and Lee [2002] the top three career attributes as rated by scholars were 1) long term career prospects, 2) pay, and 3) job security. In an IT-specific scholar survey, remuneration was shown to far outweigh other career attributes: When asked about the motivators to pursue an IT career, 52 % of the sample responded 'good money and/or benefits', 7% said a scholarship and just under 7% replied with job availability [Goupta and Houtz 2000:5]. In a local study by Hart et al. [2002] less-informed scholars focused on pay and benefits, while more-informed ones added work interest and challenge.

Hypothesis 8 attempts to distinguish between scholars who have positive and negative opinions about the IT job market, and determine whether these opinions have an influence on their inclination to study IS or CS. Three sub-hypotheses were developed around the important career aspects identified in the literature: remuneration, job availability and job security. The hypotheses are:

- *H_{8A}: Scholars who have negative perceptions about an IT starting salary are less inclined to study IS or CS than scholars who have positive perceptions*
- *H_{8B}: Scholars who have negative perceptions about the number of IT jobs available are less inclined to study IS or CS than scholars who have positive perceptions*
- *H_{8C}: Scholars who have negative perceptions about the IT job market always having jobs are less inclined to study IS or CS than scholars who have positive perceptions*

While there has been a high demand for graduates with IT skills, scholars may be unaware or sceptical of the proposed demand. Gupta and Houtz [2000] identified a lack of understanding, among scholars, of the skills required to succeed in IT careers. In South Africa, Hart [2002] revealed that many students arrived at UCT not knowing what IS was, or that one could study it, let alone major in it. He found that many school students are only aware of the more technical CS degree and not of the IS programme and that even at the more advantaged public and independent schools many school learners are given no information and encouragement to study computer-related subjects. Reasons for the lack of understanding about IS could be due to IS not being offered as a subject at schools, whereas CS is. In addition to this, IS is a relatively new discipline [Watson et al. 1999]. To determine scholars' relative understanding of IS and CS, two further hypotheses are developed:

- *H_9: Scholars do not know what IS as a field of study entails*
- *H_{10}: Scholars do not know what CS as a field of study entails*

3. METHODOLOGY AND SAMPLING

In order to obtain a large representative sample which would include sufficient numbers of students who might be interested in an IS or CS degree or career, a questionnaire survey was decided on. This was approved by the local Department of Education, and was administered in schools in August 2003.

3.1 Questionnaire Design

In the questionnaire, scholars were asked to indicate their first, second and third choices for post-school study from a list of twenty fields which included IS and CS. They were asked if they had access to computers and/or the Internet at home and/or school. They were also asked to choose which of CS and IS they would study if given a choice between the two. Three statements relating to the IT job market were also put to them, with a five-point Likert-scale measuring their perceptions. Schools were classified in three ways: by School Type (independent or public), School Status (either previously disadvantaged or previously advantaged during the apartheid era), and School Gender (Male, Female or Co-educational). Scholars' gender and race were recorded in most cases. Apart from these closed questions, scholars were given the opportunity of making any additional comments.

For the IT career knowledge hypotheses, two six-item constructs, adapted from the Cale and Mawhinney [1991] questionnaire, were posed to scholars on what a 'typical IS student' and a 'typical CS student' does during their degree. A five-point Likert-scale was used to measure responses to these statements. A sample of academics from the University of Cape Town's IS and CS departments also answered these questions. The mean of the academics' responses was taken as the 'correct' answer for each statement. This assumption is based on the fact that academics have taught successive courses and should have a good general understanding of what students taking their courses do, as well as their academic backgrounds.

3.2 Sampling

The sample comprised grade 12 (matriculation) scholars from schools in the Central Metropole of Cape Town. A list of 56 schools within Cape Town was obtained from the Western Cape Education Department. After piloting the questionnaire at two schools, it was subsequently refined and then administered in eight schools. All 520 questionnaires distributed were subsequently collected, and 23 of these were discarded due to them being incomplete. The remaining 497 questionnaires used in data analysis represents a 95.6% response rate. The schools were chosen to be as diverse as possible, as indicated in the scholar demographics in Table 1. Sufficient numbers of the three major racial groups in the Western Cape (Coloured, Black and White) were obtained for purposes of statistical comparisons.

4. DIGITAL DIVIDE, RACIAL GROUPING AND GENDER

For responses to questions relating to racial grouping, gender and access to personal computers and the Internet, chi-squared ($?^2$) tests were performed to test association with interest in CS or IS. A scholar was said to be interested in the relevant discipline if they entered it as either first, second or third choice for study. For analysis of association using the $?^2$ test, interest in IS or CS was combined as interest in 'IT' for all variables other than gender, race and school computer access (where the trends between CS and IS were different). This also increased the sample size and power of the test where significance could not be obtained for either CS or IS alone. To enable certain comparative statistical tests to be carried out with adequate sub-sample sizes, the race groups of white, coloured and black were used.

School Gender	***Male***	***Female***	***Co-educational***	**School status**	***Previously Advantaged***	***Previously Disadvantaged***
	16%	11%	73%		44%	56%
Gender	***Male***	***Female***	***Omitted***	**School type**	***Independent***	***Public***
	42%	57%	1%		22%	78%
Race	***White***	***Black***	***Coloured***	***Indian***	***Asian***	***Other***
	78	143	210	11	6	49

Table 1. *Scholar demographics for research sample.*

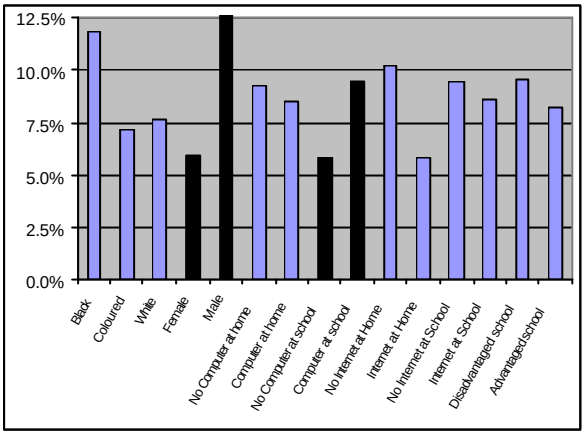

Figure 1. *Percentage in each group interested in IS.*

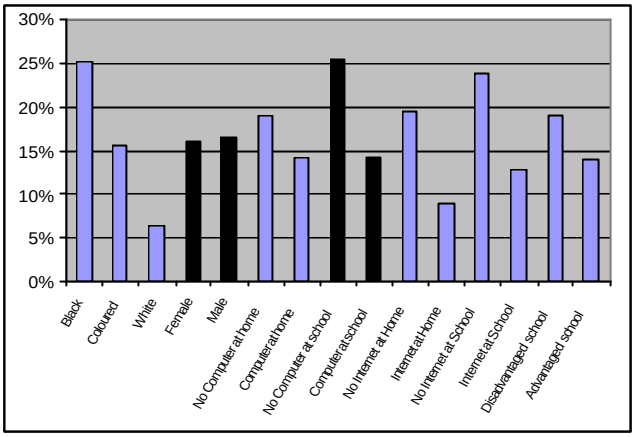

Figure 2. *Percentage in each group interested in CS.*

Grouping:	**IS**	**CS**
H_2: School PC access	1.08(0.30)	**7.14(0.0075)**
H_2: School PC access for female scholars	0.21(0.65)	**16.42(0.00005)**
H_6: Racial status	3.46(0.75)	**18.16(0.0058)**
H_7: Gender	**7.76(0.0053)**	0.01(0.92)

Table 2. *?^{2} and p values (in brackets) for association with interest to study IS and CS.*

Grouping:	**CS&IS (IT)**	**IT Females**
H_1: School status	**5.30(0.0213)**	**5.27(0.0217)**
H_3: School Internet access	**6.29(0.0121)**	**3.89(0.0486)**
H_4: Home PC access	**3.50**(0.0613)	**13.68(0.0002)**
H_5: Home Internet access	**11.13(0.0008)**	**4.77(0.0290)**

Table 3. *?^{2} and p values (in brackets) for association with interest to study IT (either IS or CS).*

The percentages of scholars interested in either CS or IS for these variables are displayed in Figures 1 and 2, with measures of association in Tables 2 and 3. The ?2 values are bold when significant (at alpha of 0.05 or less), and p values are shown in brackets. Tables 2 and 3 also indicate the hypotheses with which results are associated.

4.1 School status

Figures 1 and 2 show that the percentage of scholars choosing IS or CS as one of their top 3 study fields was higher in previously disadvantaged schools than in previously advantaged schools and the ?^{2} analysis results in Table 3 show that this difference is significant. These findings are contrary to some of those cited by Hart et al. [1999], where scholars attending previously disadvantaged schools were less inclined to choose a degree in IS or CS, a factor attributed to the disparity in the allocation of resources to schools.

The results displayed in Figure 3 confirm that scholars at previously disadvantaged schools have lower access to personal computers and the Internet. In many previously disadvantaged schools personal computers are a new resource. Comments of scholars from previously disadvantaged schools, listed in Table 4, indicate a perception that access to computers at school should be a priority and its absence puts the scholar at an disadvantage. The incorrect perception that computer knowledge is a requirement to study IS or CS is also expressed.

Feels Government should see to it that there are **computers** in township schools
I think **computers** are a good priority to people and students learn a lot from them
Pupils at school should be taught **computer** skills at school so when they are finished matric they have an advantage
Want to know how to use a **computer**
Like CS but don't have **access to a computer**
I think computer (studies) are for people in private schools. At university they only take people with huge knowledge or **background in computers**
I think it's a wonderful field to go into, but due to my lack of **computer knowledge** I won't worry with it

Table 4. *Comments from scholars at previously disadvantaged schools.*

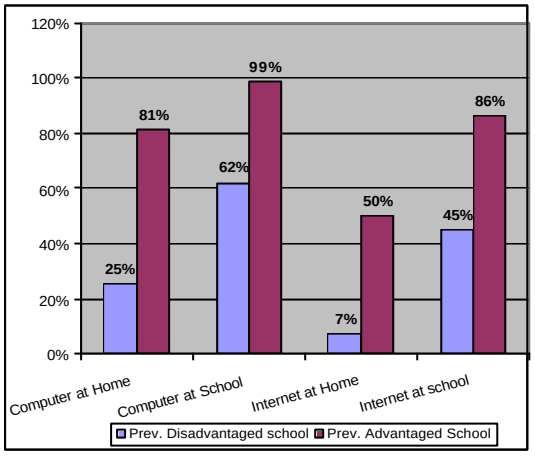

Figure 3. *Access by School Type.*

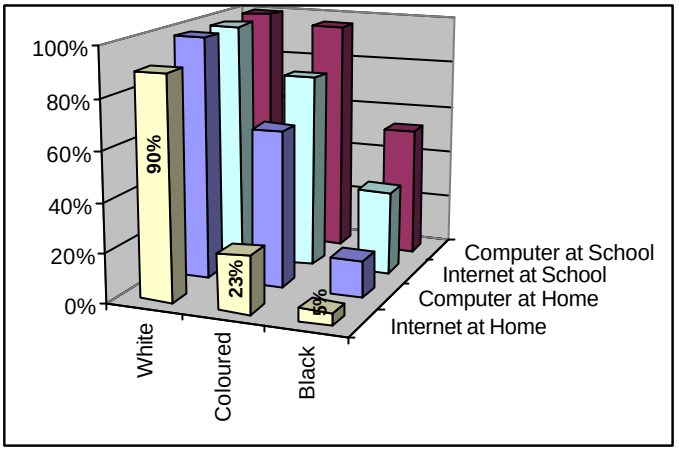

Figure 4. *Access by Racial Group.*

4.2 Access to Computers and the Internet

Figures 2 and 3 show that scholars that have access to the Internet or to personal computers are less likely to choose IS or CS than scholars without access. For Internet access at home or school the scholars interested in IS and CS were combined for $?^2$ analysis and the association was found to be significant (Table 3). For computer access at home significance was less marked. For computer access at schools, different trends were obtained for scholars interested in IS and in CS, and on analysis only the association for CS was significant (Table 2). Access to computers and the Internet, and better resources at previously advantaged schools appears to deter these scholars from wanting to study IT.

4.3 Racial Groupings

A legacy of apartheid is that a scholars' race is still associated to a large extent with school status, school type and with access to computers and the Internet. Access to computers and the Internet per racial grouping is shown in Figure 4, with white scholars having the most access. Figure 5 shows that the majority of white respondents were in independent and previously advantaged schools. While significantly more black scholars expressed an interest in studying CS as opposed to IS (Figures 1 and 2 and Table 2), this was not significant with white scholars. Black scholars showed the highest interest in studying IS, with coloured scholars just lower than white scholars. Table 2 shows that the differences for IS are not significant. In contrast, racial status was shown to be highly significant ($p=0.0058$) in terms of inclination to study CS, with black scholars showing the highest inclination and white scholars the lowest.

Literature identifies poverty and lack of role models as barriers to education for African, Coloured and Indian scholars. With the IT job market being occupied by predominantly white males there have been relatively few black role models and it would therefore be expected that African, Coloured and Indian scholars would be less inclined to pursue IS or CS. Our results show that in contrast Black and Coloured scholars show more interest in choosing CS than white scholars, showing that other factors are playing a role.

4.4 Gender

Figures 1 and 2 separately show female and male scholars' inclination to study IS and CS: considerably more females chose to study CS than IS. Male scholars are more inclined to study IS than female scholars are and a low p value of 0.0053 in Table 2 shows that this result is highly significant. In contrast, for interest to study CS, there is no perceivable difference between males and females.

The literature states that females are less inclined than males to follow a more technically oriented degree, such as CS [Durndell & Lightbody, 1996]. It was expected that females would be less inclined to pursue a degree in CS than males, but analysis of the data proved otherwise, showing that other factors must be encouraging female scholars to study CS.

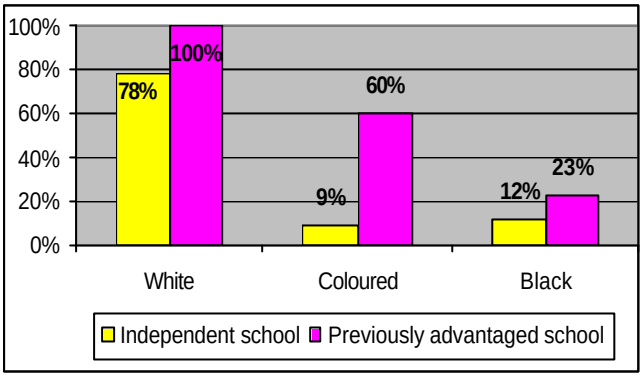

Figure 5. *Percentage by race in independent and advantaged schools.*

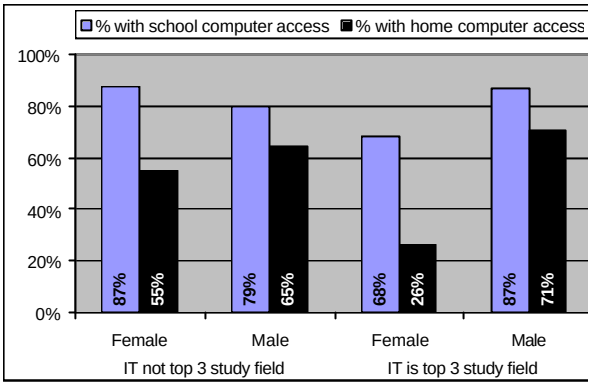

Figure 6. *PC Access by gender and IT interest.*

Gender	Computer at Home	Internet at home
Female	49%	20%
Male	66%	46%

Table 5. *Home computer and Internet access for male and female scholars.*

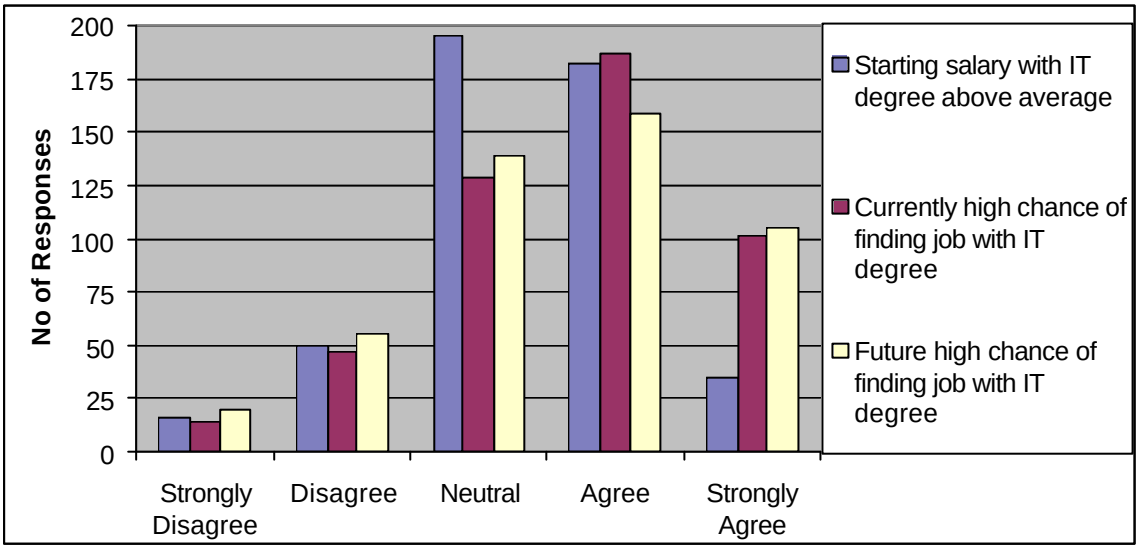

Figure 7. *Scholars' perceptions of the IT job market.*

Computer self efficacy [Compeau and Higgins 1995] is often cited as one of the reasons for gender differences in IS enrolments. For our sample, Table 5 shows that male scholars had significantly more access to computers and the Internet in the home environment than female scholars, which would usually coincide with females having lower levels of self-efficacy than males.

Our results have shown that computer access has a negative influence on the choice of IS and CS as a study field. Figure 6 separates computer access and career choice for female and male scholars and shows that this influence is not equal for both genders. Further analysis by gender was performed and the results for female scholars are presented in Table 3. The effect of lack of computer access at home on interest to study IT is highly significant for females but not significant for males. For computer access at school, only the effect on CS was significant (Table 2). On further analysis, school PC access is highly significant for females choosing CS, but not for any other combination. Table 3 confirms that for female scholars as well as males, lack of Internet access at school and at home coincides with increased interest in IT study. Analysis of interest in IS as study choice showed none of the variables to be significant.

5. IT JOB MARKET

Figure 7 shows that scholars' perceptions of the IT job market were generally positive with good job chances being seen as more probable than higher than average starting salaries. Figure 8 depicts perceptions of the IT job market from scholars who had expressed interest in IT as study field, and Figure 9 displays responses for those who had not.

Black scholars, female scholars and scholars without a computer at home had higher perceptions of job prospects with either a CS or IS degree. Scholars in these groupings, further grouped into interest in IS or CS show the greatest variation in perception. Further analysis was therefore performed on black and female scholars and is presented in Table 6.

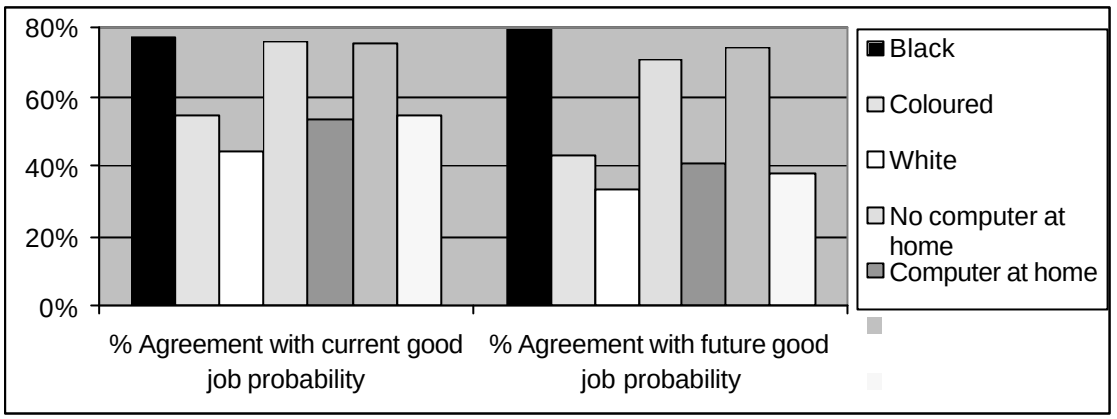

Figure 8. *Scholars who have chosen IT as a possible field of study.*

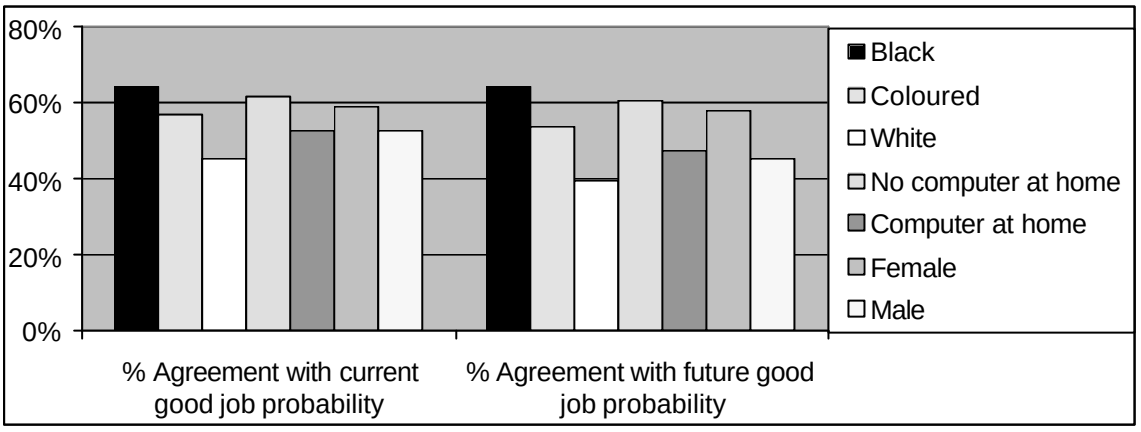

Figure 9. *Scholars who have NOT chosen IT as a possible field of study.*

Grouping:	**IS all**	**CS all**	**IT all**	**IT female**	**IT black**
Perceptions about an IT starting salary	0.01 (0.81)	0.06 (0.17)	0.05 (0.24)	0.04 (0.48)	0.09 (0.30)
Perceptions about the probability of finding a job with an IS/CS degree	0.05 (0.26)	**0.091 (0.047)**	**0.097 (0.033)**	**0.149 (0.014)**	**0.206 (0.019)**

Table 6. *Correlations and p values for association with interest to study.*

To be able to carry out significance testing on an ordinal, as opposed to nominal scale, inclination to study IS and CS was scored on a four-point scale, with respondents scoring 3 for a subject as first choice, 2 for second choice, 1 for third choice or 0 if the subject was not selected. The questions on current and future probability of finding a job with an IS or CS degree were shown to be correlated and were therefore grouped in this analysis. Similar conclusions were obtained when using Spearman's rank correlation, the Gamma statistic, and Kendall's Tau statistic.

Scholars with negative perceptions about the future probability of finding a job with either a CS or IS degree are less inclined to study CS or IT degrees than scholars who have positive perceptions. This affect is even more significant with female and black scholars. Perceptions about IT starting salaries did not appear to influence scholars study choice at variance with some previous findings. Once again no significant correlations could be found for IS.

6. IT CAREER KNOWLEDGE

Table 7 illustrates the mean responses of scholars and academics to the twelve questions regarding the behaviour and background of IS and CS students. Scholars' responses were compared to academics' responses for each statement separately to determine how correct their perception of an IS or CS degree is. Thus, scholar misconceptions are defined as instances where scholar responses vary significantly from academic responses. Despite the ordinal nature of the Likert scale it is conventional with a large sample to use means and t-tests to examine group differences, and t statistics and p-values are also given in Table 7. All the questions in the IS construct have p-values that support the alternative hypothesis, so there is strong evidence to infer that scholars do not know what an IS degree entails.

In terms of CS, scholars have a partial understanding of the degree but are unaware that the degree does not require the student to work alone and that having a strong background in computers is not required but preferable. They over-estimated most strongly the extent to which CS and IS students design new computer hardware.

Statement	Scholar mean	Academic mean	t	p
An Information Systems student				
spends most of his/her time writing computer programs	**3.072**	**2**	**3.67**	**0.006**
spends most of his/her time interacting with other people	**3.079**	**4.111**	**-3.89**	**0.004**
spends most of his/her time working alone	**2.9596**	**1.889**	**3.41**	**0.009**
spends most of his/her time designing new computer hardware	**3.072**	**1**	**39.12**	**0.0000**
is a whiz at mathematics	**2.746**	**1.667**	**6.19**	**0.0001**
started the degree with a strong prior background in computers	**3.128**	**1.889**	**4.65**	**0.0012**
A Computer Science student				
spends most of his/her time writing computer programs	3.465	4.111	-1.82	0.106
spends most of his/her time interacting with other people	2.975	2.889	0.33	0.792
spends most of his/her time working alone	**3.153**	**2.333**	**2.79**	**0.0209**
spends most of his/her time designing new computer hardware	**3.449**	**1.222**	**14.35**	**0.0000**
is a whiz at mathematics	3.4	3.111	1.09	0.305
started the degree with a strong prior background in computers	**3.491**	**2.556**	**3.13**	**0.012**

Table 7. *IT career knowledge hypotheses with t and p values.*

Don't know enough
Knows nothing about IS and requirements & needs the information
Never heard of IS
No idea what IS and CS is
Don't know anything about CS and IS
Don't know the difference between IS and CS
Thought it was one field
Thinks CS is theory and IS is prac & hardware
Want to know requirements & what subjects are involved in the degree
Would like more information

Table 8. *Scholar comments relevant to their IT career knowledge.*

Scholars' comments listed in Table 8 confirm that many of them have little understanding of IS and the difference between IS and CS. This is consistent with results obtained by Hart et al [2002] where over 70% of scholars surveyed had heard of CS, while just over 40% had heard of IS. The awareness of IS was lower with black scholars and scholars from previously disadvantaged schools. Reasons for the lack of understanding about IS could be due to the fact that IS is not offered as a subject at schools, whereas CS or computer studies is. In addition to this IS is a relatively new discipline [Watson et al. 1999].

7. DISCUSSION OF FINDINGS

7.1 Interest in IS and CS

Only 9% of the scholars surveyed chose IS as a possible study choice. The scholars showed little understanding of IS and the awareness of IS was found to be lower for black and disadvantaged scholars. Other than gender and school PC access, the relevant factors analysed had the same influence on the IS study choice as they did on the CS study choice, However, analyses showed that gender was the only significant factor found to influence scholars' interest in IS, with male students being significantly more interested in the study choice than female students.

Of the scholars surveyed, 16% chose CS and 23% chose the IT area (CS or IS) as a possible study choice. Scholars had a partial understanding of CS. The perception of probability of finding a job in IT is significantly associated with interest in IT and CS, not in IS alone. Perceptions are not consistent across different scholar categories but black and female students are significantly more influenced to study IS and CS because of favourable job perceptions.

7.2 Digital divide issues

In terms of the racial categories studied, black scholars were the most confident in the job market, followed by coloured scholars and then white scholars. This could account for racial status being shown to be an indicator for study choice for CS. Racial grouping was shown to be a significant factor, however, in contrast with previous research, black scholars were more interested in CS than coloured scholars, who were more interested than white scholars. While this is pleasing for universities eager to attract black scholars to their programs, many of the interested scholars might not meet the necessary entrance requirements. As stated in Hart [2002], for most university IS and CS major courses a matriculation exemption and a pass in mathematics are minimum requirements. While up to 95% of scholars in an

independent school surveyed meet these requirements, in some previously disadvantaged schools this percentage is as low as 5%.

Lack of Internet access and computer access at home has a surprisingly positive impact on scholars choosing CS or IS, particularly so for females. The latter may be affected by a small sub-sample. Job confidence was also shown to have a strong positive impact on females choosing IT. These opposing factors could explain why gender was not shown to be significant for choosing CS overall.

7.3 Results of hypothesis testing

Results obtained were unexpected in some areas, and confirm the importance of choosing a sample that allows for a two-tailed alternative with a suitable p-value. The stated alternative hypotheses were accepted for H_{8B} and H_{8C} (both CS and IS), for H_7 (IS only), H_9 (IS), and partly for H_{10} (CS). The null hypotheses were accepted for H_{8A} (IS and CS), for H_2 and H_6 (IS only), and for H_7 (CS only). In the other cases the hypothesised alternatives were effectively reversed. H_1, H_3, H_4 (less significantly), and H_5 yielded results the opposite of what was expected for IT, while H_2 and H_6 were strongly reversed for CS only.

7.4 Further analysis and limitations

Because certain results were surprising, a deeper look was taken at the raw data. This revealed that, although the sample was large and the demographic split overall was reasonably in keeping with that of the school-going population in the Western Cape, certain combinations of demographic variables may have had an effect on results. It transpired that there were only twelve white females in the sample, none of whom had expressed an interest in CS or IS. (This indicates to some extent the transformation that has taken place since the early 1990's, as three of the schools were 'previously advantaged' co-ed or girls schools, which prior to that had only admitted white scholars). The only inclination for females to study CS or IS therefore came from black or coloured scholars. Of the 65 white males, only seven were interested in IS, and nine in either CS or IS. This was compounded by the fact that most white males came from an independent school whose pupils were extremely well catered for in terms of computers and the Internet both at home and at school. Of the 283 females, only 16 expressed an interest in IS. Of these, five had a PC at home and only one had the Internet at home. However, all but two of these had PCs at school, and all but five the Internet at school.

Some tests were rerun excluding the independent all-male school, but this did not materially impact results. Stepwise multiple regression and stepwise discriminant analysis were also performed on various variables to determine which were most significant in determining inclination to study CS and IS, and to see whether more of the variance could be explained. Partly because of the sparseness of certain categories discussed above, this did not add significantly to the conclusions.

It is recommended that further research be carried out that takes into account the school subjects currently being taken, so that the 'reality' of the scholars' wishes can be confirmed. This research paper used a sample of Grade 12 scholars; and it would be useful to include people from earlier classes in future studies. It would also be useful to conduct research in other parts of the country, including more rural areas, as the results may not be representative of South Africa as a whole.

8. CONCLUSIONS

Unlike some previous research, the fact that certain 'deprived' groups (the previously disadvantaged and females) have not experienced computers and the Internet apparently coincides with an increased wish to study IS or CS. They are also more optimistic than others about jobs in these fields. These are however the groups who had the least awareness and understanding of IS. The strong wish to overcome the digital divide seems to have overcome some of the deterrents of computer self-efficacy. Does this reflect a change in the past situation that is also partly mirrored in declining numbers of CS and IS students in many educational institutions? When they had the opportunity in the past, did many males and 'previously advantaged' students study CS and IS because they felt comfortable with it, and thought that it was the career of the future? Now that the 'Internet bubble' has burst, and a more sober approach is being taken to IS as a career, have many of these abandoned it, leaving an increased proportion of previous 'have nots' to take their places? Is there some sense of IT 'familiarity breeding contempt'? The problem however is that many of the stated wishes of the 'have nots' can not come to fruition because of prerequisite mathematics requirements and overall entrance requirements they may not meet. It is important for institutions to be aware of this. School teachers, career advisors and parents should be better informing these students about the CS and IS fields, and advising them on school subjects needed to gain entry to them.

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