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Keywords
Computer attitudes; Saudi Arabia; higher education

Abstract
A study of undergraduate students in Saudi Arabia found that although they used technology for an average of 45 hours per week and had positive attitudes to it, they did not frequently use technology, in particular computers, in support of their learning. Qualitative evidence suggests that the students were not routinely required to use computers at university, and that in some cases the universities did not provide computing facilities or actively prevented technology usage. Factors which influenced attitudes to computers included: city of study, parental encouragement, and English language proficiency but not gender.

1 Introduction

Saudi Arabia is a developing economy which is experiencing rapid technological growth, and has a relatively recently established higher education sector. While evidence from other countries would suggest that there are benefits to integrating technology enhanced learning within university degree programmes, Saudi Arabian universities have generally not yet done so (Alturise & Alojaiman, 2013). However, improving educational technology provision is a national priority for the future: the King Abdullah Bin Abdulaziz Public Education Development Project[1] which has invested US$3.1 billion to improve education in Saudi Arabia, aims to "utilize information and communication technology (ICT) in education to stimulate learning".

This paper uses qualitative and quantitative data to examine the extent to which Saudi Arabian undergraduates currently use technology, both generally and in support of their learning. It also explores students' attitudes to computers and the factors which influence those attitudes, using a standardised computer attitude scale and focus group data. It contributes data on technology usage patterns within Saudi Arabian university students, which will be of interest to educators and policy makers in that context, and additionally makes a wider contribution to the study of the factors which influence computer attitudes. The strong cultural gender roles in Saudi Arabia give reason to believe that there would be gender differences in attitudes to computers there. Other factors which can influence attitudes include: inequalities in technology infrastructure and socio-economic development in rural areas, parental encouragement and English language proficiency.

2 Background

[1] http://susris.com/glossary/king-abdullah-bin-abdulaziz-public-education-development-project/

2.1 The Saudi Arabian context

2.1.1 Technology Use in the KSA

A survey of 3000 people conducted by the Saudi Arabian Communications and Information Technology Commission (CITC) in 2014, found that about 91% of respondents use the Internet. The majority of participants reported four important reasons for using the Internet; browsing websites (87%), social networking (67%), communication (55%), and looking for information (54%). Social networking is popular (90.79% of respondents used social networks, 90% female and 91% male), with Facebook and Youtube the most popular services.

The home was the first point of access to the Internet, and the one most frequently reported by participants (CITC, 2014). The main reason for not using the Internet at home was using a mobile Internet connection instead (CITC, 2014). About 55% of younger adults (aged between 20 and 29) reported accessing the Internet from educational institutions, while 83% of the same group reported accessing Internet at home (CITC, 2014). In terms of education, 45% of participants overall reported using the Internet for learning and educational purposes either on mobile devices or at home (CITC, 2014). 77% of the respondents used a desktop, laptop or tablet device (86% of females, 72% of males). Mobile Internet usage was 80% among the general population and 91% in the 20-29 year old bracket (CITC, 2014, p1); this is relevant because students in other countries often access learning content on mobile devices and the prevalence of mobile Internet usage in KSA suggests that the hardware to do so is available.

The CITC study also reported that a large percentage of Saudis prefer to use an Arabic language operating system (63%), web content (67%) and other electronic content (68%) rather than English versions. However, a low proportion of online content is available in Arabic (estimated 1.5%[2]), which may present a barrier to usage.

2.1.2 Higher Education in KSA

Saudi Arabia established its Higher Education system in 1950s, with the foundation of King Saud University. Higher Education is free for every student and the government issues a monthly grant; this has led to a rise in the number of students (Alturise & Alojaiman, 2013). In 2015, there were twenty five government universities, with 41, 927 teaching staff educating a total of 666,475 students[3]. Enrolment rates in tertiary education are 42% for women and 40% for men (World Economic Forum, 2013).

Saudi Arabia's universities are gender segregated, with the exception of the Colleges of Medicine and King Abdullah University of Science (Alturise & Alojaiman, 2013). Because of the division of the university disciplines by gender, male and females do not usually receive equal opportunities. Male students have a wider range of educational and specialist choices available to them, whereas most women study education, human sciences, natural sciences, and Islamic courses (Almunajjed, 2009; El-sherbeeny, 2014). Thus the majority of females graduate from humanities and education departments, and many women choose to enter the field of education when they graduate, as teaching is seen as a job suitable for females. It is still the case that women have less access to engineering courses, which are traditionally filled by men (El-Sherbeeny, 2014). According to Islam

[2] http://www.stateofdigital.com/the-arabic-web/
[3] http://he.moe.gov.sa/EN/STUDYINSIDE/UNIVERSITIESSTATISTICS/Pages/default.aspx

(2014), 90% of Saudi women currently involved in the workforce are educated, but qualifications will not necessarily lead to employment: nearly 80% of unemployed women in the country have university level education or more. Labour force participation stands at 18% for women and 76% for men (World Economic Forum, 2013).

In a literature review examining the use of ICT in Saudi Arabian universities, Alturise & Alojaiman (2013) found that ICT is not integrated into the curriculum, staff lack the time (and in some cases the motivation) to learn how to use ICT, there is a lack of technical support, and inadequate access to the Internet. Alfahad's survey of 161 female students at King Saud University in Riyadh found that 69% of the participants used an electronic device for their studies at least once a week (7.5 % daily), and 35% accessed an online course management tool at least once a week (5% daily) (Alfahad, 2012). This level of technology usage is lower than other countries with more established higher education systems. For example, in a study of 799 undergraduate and 81 postgraduate students in New Zealand, at least 87% of them used digital technology daily for university work (Lai, & Hong, 2015). A study of 2338 German university students found that the students spent around 4 hours each day learning online (Zawacki-Richter & Müskens, 2015).

Nassuora (2012) surveyed 80 students from Al-Faisal University in the capital city of Saudi Arabia. 82.5% of the participants said they do not use their mobiles for learning. This is in contrast to the results of the large 2014 ECAR international study of students' attitudes and usage of technology which found that around 70% of students across 15 countries (not including Saudi Arabia) used smartphones for academic purposes such as accessing course materials and e-reading (Dahlstrom & Bichsel, 2014).

2.2 Factors influencing attitudes to computers

2.2.1 Gender

According to "The World's Women 2010" report, the United Nations Department of Economic and Social Affairs indicated that a gender digital divide still exists, more prominently in less developed countries with lower Internet access rates, but also in the developed countries with high access rates (Mrkic, Johnson & Rose,2010). There is a lack of women participating in the technology labour market internationally. A report by the World Economic Forum in 2016, which studied employment trends in 15 regions worldwide, found that only 24% of the workforce in Information and Communication Technology were female, that there was a 25% gender pay gap in this sector and that 37% of companies regarded expanding women's participation in the work force as an opportunity (Word Economic Forum, 2016).

Moghaddam (2010) attributes the wider gap in developing countries to culture and social values as predicted by Hofstede's cultural dimensions (Hofstede, Hofstede& Minkov, 2010). In his analysis, developing countries generally have high power distance (more inequality between people), lower individualism (less emphasis on individual achievements and more on collective achievements) and higher masculinity (the society tends to reinforce typical masculine work role model).Taken together, these cultural factors tend to lead to a gender gap.

Much research has been conducted on gender differences in attitudes to computers over a period of nearly four decades. In an analysis of twenty five years of literature (71 studies), Kay summarised that "Males and females are more similar than different on all constructs assessed, for most grade levels and contexts. However, males report moderately more positive affective attitudes, higher self-efficacy, and more frequent use"(Kay, 2008;p12).

In this paper, our analysis focuses on affective attitudes to computers as measured by the commonly used, well validated CAS scale which considers the dimensions of anxiety, liking, confidence and perceived usefulness (Loyd and Gressard 1985). We acknowledge that, since the inception of the scale, patterns of technology use have changed markedly, with rapid growth in ownership and use of mobile devices like tablets and smart phones, at the expense of desktop systems, and, to a lesser extent, laptops. Most mobile device use beyond telephony is via the Internet, for social and entertainment purposes, and this might be expected to have a positive effect on attitudes to wider computer based technologies.

Nonetheless, KSA has relatively underdeveloped use of technology for teaching, with almost all based on traditional laboratories or classrooms of desktop computers. Thus, attitudes specifically to computers are an important factor in understanding how KSA students respond to their use in teaching. Furthermore, the CAS scale is well established and widely used, enabling consistent comparisons with longitudinal attitude changes and across cultures.

Within the CAS scale, the *anxiety* subscale refers to feelings of unease, threat, hostility and aggression while using a computer; the *liking* subscale refers to experiences of enjoyment with or avoidance of computers; the *confidence* subscale refers to feelings such as that computers are hard to use or computing courses are difficult to handle; and finally the *usefulness* subscale refers to participants' perceptions of the extent to which computers are of benefit in everyday life and one's career, or whether they are a waste of time. In the literature which follows, prior research with other scales is also reported, but the focus remains on similar concepts within the affective dimensions of attitudes to computers.

The affective component of attitudes to computing is particularly well studied in the computer anxiety literature. The consequences of computer anxiety are avoidance of computers, attempts to reduce time spent with them, and caution when using them (Maricutoiu, 2014) – all of which could prevent learners capitalising on benefits of educational technology. In spite of this, computer anxiety does not necessarily reduce an individual's perception of utility of computers in general (Maricutoiu, 2014). Powell's (2013) systematic review of 80 computer anxiety (CA) studies published over two decade (1990s and 2000s) provides some insight into how findings vary according to demographic group. Almost all studies in both decades which used child participants found girls to have higher CA than boys. Moreover, most studies using adult participants found women to have higher CA than men. However, the pattern of findings is different in studies of college students: in both decades, two thirds of the studies of college students found no gender differences in CA.

One study of Saudi Arabian students (Oshan & Khudair, 2008) measured attitudes toward the Internet among 793 Saudi Arabian students and found that Saudi women have positive attitudes to the Internet and lower Internet anxiety than men, but that they were less confident about their ability to control their own Internet usage. Another study examined 531 KSA students' attitudes toward e-learning and found the students to have positive attitudes in general, with males indicating stronger positive attitudes than females (Al-Harbi, 2010).

2.2.2 Prior Computer Experience

Previous meta-analyses have found that computer anxiety is correlated with lack of computer experience (Maricutoiu, 2014; Powell, 2013). Prior experience of working with computers reduces anxiety and improves performance when using them.

A study by Korobili et al. (Korobili, Togia, & Malliari, 2010) showed that Greek students' levels of computer anxiety vary with their experiences of computers and how frequently they use them. The researchers found that students who own PCs (and had done so since high school), and who use them more frequently and at a higher level, had significantly reduced anxiety levels towards computers.

Prior experience has an impact on self-confidence when using a computer. A study of 70 Turkish students found that those with more than four years of computer experience were more confident about their competence to use hardware and software than those with less prior experience (Isman & Celikli ,2009).

Beckers and Schmidt conducted a study of 184 psychology students in the Netherlands to explore how feelings of computer anxiety develop (Beckers & Schmidt, 2003). They found that an enjoyable initial exposure to computers, during which the user felt in control, was associated with greater subsequent computer experience, which in turn was associated with lower levels of anxiety and greater liking of computers.

2.2.3 Parental Encouragement

Families and parents are other important factors that influence students' attitudes toward computers (Yuen and Lau, 2014). In studies of university undergraduate students in Iran and Tawain respectively, Shashani and Khalili (2000) and Liu (2009) found that home computer access in conjunction with parental support helps students build their computer knowledge, and that students whose parents are highly educated tend to have greater confidence and knowledge about using computers. However less confidence and interest in computer work are displayed by students, particularly females, who feel that their parents hold stereotyped views on computers.

Previous surveys have found that there are gender differences in the degree to which parents encourage their offspring to engage with technology, with parents displaying a more protective attitude to girls. A study of Internet and television usage among undergraduate students in Saudi Arabia, Miliany found that parents were likely to restrict or prevent Internet usage among their daughters more than their sons (Miliany, 2014).

2.2.4 English language proficiency

International students potentially experience language barriers when using technology, since most software and applications use English and can be worded in unfamiliar jargon. Therefore, before students can use technology to complete their assignments, they must first learn the basics of the language used for relevant software applications (Alturise & Alojaiman, 2013). Al-Hunaiyyan et al, (2008); Korobili, et al. (2010) and Antonio & Tuffley (2014) investigated knowledge of the English language as an influence on student attitudes; students who had knowledge of English reported more positive computer attitudes. In Li and Kirkup's comparison of UK and Chinese students' attitudes to the Internet, some Chinese students reported that they did not like to use the Internet because too many of the sites were in English and that it was not a good medium for cultural exchange because of language barriers (Li and Kirup, 2007).

2.2.5 Location

The rural-urban digital divide (RUDD) refers to the inequality of access to the Internet and other technological resources for people living in different geographical regions of a country (Li &Ranieri, 2013). Those living in rural areas are less likely to have access to high quality Internet services for reasons relating to poorer infrastructure in remote areas or socio-economic inequalities (Hollifield, et al., 2003), and this has an impact on digital literacy.

There is likely to be rural-urban divide in Saudi Arabia for socio-economic, educational and cultural reasons. 82.1% of the Saudi population live in urban areas while 17.9% live in rural areas[4]. There are fewer employment opportunities in rural settings in Saudi Arabia. For example, the Hael region in the north of Saudi Arabia has the highest rate of unemployment at 35% (Almunajed, 2009) (in comparison to 5.7% overall[5]). Regional differences in unemployment rate will lead to both a lower likelihood of technology adoption in rural areas due to economic barriers, and also less exposure to new technology skills in the workplace.
Rural areas within the Middle East including Saudi Arabia tend to have higher rates of illiteracy than urban areas (Roudi-Fahimi and Moghadam, 2003). It has been estimated that a quarter of the country's rural population fails to get any kind of formal education, and half of that number cannot read or write. In urban areas, the percentage of those who do not get a formal education is only between 8 and 9%, and all of them can read and write (Alsakran, et al., 2009). In Saudi Arabia, urban schools have more resources than rural schools, and their teachers are more experienced (Al-Silami, 2010). Those living in rural areas, therefore, may lack the underlying literacy skills required to use many software packages and are less likely to have encountered digital learning at school.

In addition, there are cultural differences between urban and rural areas which may impact technology acceptance. Most large Saudi Arabian cities have a multicultural population with varied backgrounds. This differs from the typical population of smaller cities, towns, and villages, which contain many Bedouin families who have distinct conservative cultural traditions (Al-Silami, 2010).

For the purposes of this paper, the term *location* refers to the city in which the student participants study: *capital* city refers to Riyadh (population 5188286) and Hail (population 310897), Kharj (population 40114) and Majmaah (population 47743)[6] and referred to as *small* cities. The small cities have one recently established university (within the last decade) and educate students from local rural villages.

3 Research questions

Saudi Arabia is in the midst of rapid technological change. While a high proportion of the population has access to the Internet at home, previous studies have found that learning technology is not well integrated within the relatively new higher education sector. This study aims to document undergraduate students' patterns of technology usage (RQ1), and their attitudes to it (RQ2). A range of factors which may influence attitudes to technology in the Saudi Arabian context have been identified from the literature: gender, prior computing experience, parental encouragement, English language proficiency, and location (the rural-urban digital divide) (RQ3).

- RQ1: To what extent do Saudi Arabian undergraduates use technology, in particular computers, both generally and in support of their learning?
- RQ2: What are the attitudes of Saudi Arabian undergraduates to computers, both generally and in the support of their learning?

[4] http://www.geohive.com/earth/pop_urban.aspx
[5] http://www.cdsi.gov.sa/english/
[6] Population data from Central Department of Statistics & Information (2010).

- RQ3: What factors influence these students' attitudes to computers?

4 Methodology

In order to answer these research questions, a mixed method approach was employed. Quantitative survey data on usage patterns and computing attitudes was gathered from over 1000 undergraduates students from 6 universities in the capital and small cities. In addition, to more deeply understand the students' perspectives, a series of focus groups was conducted with 36 students.

4.1 Quantitative Methodology

4.1.1 Participants

The study sample includes 82% (881) undergraduate students from three universities in the capital city of Saudi Arabia, while 17.9% (192) of the sample were from three universities located in small cities. The total number of participants was 1073, 54.7% female, 45.2% male. The participants were from different subjects of study as follows: Islamic Studies and Education (254), Medicine (74), Computer Science (115), Life Sciences (108), Social Studies (100), Preparation Year (37), Business Management and Maths (187), Languages (167). A further 10 participants did not report their subject of study. 44.5% were in their first or second year, and 54.9% in their third and fourth years. The ages of the participants range from 18 to 41 years.

4.1.2 Procedure and Materials

Written consent was gained from each institution and from each participant. Participants were asked to complete questionnaires about their gender, age and course of study, information about their computer use and computer experience using an adapted version of questions from Garland & Noyes (2004) with the addition of computer skills questions (experience of most popular applications and programs). Participants were also asked to self-report their English proficiency by rating it as one of: No English, Limited, Good, Very Good and Excellent. These answers were converted to numerical scores (where higher proficiency has a higher score).

In addition to demographic and technology usage questions, participants were asked to complete the Computer Attitudes Scale (CAS) developed by Loyd and Gressard (1985) for university students. CAS has four subscales: computer anxiety; computer confidence; computer liking; and computer usefulness. The total score for the four subscales is also used to measure attitudes (Loyd & Loyd, 1985). The scales were scored as follows: "Item responses were coded so that a higher score indicated a lower degree of anxiety and a higher degree of liking, confidence and usefulness. A higher score on any of the subscales or total scores indicated a more positive attitude toward using computers" (Loyd & Loyd, 1984). The highest possible score in the CAS is 200, while the lowest possible score is 40.

To measure the reliability and validity of the questionnaire with the Arabic version before conducting the study, data were collected from sixty-five undergraduate students. The reliability test coefficient alpha result for attitudes scale (CAS, scales) was 0.9 (see Table 1)- close to the English version by Loyd and Gressard (1985). In addition the questionnaire's validity was measured by identifying how the scale items correlate to each other: this showed high correlation with the Arabic version, with values between .67 and .91.

CAS Questionnaire	Computer Anxiety	Computer Confidence	Computer Liking	Computer Usefulness	Computer Attitude
Arabic Version	.82	.81	.79	.77	.92
English Version	.90	.89	.89	.82	.90
The Total Data Arabic Version	.80	.81	.73	.71	.90

Table 1. The Coefficient Alpha for CAS English and Arabic

A questionnaire about beliefs regarding gender abilities was also administered as part of a wider study (Alothman, 2016) but are not further considered here. The question sets used in the study can be found in the supplementary materials.

4.2 Qualitative Methodology

Six focus groups (three male and three female) were conducted with six undergraduate students in each group to study student's attitudes in more depth. The groups were as follows: male urban computer science students (MCU), male urban non computer science students (MSU), male rural non computer science students (MSR), female urban computer science students (FCU), female urban non computer science students (FSU) and female rural non computer science students (FSR).

Error! Reference source not found. shows how each group is composed and referred to in the analysis. The variation in groups was to help make comparisons between rural and urban students, between male and female students, and to compare Computer Science students with other subject students. After getting formal agreement from each university to conduct the study, participants were asked to sign forms of informed consent before starting the discussion.

The interview started with demographic questions about age and study subject. Subsequent questions were about computer use at home and university, computer experience, computer skills, and encouragement to use computers. The question set is available in the supplementary materials.

In order to make the discussion easier and more effective interviews were carried out in Arabic, as the interviewees were native Arabic speakers. The first author took notes during these sessions, as the participants declined to be audio recorded. The notes were translated into English by the first author then evaluated by a professional translator. NVivo (Qualitative data analysis software) was used to analyse this qualitative data using thematic analysis. Transcripts of two of the groups were second-coded by the second author to validate the analyses. The percentage of agreement of the inter-rater reliability was 95% (Alothman, 2016).

5 Results

5.1 RQ1: Technology usage among Saudi Arabian undergraduate students

5.1.1 Findings from Quantitative Data

Total N = 1051		Male, capital city (N= 390)		Female, capital city (472)		Male, small city (N=82)		Female, small city (N=107)	
		M	SD	M	SD	M	SD	M	SD
1	Computer or laptop (Home)	16.3	18.1	16.1	20.5	18.2	37.9	9.7	12.8
2	Computer or laptop (University)	2.5	4.2	1.9	3.0	3.3	4.7	1.1	4.6
3	Total time spent using technology	45.9	48.7	46.5	50.3	46.0	36.4	35.4	37.6
4	Email	3.4	6.8	2.8	4.3	2.7	4.9	3.1	6.4
5	Social networking	11.0	14.8	12.8	19.6	12.6	12.5	9.4	12.7
6	Productivity software	4.3	7.8	4.8	10.9	2.8	4.5	3.1	4.8
7	Computer assisted learning	2.5	5.5	2.3	4.4	1.7	3.8	2.0	4.3
8	Computer programming	1.4	4.6	1.2	4.2	1.0	3.0	0.6	1.7
9	Internet usage	16.2	19.1	17.8	23.4	17.5	16.3	12.1	12.7
10	Games	4.3	10.3	2.8	8.27	4.4	11.0	3.3	7.1
11	Other	2.4	6.7	2.5	11.5	1.0	2.4	1.7	3.6

Table 2. Hours per week on various technological activities by gender and location. Row 3 was calculated by summing hours spent using applications in rows 4-11

In terms of computer experience, students reported a mean of 8 years (SD = 3.0) of experience in using computers (Male M = 8.4, Male SD = 3.2; Female M = 8.5, Female SD = 2.9). As shown in Table 2, location and gender have an impact on hours spent using technology: women who study in small cities spend considerably less time using technology per week than either men in the same area or women who study in the capital city. Furthermore, all student groups spend considerably less time using a computer or laptop at the university than they do at home.

Self-reported estimates of the number of hours spent using different applications (on computers or mobile devices) are also shown in Table 2. Row 3 shows the total estimate of time spent in various technology activities, based on summing rows 4-11. The total time spent in these activities is far greater than the time spent using computers or laptops at home and university, which suggests that much of the activity was carried out on mobile devices. When mobile device usage is taken into account, the students spent around 45 hours per week using technology. The most frequent activities were using social networking and using the Internet. Using productivity software (such as word-processors, spreadsheets or data-bases), computer programming, playing games and engaging in computer assisted learning were less popular activities.

5.1.2 Findings from Qualitative Data

All students who took part in the focus groups have smartphones, except one female student from the small city who uses a feature phone instead. All students (male and female) use smartphones for chatting, social networking applications, news applications, Instagram, notes, dictionary, games, to send broadcasts and for learning English applications.

Small city students, male and female, reported rarely using computers in general. On the other hand, most participants from the capital city, studying different subjects, reported that they did use computers for studying, mentioning activities such as using a word processor, using graphics programs and translation.

Participants were asked to speculate about the reasons behind previous studies finding that students use computers for entertainment more than for learning. They suggested that this situation could be related to students' limited knowledge and skills with computers as discovered from students' replies such as: "*Maybe they are not aware about how to use it for learning or to use it for something useful*" (FCU)

Male computer students explained that the possible reason why Saudi students tend to use computers for entertainment more than learning is as a result of the education system in schools and universities in Saudi Arabia: "*There is no learning from childhood about how to benefit from computers*" (MCU). Similarly, other male and female students from different subjects offered the same reason, mentioning there was no need to use computers or the Internet in their study: "*In our education and study there is no need to use computers, or we don't have to use computers*" (MSU); "*Because we don't depend on computers to produce homework or projects*" (FSU). A female student from the small city explained not using computers for learning thus: "*The main reason is that in our education system we learned about computers in few classes in High School and then no more in other classes or even in the university…If the education system is strong we will use computers for studying, learning and increasing knowledge*" (FSR). Moreover, some students felt it was due to the availability of material or sources on the Internet: "*There are not enough education sources*" (FCU).

In addition, most of the non-Computer Science students don't use computers in university. Females in one university in the capital city and females from the small city are not allowed to bring and use their laptops or tablets in class, and in the small city, they are additionally prevented from bringing smartphones onto the campus: "*No. The university don't allow us to bring laptops, tablets or smartphones*" (FSR); "*Though it is not allowed to bring or use computers or tablets in the university, we have to get permission if we need to use them for presentations*" (FSU). Moreover, some capital city students reported that there are computer labs in their university, but these were not available to all students or not available at all times: "*But the labs are not open all the time; labs are for Computer Science students only*" (MCU), whereas some others did not know whether there was a computer lab at university or not. Students from the small city said that there are computer labs available but without Internet access; or no computer labs were available for all students: "*No computer labs for students, but maybe there are for Computer Science students.*" (FSR)

5.2 RQ2: Attitudes towards computers among Saudi Arabian undergraduate students

5.2.1 Findings from Quantitative Data

The mean CAS score was 148.38 (sd = 22.83). As the scale ranges between 70 and 200, this indicates that the students in this sample were well disposed the computers. Figure 1 shows the responses to the CAS anxiety sub-scale. A high proportion of the students agreed that they feel comfortable and

at ease with computers, and correspondingly a high proportion disagreed that they feel negative emotions such as discomfort, aggression or hostility towards computers.

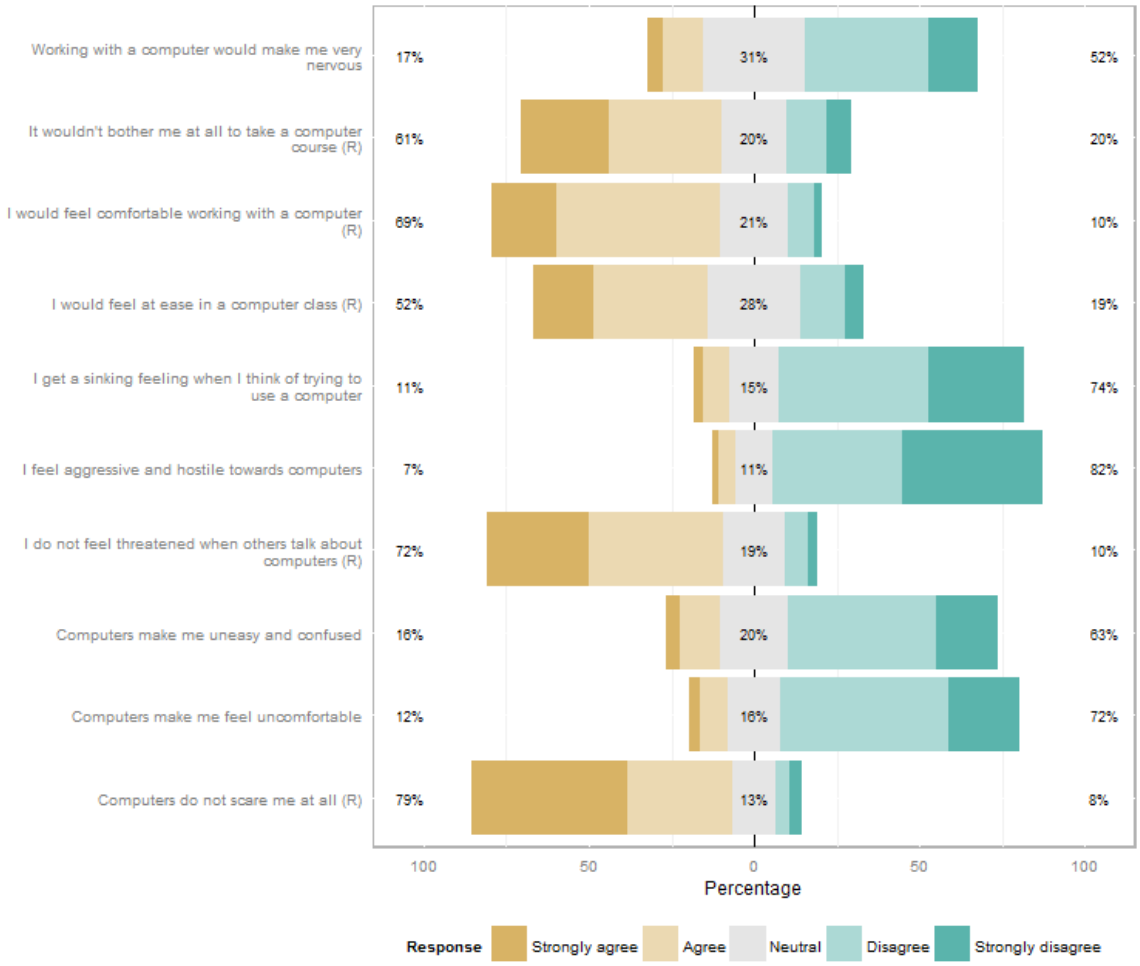

Figure 1. Computer Attitude Scale responses: anxiety.

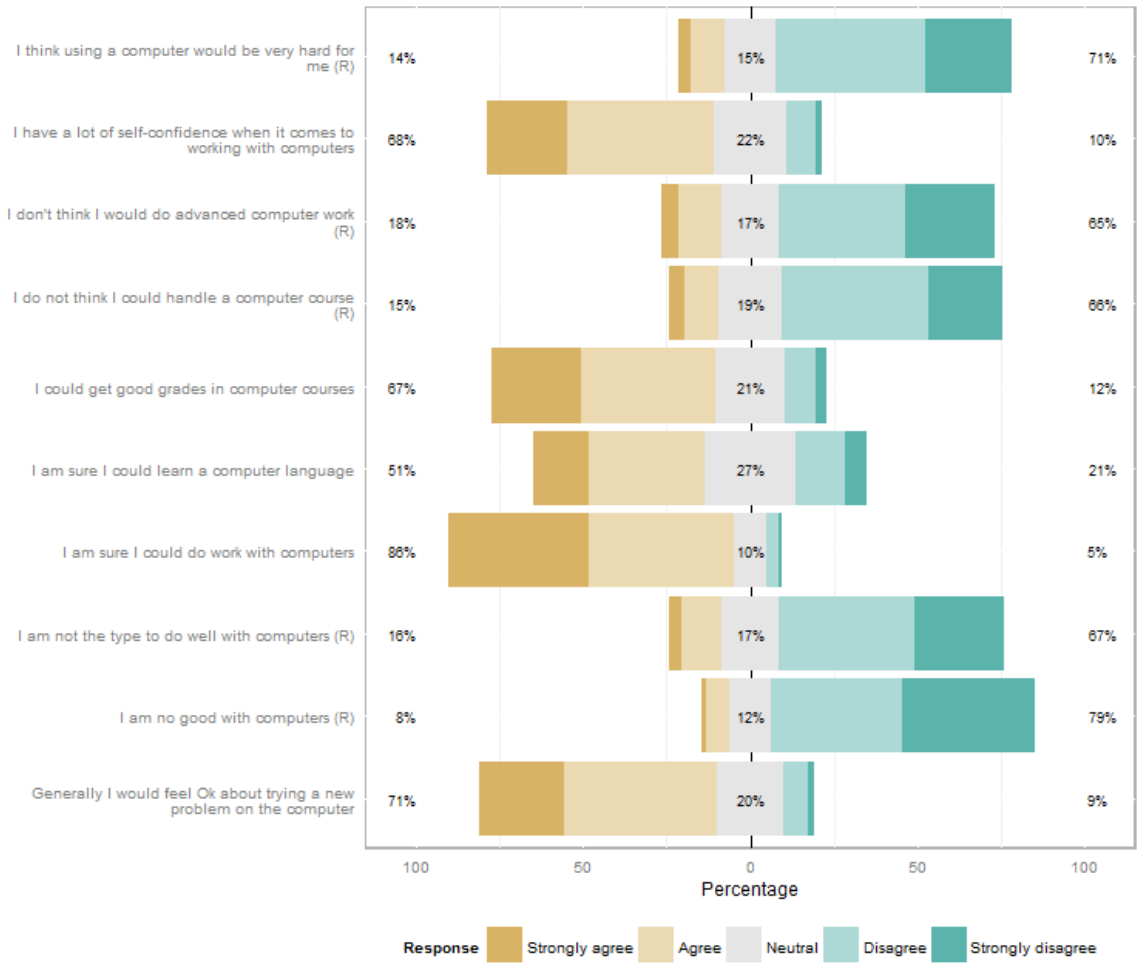

Figure 2. Computer Attitude Scale responses: confidence.

The students were positive in their responses to the CAS confidence sub-scale, as shown in Figure 2. 68% agreed that they had a lot of self-confidence when using computers, 86% were sure they could do work with computers, and 67% thought they could get good grades in computer courses.

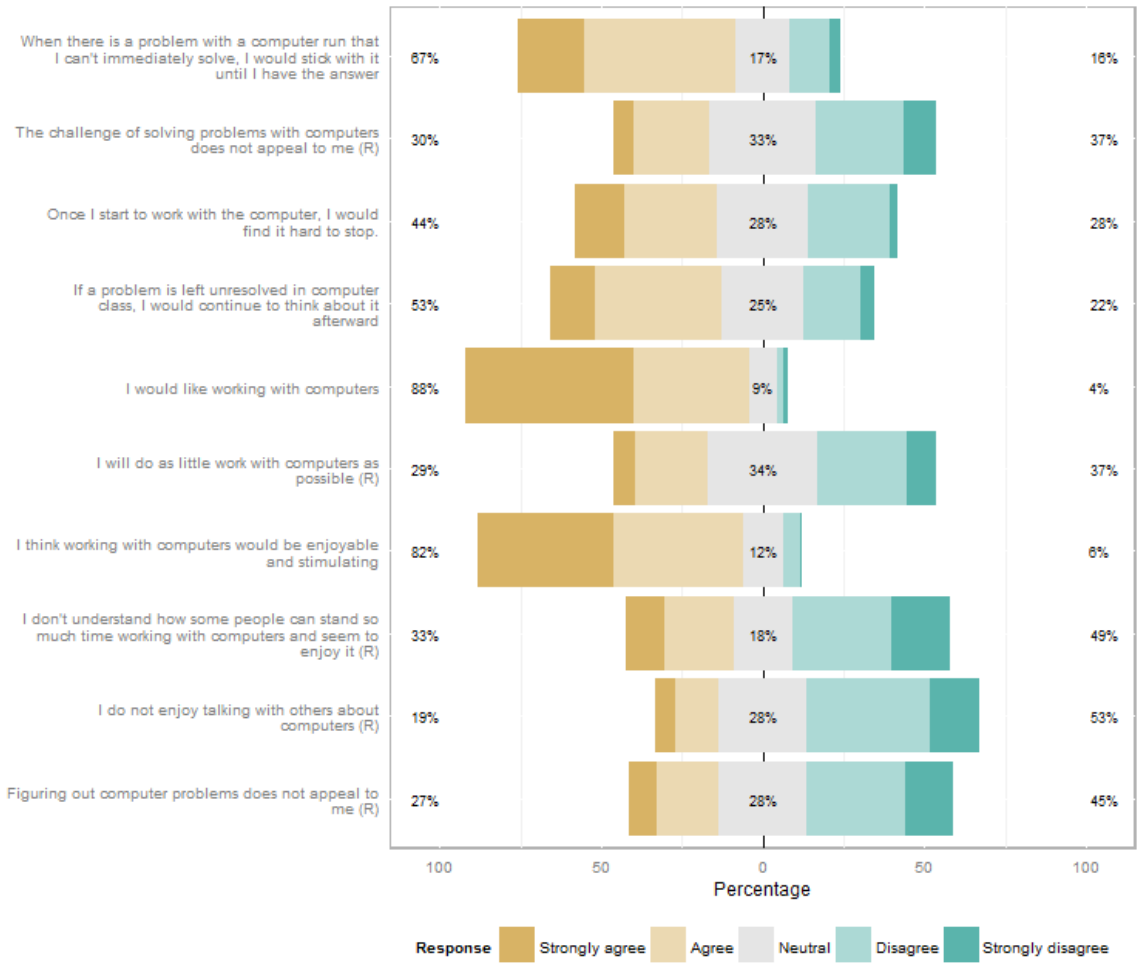

Figure 3. Computer Attitude Scale responses: liking.

The students scored highly on the liking sub-scale (Figure 3). For example, 88% of them agreed that they would like working with computers, and 82% agreed that computer work would be enjoyable and stimulating. Responses relating to talking about computers with others, and problem solving relating to computing were more varied.

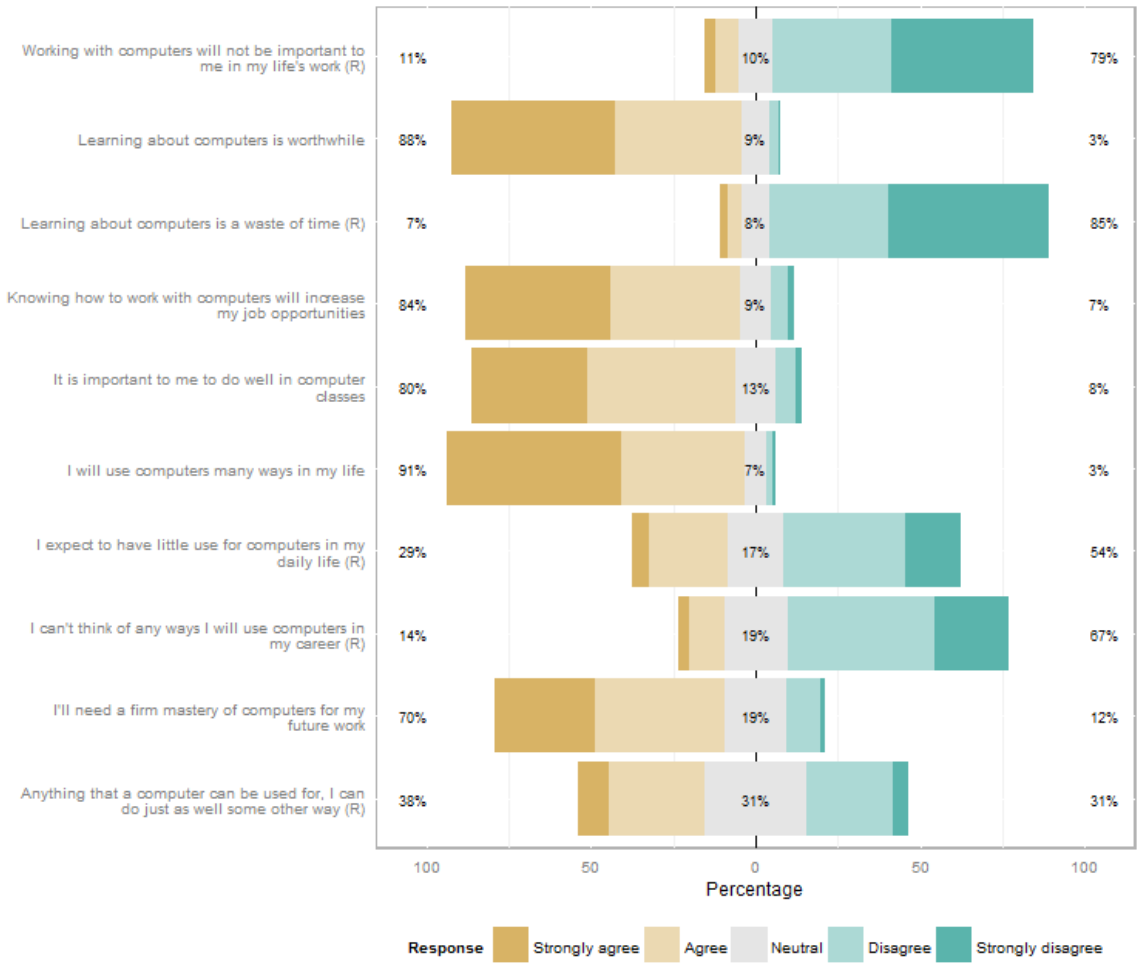

Figure 4. Computer Attitude Scale responses: Usefulness.

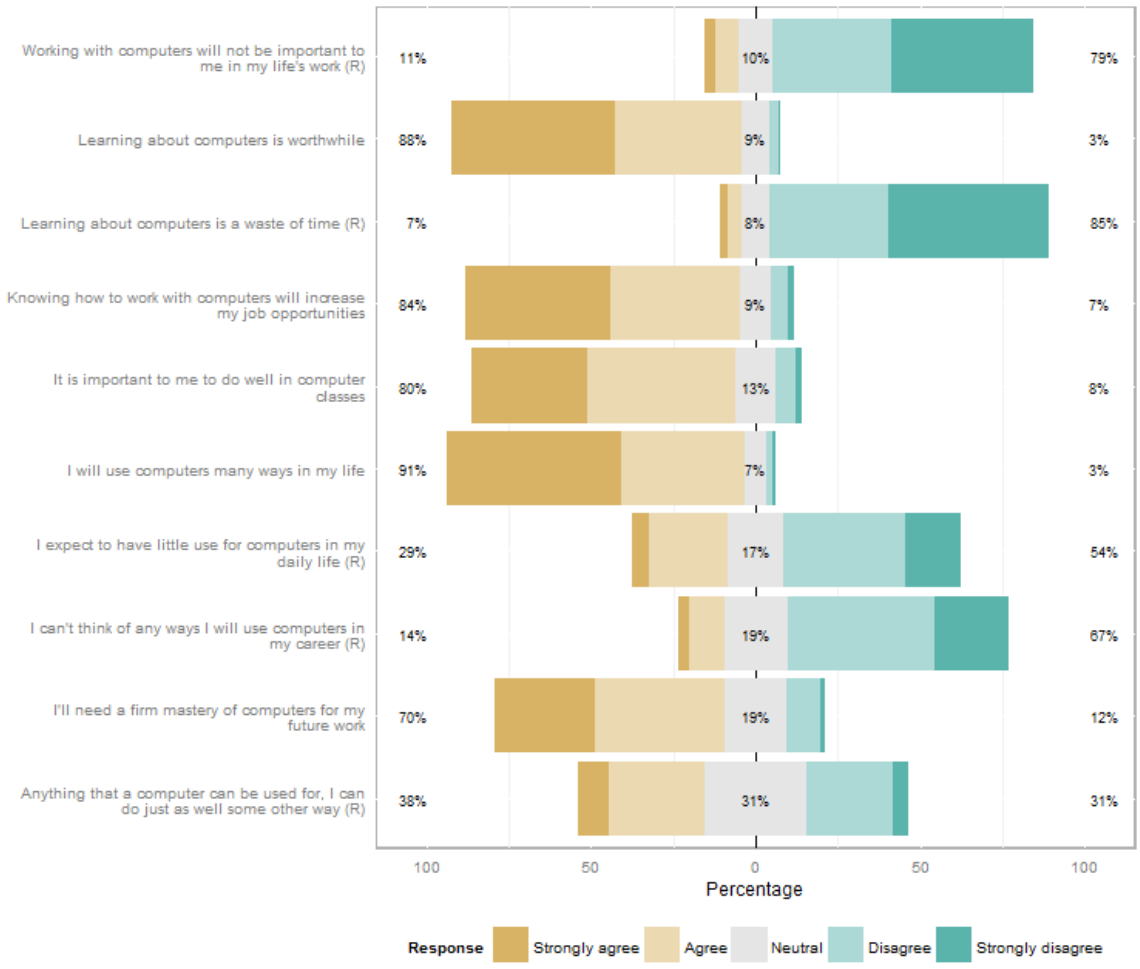

Figure 4, the students generally considered computers to be useful to their lives – e.g. 88% agreed that learning about computers is worthwhile, 91% agreed they would use computers many ways in their lives, and 70% agreed that they would need a firm mastery of computers for future work.

5.2.2 Findings from Qualitative Data

When asked how they felt when they were first introduced to computers, the students replied for the most part positively e.g. "*I was dazzled*" (MCU), "*I wanted to learn everything about the computer*." (FSR). Two students in the rural focus groups mentioned being nervous or worried, and one reported boredom.

The focus groups showed that some students have lower confidence in their computer skills which made them unhappy to do homework or projects when their teachers asked them to: "*I don't have many computer skills so it makes me nervous*" (FSR). Weaker computer skills made them take a long time doing their homework and they felt doing work with a computer was difficult and complicated: "*I don't like doing work with a computer because searching and writing take a long time*" (MSR); "*I need help; so difficult, very complicated*" (FSU); and "*No. It takes a long time to do, then hurts my eyes*" (FSR). Computer students also didn't like to do homework using computers and they (paradoxically) felt doing it without computers was easier: "*If I can do it by hand it would be easier*" (FCU).

The focus groups considered whether undergraduate Saudi students were interested in having workshops about computing to increase their skills. "*I want them because computers help in lots of careers*" (MSU); "*More workshops in computers are important for opportunities to get jobs*" (FSU). Other students wanted to have opportunities in computer workshops to increase their skills and knowledge as they think computers are important in their life: "*Computers are now used for all fields*" (MSR); "*Computers have become important in our life so I would learn more skills to increase my knowledge*" (FSR). Reluctance to attend workshops in computer skills was voiced by five females from both cities, because they have a negative attitude towards computers: "*No. I don't like working with computers unless needed*" (FSU)

5.3 RQ3: Factors influencing attitudes towards computers

5.3.1 Findings from Quantitative Data

A multiple regression model was built in R(R Development Core Team, 2011) following the procedure in Chapter 7 of (Field, Miles, & Fileld, 2012). Factors of theoretical interest were added in the order of anticipated importance (gender, location, prior computing experience, English language proficiency, parental encouragement). The fit of each model was compared to the previous model. After this initial analysis, the regression was repeated using the model with the best fit, excluding the variables which were statistically redundant the first time (gender). The result of this is labelled as "final model" in Table 3, and illustrated graphically in Figure 5. The model is based on a dataset containing the 1051 participants who completed all of the questionnaire items relating to the factors under study (22 participants had missing data). The residuals of this model were examined for outliers and influential cases but none were found.

	ΔR^2	B	SE B	β	P
Step 1	-0.0009				.79
Constant		149.8	1.008		<.0001
Gender		0.35	1.355	0.008	0.80
Step 2	0.07				<.001
Constant		137.6	1.76		<.001
Gender		0.82	1.31	0.02	0.5
Location		14.4	1.73	0.26	<.001
Step 3	0.12				<.0001
Constant		124.11	2.53		<.0001
Gender		0.27	1.28	0.006	0.84
Location		12.12	1.7	0.22	<.0001
Experience		7.74	0.97	0.25	<.0001
Step 4	0.08				<.0001
Constant		131.04	2.12		<.0001
Gender		0.27	1.3	0.006	0.84
Location		14.09	1.72	0.25	<.0001
Parental encouragement		7.52	1.66	0.14	<.0001
Step 5	0.14				<.0001
Constant		117.14	2.91		<.0001
Gender		-0.01	1.27	-0.0003	0.92

Location		11.16	1.71	0.20	<.0001
Experience		6.92	0.98	0.22	<.0001
English language proficiency		3.03	0.64	0.15	<.0001
Final model	0.15				<.0001
Constant		113.70	3.01		<.0001
Location		11.17	1.71	0.20	<.0001
Experience		6.69	0.98	0.21	<.0001
English language proficiency		2.86	0.64	0.14	<.0001
Parental encouragement		5.45	1.64	0.10	<.001

Table 3. Regression results

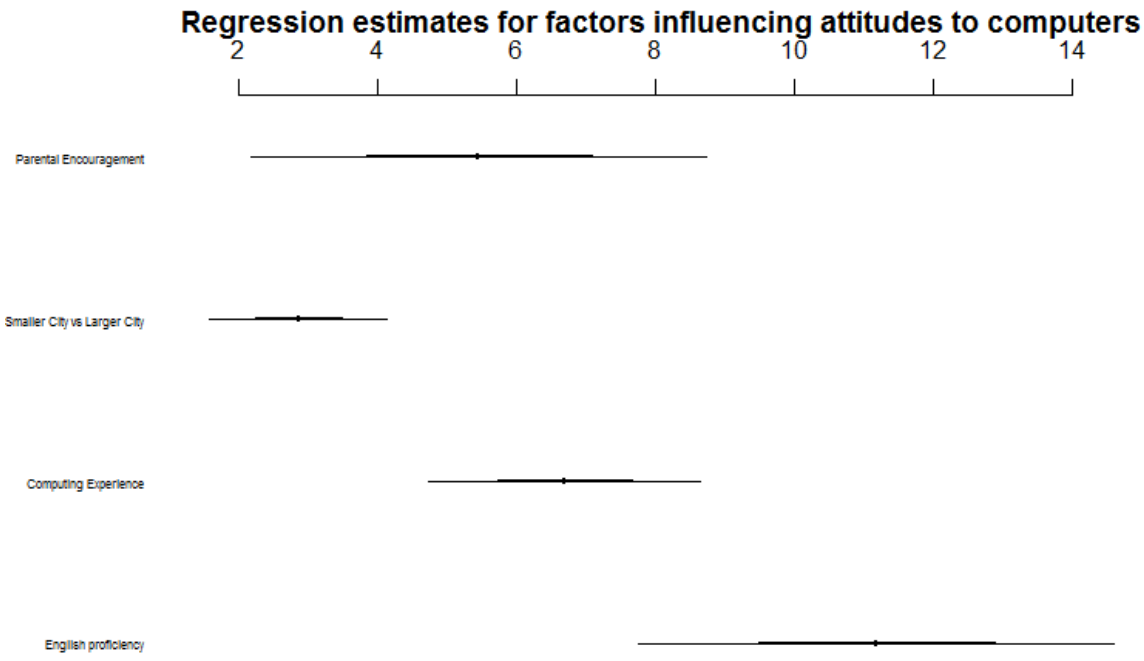

Figure 5. Regression estimates for factors influencing attitudes to computers

In summary, the factors which significantly predict attitudes to computers in this sample of KSA undergraduates are English language proficiency, the location of the university, parental and encouragement and number of years of experience in using a computer. Students who self-report at

higher proficiency in English, those who attend university in the capital city, those whose parents encouraged them to use the computer and those who have more years of experience using the computer are likely to have more positive attitudes to computers. Gender was not a statistically significant predictor.

5.3.2 Findings from Qualitative Data

Sources of encouragement to use a computer for the first time were varied. Males students from the capital city were encouraged by family, friends or were interested for themselves to explore something new and one male student got encouragement from "*My teacher when I was in school. He taught us some skills and gave us some homework to do by computer*" (MSU). Female students had most encouragement from family, friends or were self-motivated: "*My neighbours: I was going to them every day and they shared their computer with me then my father bought one*" (FSU); and "*My father: he thinks computers are important*" (FCU). Students from the small city had encouragement from: "*My family and friends*" (MSR, FSR); "*Myself: I have not had any encouragement and my parents don't use it*" (FSR); and few of the students bought a computer for themselves.

However, five students from the small city reported that their encouragement was from school and that it was the first place they got to use a computer: "*My teacher in High School made me like computers*" (FSR).

Most parents encouraged their children to use computers: "*They encouraged me to use it in learning, not just for other purposes*" (MCU); "*They encouraged me they see that a computer is important" (FSU)*; "*Sometimes they encourage me to have some workshops*" (FSU); and "*They encouraged me because computers are becoming an important tool in society*" (FSR). A number of parents or other family members bought a computer or laptop for their children.

However, eight students reported that they still don't have encouragement from their parents to use computers: "*No. They don't know what it is and how to use it*" (MSU); "*No. My parents' view of computers is they are something that does not benefit anything unless in university*" (MSR); and "*They say that computers are not good; they waste time and harm the eyes*" (FSR).

In regards to the differences between males and females in getting encouragement from parents to use computers, nine students' opinion is that there are no differences in parental encouragement for either males or females: "*Girls are like boys in getting encouragement*" (MCU); and "*No differences*" (MSU). On the other hand, fourteen students agreed that there was a difference in encouragement to use computers between males and females. They reported that males get more encouragement and they usually had a computer first: "*Boys have more chance and more encouragement*" (FCU); "*It's boys who usually have a computer first, they buy it and bring it home*" (FSU).

The participants suggested many reasons for boys getting more encouragement than girls, such as job opportunity for males, or that study and work are more important for males than females: "*Boys need computers for work, but girls have little computer usage for work*" (MSU); "*Girls are busy with house work*" (MCU); "*They [parents] are careful about boys' studies*" (FSR). Female students reported that boys usually have a computer first "*Because they [boys] go out of the home and meet people; learn more out of the home*" (FSU). Another female argued that boys do not always have a computer before girls because she herself got a computer first: "*I got my own laptop before my older brother*" (FCU).

However, four students were neutral in deciding whether boys and girls differ or not. They attributed differences between boys and girls in parental levels of encouragement to use computers:

"*It depends on the parents*" (FSR); "*They encourage those interested in computers whether they are a girl or boy*" (FCU). A male student from the small city suggested there are no differences between girls and boys as it is important for both: "*Because it's important for university study*" (MSR).

In addition, this difference between males and females in encouragement from parents may have been caused by restrictions on females using computers. These restrictions come from Saudi culture and religion: *"It's religious faith and morality*" (MSU). Some students mentioned restrictions on girls such as chatting with foreign men "*Our culture forbids chatting with strangers*" (MSU); "*Maybe in some homes they don't allow the girls to use smartphones or Internet*" (FSU). Social networking connecting people with different genders is forbidden in some families: "*They don't use Twitter and Facebook*" (MCU); "A*nything related to dating strangers is not good for girls*" (MSR); "*Now there is still a problem with chatting with men or adding them in Facebook*" (FSU). Other restrictions on girls include not putting their photo online, not using the camera, and not using the computer for long periods. However, girls' restrictions are becoming rarer: *"Maybe in the past, but now no restrictions are imposed*" (MSR); "*In the beginning they are scared of the Internet, but now it's my area of study no-one asks me*" (FCU).

Knowing the English language has been reported to be an important element in learning and using computers by both genders and by students from the capital city and the small city "*When we try to find information in our study of Computer Science we find rich and useful information in English and don't find it in Arabic*" (FCU). "*Most programs and websites are in English*" (MSR); Not having English skills makes using computers more difficult: "*My English language is not good and I find I have difficulties*" (FSR); Also they agreed that the better one's English language knowledge is, the better one would be as a programmer: "*A person who has good English language skills is the best user of computers*" (MCU). However, male students said that using computers helps them learn English: "*Of course learning with a computer forces you to learn English*" (MSU).

6 Discussion

Saudi Arabian undergraduates have positive attitudes to technology, including computers, and have integrated it into their lives. Participants in this study frequently use software applications for Internet browsing and social media, often on mobile phones. However, the positive attitudes and familiarity with technology does not appear to be harnessed for educational purposes. Students spent only four hours per week using computers or laptops at university. Qualitative evidence suggests that some universities do not provide computing facilities, and some women's universities actively forbid their students to use laptops. Students reported spending 2 hours per week using computer based learning software and 4 hours per week using productivity software (such as word processors and spreadsheets) which could be used to work on university assignments. This is a relatively low usage of technology for study in contrast to students in other countries.

There is great potential for integrating educational technology within the curriculum in Saudi Arabian universities. While computer labs and software infrastructure such as institutional learning management systems are important facilities for universities, there is also an untapped opportunity for mobile learning in Saudi Arabia, as previous research found that 82% of students in KSA did not use their mobile phones for learning (Nassuora, 2013).

It is interesting that gender was not a significant predictor of computer attitudes, given that Saudi Arabian society has such distinct gender roles. It may be that given the high prevalence of technology usage in the home in Saudi Arabia for both men and women, it has become culturally accepted and positively regarded. The focus group participants spoke of some cultural restrictions on women participating in social networking activities such as posting photos, although some believed that this was changing. Certainly, the CITC (2014) data shows equal participation in using

services such as Facebook and You Tube, although it does not reveal subtleties about ways in which they might be used.

There is, however, evidence of a geographical divide in attitudes to technology. The fact that women studying in the smaller cities spend considerably less time using computers per week than their peers suggests an interaction between location and gender. It may be the case that traditional conservative values which might prevent women from using technology have changed at a faster pace in the capital city. Future qualitative research could explore people's attitudes to technology in the smaller cities and surrounding rural areas, and their beliefs about the ways in which it is appropriate for women to use technology.

6.1 Limitations

One limitation of the study is that there were fewer participants from rural areas in the study. While this has been factored into the statistical methods in the quantitative data set, it would have been beneficial to include more rural participants in the focus groups. Another limitation is that data pertaining to home address was not gathered, so we do not know what proportion of the participants grew up or currently live in isolated or non-populous areas. This should be addressed in a future study. The results from this study of undergraduate students are not likely to be representative of the general population of young people in rural areas; we would expect the rural-urban divide effect to be more pronounced in the general population because those who are unable to afford to attend university are also less likely to be able to afford access technology.

In addition, English language proficiency was self-rated; the data would be more reliable if we had used objective measure perhaps from an English test.

Focusing on computer attitudes is important for understanding current practice in KSA education. Nonetheless, future studies should more explicitly explore attitudes to contemporary mobile technologies and track their up take in KSA for teaching and learning. In turn, it would be valuable to revisit the original Computer Attitudes scale and explore the elaboration of a new instrument of broader scope.

7 Conclusions

This study of undergraduate students in Saudi Arabia found that although they used technology for an average of 45 hours per week and had positive attitudes to it, they did not frequently use technology in support of their learning. Qualitative evidence suggests that the students were not routinely required to use computers at university, and indeed that in some cases the universities did not provide computing facilities or actively prevented technology usage. Saudi Arabian universities have an opportunity to harness technology to aid teaching and learning within the university curriculum by capitalising on their students' positive attitudes to technology, and their experience of using computers out-with university. However, because some students lack technological confidence and skills, it would be beneficial to ensure that all students are supported in learning how to use technology effectively for studying, especially if they lack experience, or have not had parental encouragement. This is particularly important in the universities in small cities, where further efforts to address the rural-urban divide may be necessary. As lack of English language proficiency is a factor related to more negative attitudes (such as low confidence or anxiety), it would be helpful either to provide online learning materials in Arabic, or to provide additional English language support. We also recommend that advantage be taken of the very wide use of smart phones across KSA society, to bring the educational benefits of learning technology to those who lack access to more substantial fixed computer facilities. This would require investment in support to ensure that on-line educational resources are provided on small mobile devices in a manner appropriate to their

technologies (i.e. restricted displays, keyboards and battery life), while still consistent with the full scale versions.

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9 References

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- Students in Saudi Arabia use technology for on average 45 hours per week.
- Students' were positive to learning, but they did not often use it for learning.
- Computer attitudes were predicted by English proficiency and computing experience.
- Location and parental encouragement were also predictive factors.
- No gender differences in computer attitudes were found.