Innovators to laggards – how South African students adopted and perceived technologically enhanced learning

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ABSTRACT

The purpose of this study is to determine whether the information and communication technology (ICT) adoption profiles of accounting students at a South African University influenced their perceptions of the usefulness of a technologically enhanced learning (TEL) opportunity.

The findings suggest that the South African accounting students' ICT adoption profiles differ from global profiles as their distribution curve is skewed to the left favouring ICT adoption. Statistically significant differences were noted between gender groups, but no culturally-based digital divide emerged.

Despite the differences noted, the majority of students, irrespective of ICT adoption profiles, their gender or culture agreed that the learning value of an online simulation was more beneficial than traditional teaching methods. It can therefore be concluded that well designed TEL opportunities, which add value to students' learning experience, will be well received by students irrespective of their ICT adoption profiles.

Keywords: Information and Communication Technology, Technology enhanced learning opportunities, Rogers Diffusion of Technology, technology adoption, digital divide

INTRODUCTION

The purpose of this study is to determine whether the information and communication technology (ICT) adoption profiles of accounting students at a South African University influenced their perceptions of the usefulness of a technologically enhanced learning (TEL) opportunity. This could assist educators in the development and implementation of TEL opportunities, which involves the integration of traditional classroom teaching with e-learning activities (Lee & Hung, 2015; Little, 2015), particularly in diverse student groups. TEL opportunities are used by many educators in the form of flipped classrooms, e-tutorials, online simulations and video recordings to reach students, deliver information and to engage learning outside the classroom (Little, 2015; Tshabalala, Ndeya-Ndereya, & van der Merwe, 2014).

The higher education sector in South Africa underwent turmoil during the past two years with the "Fees must fall" campaign, bringing almost all academic activities for periods of time, to a standstill (Habib, 2016). During these campaigns students were not allowed access to campuses necessitating educators to extend their classrooms into the digital realm, making more intense use of TEL opportunities. Another challenge faced by educators is the need to cross the bridge between theoretical knowledge and real-world application. TEL opportunities, in the form of simulations, have been used in the past to address this challenge (Anderson & Lawton, 2008; Buckless, Krawczyk, & Showalter, 2014; Kirstein & Kunz, 2015; Siegel, Omer, & Agrawal, 1997; Steenkamp & Rudman, 2007). TEL is an international phenomenon as it also addresses the way in which the current generation of students, attending higher education, prefer to learn (Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012; Carter & Weerakkody, 2008; Kirstein & Kunz, 2015; Penjor & Zander, 2016).

Previous investigations into TEL opportunities indicated various factors effecting the diffusion[1] of such opportunities (Bhuasiri et al., 2012; Carter & Weerakkody, 2008; Rogers, 2003). One of the factors affecting the diffusion of TEL opportunities is the ICT adoption profiles of the students involved in the opportunity (Rogers, 2003). It can therefore be argued that students' ICT adoption will have an effect on the perceived usefulness of TEL opportunities. This study will therefore

[1] In this study diffusion refers to "the process by which an innovation is communicated through certain channels over time among members of a social system" (Rogers, 2003, p. 5). "Adoption" will be used in this study as a synonym for "diffuse".

contribute towards the literature by providing an understanding of the relationship between the ICT adoption profiles of accounting students in a South African context and the perceived usefulness of a specific implemented TEL opportunity.

As the adoption distribution may not be uniform within a classroom (Bhuasiri et al., 2012; Penjor & Zander, 2016; Rogers, 2003), it gives rise to the question: what does the ICT adoption profiles of senior accounting students look like? In addition, in South Africa and across the world accounting classrooms comprise of students from a diversity of cultural expression including different gender and population groups (Hammond, Clayton, & Arnold, 2009; Janse van Rensburg, Coetzee, & Schmulian, 2014). Being a multi-cultural country, South African students may include African[2], Asian, Indian (descendants from India living in South Africa), Cape Coloureds or Mixed-race[3] and White. Further questions are therefore raised on whether the ICT adoption profiles of accounting students from different gender and culture groups differ. This study will thus in addition extend the literature by providing an understanding of the ICT adoption profiles of accounting students in a South African context.

The literature review, providing the theoretical underpinning of the study and the research questions are presented next. This is followed by the method section, the results and findings and the conclusions with suggestions for further research.

LITERATURE REVIEW

Technology enhanced learning (TEL)

TEL entails the use of digital, mobile and networked devices within educational programs (Bhuasiri et al., 2012; Selim, 2007; Thota, 2015; Tshabalala et al., 2014). It involves a mixture of face-to-face teaching and a variety of TEL opportunities to deliver instruction, information and learning content to students (Bhuasiri et al., 2012; Selim, 2007; Thota, 2015; Tshabalala et al., 2014). Due to the differing nature of TEL opportunities, for example flipped classrooms, e-tutorials, online simulations and video recordings, there are many theoretical learning approaches underpinning

[2] The culture group "*African*" refers to black, indigenous or native South Africans.

[3] The culture group "Coloureds" also refer to as "mixed race" derives from at least five different paternal populations with more than 60% maternal contribution of Khoisan people (Quintana-Murci et al., 2010)

these opportunities (Thota, 2015). The real strength of incorporating TEL in the learning proses is that it allows for additional time in class that gives rise to more opportunities for *inter alia* active and experiential learning, which are both regarded as good practises in undergraduate education (Chickering & Gamson, 1999; Little, 2015; Thota, 2015).

Active learning involves a variety of teaching practises such as peer learning and team work (Chickering & Gamson, 1999; Kassens-Noor, 2012). This can provide students with opportunities to discover processes and apply knowledge through the use of technology (Chickering & Gamson, 1999; Kassens-Noor, 2012). Experiential learning on the other hand involves a process of learning that connects the student to a real life situation in which the student is a participant, instead of a spectator, for example by utilising online simulations (Beaudin & Quick, 1995; Gentry, 1990; Kirstein & Kunz, 2015; Kolb, 1984; Rudman & Terblanche, 2011; Slabbert, De Kock, & Hattingh, 2009).

The advantages of experiential learning have been well documented and include *inter alia* bridging the gap between theory learned and the practical application thereof (Bradley, 2006; Weller, 2004) and allowing for critical thinking and a deeper learning approach by students (Beckem & Watkins, 2012; Clarke, 2009). In addition it allows high-order cognitive skills development required of accounting students that addresses the higher levels of Blooms taxonomy (Little, 2015; SAICA, 2014; Thota, 2015).

The incorporation of TEL opportunities by means of different learning approaches such as active learning and experiential learning has the ability to transform education into a more effective, affordable, flexible and efficient environment (Abouchedid & Eid, 2004; Henderson, 2003; Lee & Hung, 2015). Another advantage of incorporating TEL opportunities in classrooms is that the generation of students for whom these learning opportunities are designed and implemented welcomes the use of information technology (Dorsey, 2016; Elam, Stratton, & Gibson, 2007; Hope, 2016). This generation of students' (known as the iGeneration) has a keen interest in using information technology in as many areas of their lives, as possible (Dorsey, 2016; Elam et al., 2007; Hope, 2016; Tshabalala et al., 2014). Even though this generation has grown up with technology, the assumption cannot be made that all students adopt TEL opportunities at the same time or pace (Dorsey, 2016; Hope, 2016; Rogers, 2003). The possibility of a digital

divide can also not be ignored when technology adoption profiles are considered, as South Africa is notorious for lagging behind on computer access and usage (Bornman, 2016).

Technology adoption profiles

The probability of TEL opportunities being adopted or abandoned and the pace at which it is adopted or abandoned can be explained through Rogers' Diffusion of Innovation (DOI) theory (Penjor & Zander, 2016; Rogers, 2003). The Rogers DOI theory was traditionally used to explain certain behavioural intentions but was later acknowledged as a framework for technology adoption (Dutta & Omolayole, 2016) and is currently widely used as a framework for technology adoption (Penjor & Zander, 2016; Rogers, 2003; Sahin, 2006; Tao, Cheng, & Sun, 2009; Tshabalala et al., 2014). According to the Rogers DOI theory the rate at which novel ICT's are adopted varies between individuals based on the differences in their attitudes towards the ICT (Penjor & Zander, 2016; Rogers, 2003; Sahin, 2006).

The DOI theory therefore provides a framework that can be used to analyse the patterns of technology adoption of individuals (Penjor & Zander, 2016; Rogers, 2003), that can be extended to TEL. The technology adoption patterns of individuals can be divided into five categories based on the time it takes them to start adopting new technological innovations and/or opportunities (Penjor & Zander, 2016; Rogers, 2003; Sahin, 2006; Tao et al., 2009). These adoption categories are labelled as *Innovators*, *Early adopters*, *Early majority*, *Late majority* and *Laggards* (Rogers, 2003). Each of these categories has its own "personality" (Robinson, 2009, p. 4) and the way in which they approach TEL opportunities may vary. The characteristics and the ways in which TEL opportunities can be approached by educators, for each category, are explained in Table 1.

Table 1: Characteristics and ways of approaching TEL opportunities per category

Category	Characteristics	Educator's approach to TEL opportunities
Innovators	The first users of new technologies are the *innovators*, they are willing to experience new ideas, are prepared to venture into uncertainty, known to be risk takers and are interested in and have high technical knowledge.	Get the *innovators* involved in your TEL opportunity as soon as possible. They like to try out new things and share their new discoveries. All they need is time to master the new innovations. They are the perfect partners in designing and improving your TEL projects.
Early adopters	*Early adopters* usually have the greatest degree of opinions about the new ideas. They are known to first examine the new ideas' benefits and are more than willing to try it if they can make connections between clever innovations and their personal needs. They also provide the other adopter categories with help and advice regarding the new ideas.	Get a number of *early adopters* to trial the TEL opportunity as they will give you very valuable feedback on how to make the opportunity more convenient, low cost and marketable. Early adopters are also known to make good peer educators.
Early majority	*Early majority* are willing to adopt the innovation once the majority of their peers have adopted it. They are known to be deliberate and very concerned about professionalism.	Simplify the TEL opportunity and instructions for the *early majority* as they want maximum ease and simplicity. They should also be provided with strong support, as should all later adopters.
Late majority	The *late majority* hate risk and are uncomfortable with new ideas. They are very sceptical and don't like new innovations and will only adopt it when they feel it is safe to do so. They have a fear though of not fitting in thus they will follow the other categories once they have tried and tested the new innovations.	Promote the TEL opportunity by stressing to the *late majority* that other students have benefited from the opportunity and that there is a risk that they may not get the optimum benefit if they do not form part of the TEL opportunity. The *late majority* will appreciate it if the TEL opportunity is refined to increase their convenience and reduce costs.
Laggards	*Laggards* are the most sceptical and critical towards adopting new innovations. Laggards are known to hold out to the bitter end. They are known to have a traditional view and interact mostly with like-minded peers. They normally have limited technological resources and prefer to be very sure an innovation works before they adopt it.	*Laggards* should feel that they have personal control over when, where, how and whether they adopt or use the TEL opportunity. They should be familiarised with the opportunity and the benefits that other *laggards* gained from the experience.

Adapted from (Robinson, 2009; Rogers, 2003)

Rogers suggested the following normal distribution curve for a population at large: innovators - 2.5%, early adopters - 13.5%, early majority - 34%, late majority - 34% and laggards - 16% (Rogers, 2003). Rogers however indicated that the 20:60:20 rule, being 20% innovators and early adopters, 60% early majority and late majority and 20% laggards, is a good all-purpose rule to categorise a population into the adoption categories (Rogers, 2003). Based on the above literature on TEL and technology adoption profiles the following research question is raised:

Research question: How do the differences in ICT adoption profiles of accounting students influence students' perceptions of the usefulness of a particular TEL opportunity they were exposed to?

In order to answer the research question four secondary (sub-) research questions should be answered:

Sub-question 1: What is the ICT adoption profile of accounting students at a South African university?

Rogers' DOI theory further identifies four key components that affect the diffusion rate of innovations namely the innovation itself, communication channels, time and the social system in which the innovation is adopted (Maitland, 1999; Sahin, 2006). The social system in which the innovation is adopted, including the *digital divide*, influences individuals' innovativeness (Rogers, 2003; Sahin, 2006).

The digital divide

The digital divide is commonly referred to as the gap between the "so-called information-haves and the information-have-nots" (Jackson, Zhao, Kolenic, Fitzgerald, Harold & Von Eye, 2008; Van Dijk & Hacker, 2003). Initially the digital divide referred to the gap in access to a computer, but the gap was later expanded to include access to the internet and the difference in ICT skills levels (Van Deursen & Van Dijk, 2010, 2014) . Nowadays it refers to the gap in the intensity and nature of information technology *use* rather than to the gap in access to information technology (Jackson et al., 2008). The gap is largely attributed to socioeconomic and geographical status based on income and education levels within groups, and also on cultural and gender differences (Jackson et al., 2008; Van Deursen & Van Dijk, 2014). Africa is regarded as one of the least computerised regions in the world, with lower individual Internet usage rates; lower computer ownership and lower

broadband subscription rates as compared to the rest of the world (Lesame, 2013). South Africa is also lagging behind other African countries in providing the infrastructure required for advancement (Bornman,2016; Lesame, 2013).

The influence of gender and culture groups on ICT adoption profiles

The student profiles in the South African higher education system have changed drastically over the past 20 years. In 2013 58% of the students enrolled for the year at higher education institutions in South Africa were females and 70% were African, compared to 64% in 2008. An awareness of the ICT adoption profiles of students from different genders and culture groups in higher education can therefore assist educators in designing and implementing TEL opportunities to benefit students in each of the different categories' approaches to TEL opportunities, irrespective of gender or culture.

From previous research it is evident that a gender-based digital divide exist (Jackson et al., 2008). Males and females adopt and use technology differently (Cheng, Kao, & Lin, 2004; Gillwald, Milek, & Stork, 2010; Less, 2003; Maitland, 1999; Venkatesh & Morris, 2000; Yuksel, 2015). Males base their decision to use technology on their perception of the usefulness thereof whilst females base their decision on their perceptions of the ease of use of the technology (Gillwald et al., 2010; Venkatesh & Morris, 2000). It was found that the Internet is used by males for information, entertainment (such as playing games) and commerce whilst females are more likely to use the Internet's communication tools (Jackson et al., 2008).

When turning to the effect of gender on the ICT adoption profiles, males found it easier to play online games than their female counterparts who were mostly categorised as later adopters of technology (Cheng et al., 2004). In a study conducted in Turkey the gender of the population made a significant difference on ICT adoption profiles, where the majority of the female participants were categorised in the early majority categories as opposed to the majority of male participants categorised as early adopters and been described as highly innovative (Yuksel, 2015). In a study conducted at the North Carolina Community College, gender, however, did not appear to play a role in ICT adoption profiles as no significant differences were noted between the male and female faculty members (Less, 2003). Based on the conflicting findings the following question is therefore raised:

Sub-question 2: Are there differences in the ICT adoption profiles of accounting students from different gender groups?

In a study which examined gender and culture group differences in the United States of America and the influence thereof on the intensity and nature of ICT use, both culture and gender differences were reported (Jackson et al., 2008). African American males used computers for playing games, that did not necessarily depend on the Internet whilst African American females were the most intense internet users (Jackson et al., 2008). These patterns might have changed since. It can therefore be asked:

Sub-question 3: Are there differences in the ICT adoption profiles of accounting students from different culture groups?

Among the four key components that affect the diffusion rate of innovations is the innovation itself (Maitland, 1999; Sahin, 2006), in this case a web-based simulation. This component of the TEL component represented pedagogically important learning activities in the course delivery strategy, prompting the next research question:

Sub-question 4: How did students experience a web-based TEL learning component in their course?

The method followed, including the way in which the data were collected, the target population and the demographic profiles of the respondents will now be discussed.

METHOD

Data collection and analysis

To explore the differences in the innovation adoption profiles of accounting students in a South African context, data were collected through an online questionnaire compiled in Qualtrics of which the link was distributed to all students in the class. For sub-question 1, students had to choose the description that best described their attitude towards technology from a list of descriptions. These descriptions were based on the categories of Rogers' DOI theory and were used to categorise the students accordingly as Rogers's DOI theory is widely used as a framework for determining the innovation adoption profile categories (Cheng et al., 2004; Penjor & Zander, 2016; Sahin, 2006; Wonglimpiyarat & Yuberk, 2005).

The questionnaire also collected information regarding the students' previous experience and awareness of digital technology. The mean tally of the number of digital technology and application activities in the list that students had used previously was calculated based on their adoption categories. This information was used to gain insight into the DOI categories of the accounting students.

Demographic information relating to the culture groups and gender of the students also formed part of the questionnaire. Students were asked to indicate their gender and the way they would describe their cultural background (Asian, Black, Coloured, Indian, White, Other). This information was used to address sub-questions 2 and 3 on whether there are any differences in the innovation adoption profiles of accounting students from different genders and culture groups. Cross tabulations were performed with the help of SPSS software. The statistical significance of the differences was determined by Chi-Square tests.

The following question was posed with four Likert scaled responses ranging from Strongly Disagree to Strongly Agree: *I think I learned more about conducting an audit because of the simulation than I would have by more traditional learning methods (e.g. seminars/tutorials)*. In order to ensure reliability, the findings from this question were compared to responses to four other similar questions. No material differences were noted. Analysis of responses to this question therefore helped to answer the overall research question

Target population - Context of the study

The South African university at which the study was conducted actively promotes a TEL learning approach, and supports ICT use in all programmes. Unlimited free Wi-Fi is available nearly everywhere on campus, while computers are provided in the library and in a large number of computer laboratories accessible to students. The accounting students are also obliged to register for a compulsory one year course on computer and information literacy during their first year which contributed credits towards their degree. The students thus had unlimited access to ICT on campus and were expected to have the knowledge and know-how to use it.

BCom Accounting Sciences is a three year degree and auditing is presented on both second and third year level as a compulsory subject. As part of the auditing module's TEL teaching model, all third year auditing students are exposed to an

online audit simulation that provides a 'virtual reality' environment within which students act as auditors of a fictitious company. Students are able to go online and explore the premises, documents and personnel employed by this company while performing audit procedures, incorporating elements of active and experiential learning (Chickering & Gamson, 1999; Kassens-Noor, 2012). The questionnaire was distributed to all third year students while enrolled for this auditing module.

Demographic profile of student respondents

The respondent students consisted of the culture groups African (n=148), White (n=189) and Other[4] (n=48) students as represented in table 2. There were more female (n=252) than male (n=133) respondents with the most prominent gender divide between the African respondents. African female respondents (n=111) significantly outnumbered the African males (n=37). This gender and cultural distribution in the respondents is consistent with the module population.

Table 2: Demographic profile of student respondents

	African	**Other ***	**White**	**N**	**Total %**
Total (n) **	148 (289)	48 (49)	189 (285)	385 (623)	
%	39%	12%	49%	100%	
Gender (n)					
Male **	37 (113)	22 (23)	75 (139)	133 (275)	35%
Female **	111 (176)	26 (26)	114 (146)	252 (348)	65%
	148	48	189	385	100%

* - The subgroupings for the culture group - Other (Asian, Indian and Coloured) are so diverse and too small to provide meaningful statistical analysis of the values, and were therefore excluded from the analysis of differences per cultural group.

** - Total module population shown in brackets.

[4] The subgroupings for culture *other* consisted of Asian, Indian and Coloured students.

RESULTS AND FINDINGS

ICT adoption profile of accounting students

In order to explore sub- question 1 the accounting students were categorised into the five DOI categories as per Rogers' DOI theory based on the descriptions, best describing their attitudes towards technology, chosen by them in the questionnaire. The results are reflected in table 3:

Table 3: DOI categories of accounting students

	Innovators	**Early adopters**	**Early majority**	**Late majority**	**Laggards**
% within the respondents	15.3%	14.4%	29.6%	25.1%	15.6%
% as per Rogers' DOI Theory	2.5%	13.5%	34%	34%	16%

The percentage of students in each of the DOI categories differs from Rogers' normal distributions for the categories (Rogers, 2003). There is a substantial difference in the percentage accounting students who describe themselves as innovators and late majority as compared to the distribution suggested by Rogers (15.3% compared to 2.5% and 25.1% compared to 34%). When comparing the accounting students to Roger's 20:60:20 rule the innovators and early adopters constituted 29.7%, the early and late majority 54.7% and the laggards 15.6% of the population. The trend emerging from the individual comparisons thus continues, highlighting the finding that more of the accounting students adopt ICT quicker than the normal distribution norm established by Rogers.

The distribution curve for accounting students is therefore skewed to the left favouring ICT adoption. Rogers's distribution represents the population at large, whereas the accounting students represent a specific subset. Accounting students at the university where the study was conducted have unlimited access to IT on campus and most probably have the knowledge and know-how to use it as a result

of the exposure in their studies which is a possible contributing factor for favouring ICT adoption.

The ICT adoption categories of accounting students can be utilised by educators when designing TEL opportunities as it provides educators an indication of how and at what level to pitch new TEL opportunities.

In order to gain insight into the DOI categories of the accounting students, information regarding their previous experience of the use and awareness of digital technology and applications were collected and investigated. In the questionnaire students were provided with a list of 14 common ICT activities such as browsing the internet, making and sharing of videos, having Facebook and Twitter accounts and a variety of others. They were asked to indicate whether they had previous experience with each of the listed ICT applications, by answering “Yes” or “No”. The average number of digital technology and application activities students had previous experience with per adoption category is presented in table 4.

Table 4: The mean number of ICT activities students had previously used

	Innovators	**Early Adopters**	**Early Majority**	**Late Majority**	**Laggards**
Mean number of ICT activities students had used	8.83	7.44	6.67	6.61	5.25

As indicated in table 4, innovators predictably had the largest awareness and previous exposure to the use of digital technology (average of 8.83 activities). The differences between the number of technologically related activities students had previous experience with between the early and late majority is very small (6.67 compared to 6.61) whilst the laggards had the smallest previous exposure to digital technology in general (5.25).

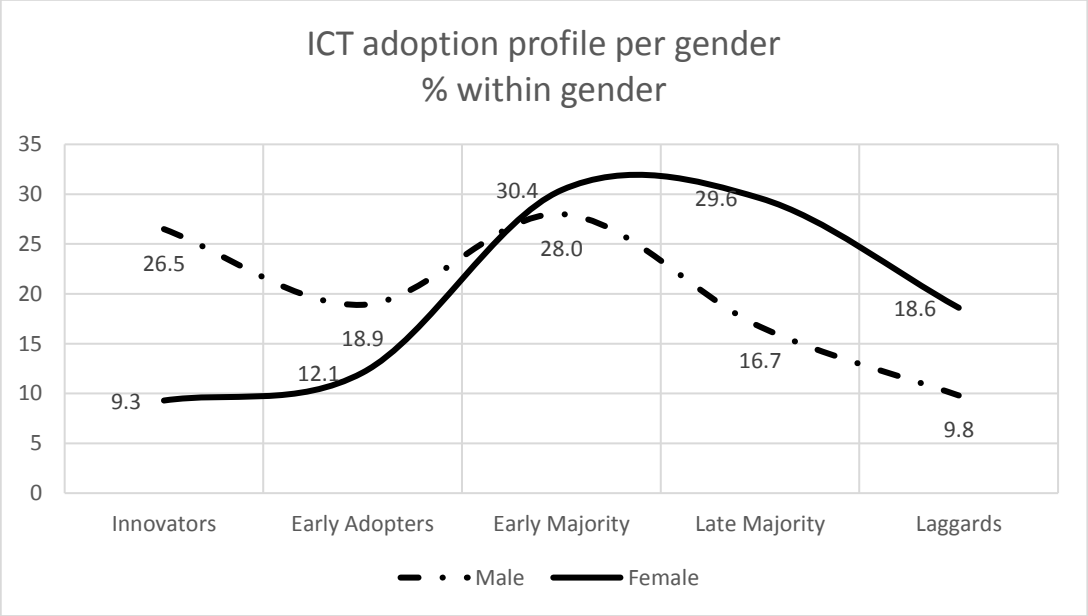
Differences in the ICT adoption profiles of gender and culture groups

To explore differences in the ICT adoption profiles between gender (sub- question 2) and culture groups (sub- question 3) cross tabulations, which can be used to

discover relationships between items, were used to display the joint distribution of the variables. The ICT adoption profiles of accounting students per gender and per culture groups displayed by the cross tabulations are represented in the figures below.

ICT adoption profile per gender groups

Figure 1: ICT adoption profile per gender

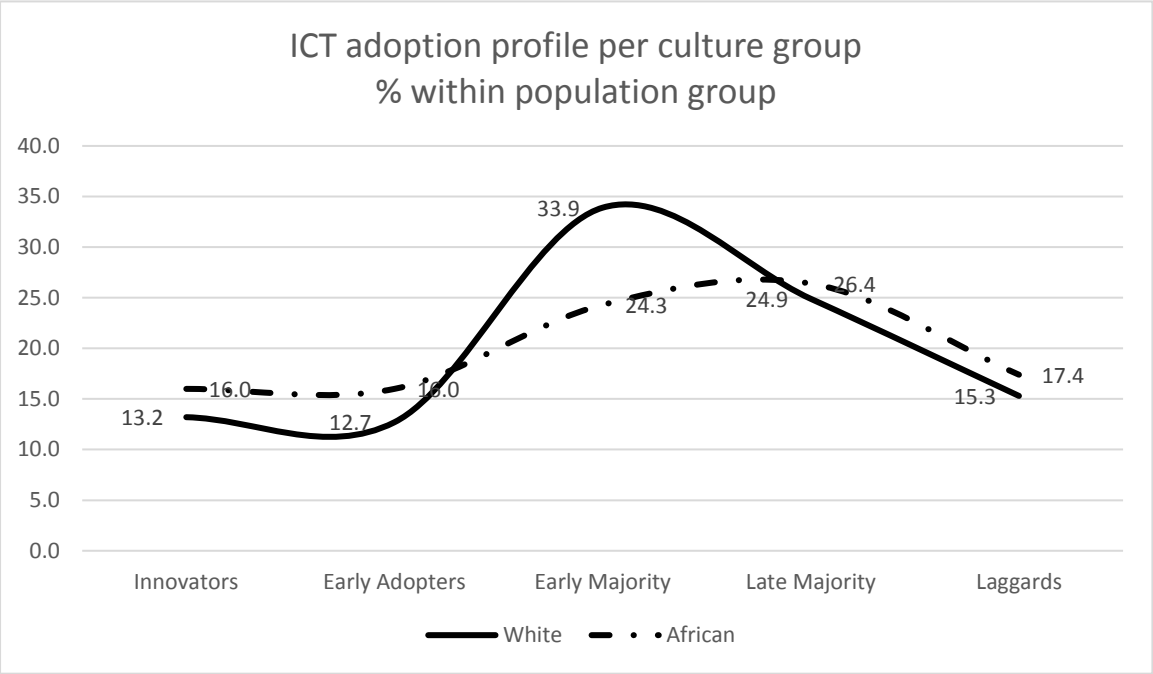


Pearson Chi-Square value = 29.487

Exploring sub- question 2, statistically significant differences were noted between male and female students (p=0.000) where the males adopted innovations quicker than the females. Males represent 73.4% of the innovators, early adopters and early majority categories, whilst only 51.8% of the females were represented in the same categories. On the other end of the adoption profile cycle thus in the late majority and the laggard categories, females dominated with 48.2% versus 26.5% males. This confirms the existence of a gender-based digital divide as reported by Jackson et al. (2008), illustrating that males and females adopt and use technology differently (Cheng et al., 2004; Gillwald et al., 2010; Less, 2003; Maitland, 1999; Venkatesh & Morris, 2000; Yuksel, 2015).

ICT adoption profile per culture group

Figure 2: ICT adoption profile per culture group



Pearson Chi-Square value=3.838

Exploring secondary research question 3, as shown in figure 2, no statistically significant differences were noted between White and African students (p=0.428) in their adoption rates. It is evident that the two culture groups adopt innovations similarly. The largest difference was noted in the early majority category where White students represented 34% versus 24% African students. It is however evident that the two culture groups adopt innovations at a very similar pace, and is not significantly influenced by a culture-based digital divide.

To further explore these differences, the interaction of the ICT adoption profile per *gender* with the ICT adoption profiles per culture group was investigated as represented in table 5.

Table 5: The ICT adoption profiles - % within gender/culture group

	Innovators	Early Adopters	Early Majority	Late Majority	Laggards
African males	21.6%	24.3%	24.3%	21.6%	8.1%
African females	14.0%	13.1%	24.3%	28.0%	20.6%
White males	28.0%	17.3%	28.0%	14.7%	12.0%
White females	3.5%	9.6%	37.7%	31.6%	17.5%

The percentage of White females within the innovator category is significantly lower than the percentage of their male counterparts with a highly statistical significant difference of p=0.000. In addition the African females adopted innovations at a much quicker pace than White female students with a statistical significant difference of p=0.023. No apparent reasons for this difference could be identified and further research into this phenomenon is suggested, as to whether it was a sampling anomaly, or related to cultural characteristics. No statistically significance differences were noted in the ICT adoption profiles of African males and African females (p=0.195) as well as between the African males and White males (p=0.701).

Educators can use the ICT adoption profiles of the accounting students for quality control and updating of TEL opportunities, incorporating elements that will enhance the TEL opportunity for each of the categories. The last important aspect to consider is whether the differences noted in the ICT adoption profiles of the accounting students had an effect of the students' perceptions of the usefulness of the online simulation they were exposed to.

Usefulness of the online simulation

Sub-question 4 explored the students' perceptions regarding the learning value of the online simulation compared to a traditional approach as presented in table 6.

Table 6: Students' perceptions of the usefulness of the online simulation

I think I learned more about conducting an audit because of the simulation than I would have by more traditional learning methods (e.g. seminars/tutorials)	White		African	
	Males	**Females**	**Males**	**Females**
	%	**%**	**%**	**%**
Strongly disagree	3.49	0.71	2.70	4.35
Disagree	11.63	27.14	16.22	19.13
Combined Disagree/Strongly disagree	***15.12***	***27.85***	***18.92***	***23.48***
Agree	63.95	52.15	48.65	53.91
Strongly agree	20.93	20.00	32.43	22.61
Combined Agree/Strongly agree	***84.88***	***72.15***	***81.08***	***76.52***

Table 6 shows the distribution of responses to the question: **I think I learned more about conducting an audit because of the simulation than I would have by more traditional learning methods (e.g. seminars/tutorials).** The combined positive responses of White male students who either agreed or strongly agreed (84.88%) and African males (81.08%) were more than the positive responses of the respective groups of females (72.15% and 76.52%). Though not statistically significant, more than 80% of the male students thought learning through the computer simulation was more effective than the traditional classes. This trend echoed to some extent the ICT adoption preferences of the gender groups. A possible explanation for this could be that, as reported above, males adopted innovations quicker than females, thereby slightly increasing the perceived learning value gained.

When looking at the male versus female perceptions of the learning value of the online simulation compared to a traditional class it is evident that there is a larger difference between the White males and White females' perceptions (84.88% compared to 72.15%) than between the African males and African females' perceptions (81.08% compared to 76.52%). This could be influenced by the statistically significant differences noted between White male and White female students' ICT adoption rates. Although statistically significant differences were also noted regarding African female and White female students' ICT adoption rates, their

perceptions on the learning value of the online simulation compared to a traditional class did not differ substantially (76.52% compared to 72.15%).

Although the ICT adoption profiles indicated significant differences per certain groups it is evident from table 6 that more than 70% of students, irrespective of culture or gender, indicated that they agree that they learnt more from the online simulation compared to a traditional class. This confirms the preference of the current generation of students to use ICT in the leaning process (Bhuasiri et al., 2012; Carter & Weerakkody, 2008; Kirstein & Kunz, 2015; Penjor & Zander, 2016). In addition, the online simulation transformed the teaching of auditing into a more effective and efficient environment (Abouchedid & Eid, 2004; Henderson, 2003; Lee & Hung, 2015).

It can therefore be concluded that well designed TEL opportunities, which add value to students' learning experience, will be well received by students irrespective of their ICT adoption profiles. Differences in ICT adoption profiles of students are no longer an excuse for not incorporating TEL opportunities. However educators need to ensure that TEL opportunities are properly designed to add value to students' learning experience.

CONCLUSION

The purpose of this study was to determine whether the information and communication technology (ICT) adoption profiles of accounting students at a South African University influenced their perceptions of the usefulness of a technologically enhanced learning (TEL) opportunity. The accounting students' ICT adoption profiles were analysed based on gender and culture groups.

The findings suggest that the ICT adoption profile of South African accounting students differ from profiles for random populations reported in the literature, similar to Penjor (2016). There were substantial differences in the percentage accounting students classified as innovators and late majority compared to the distribution in the overall population suggested by Rogers (15.3% compared to 2.5% and 25.1% compared to 34%). Penjor (2016) also reported a similar shift towards innovators (11.4%) and early adopters (21.8%) in an education sub-population. We report statistically significant differences between male and female students where the males adopted innovations quicker than the females, confirming the existence of a

gender-based digital divide. A significant *culturally*-based digital divide is not evident in this particular group of students. No statistically significant differences were noted between White and African students, indicating that these two culture groups at the University adopted innovations at a very similar pace. In addition, statistically significant differences were noted between the ICT adoption rates of White males and White females and between the African females and White females, with White females in both instances adopting technology at a slower pace. The implication to designers of TEL is to acknowledge the high proportion of innovators, and to harness their willingness to try out novel applications by piloting and providing feedback on the usability of the interventions. While there is still a significant proportion of slower adopters in the class that might be construed as conservative, care should be taken to communicate the objectives and value of a TEL event in advance, and provide sufficient instructions and examples to ease mastery of the particular intervention.

Even though the ICT adoption profiles indicated significant differences per certain groups it is evident from the results that the majority of students, irrespective of culture or gender, indicated that they agree (to some extent, or strongly) on the learning value of the online simulation compared to a traditional class, ranging from 72.15% to 84.88%. It can therefore be concluded that well designed TEL opportunities, which add value to students' learning experience, will be well received by students irrespective of their DOI profiles that reflect more their preferences in general ICT use as in ICT for learning. The finding that some of the white females who are strongly represented under late majority and laggards had a relatively lower preference for the simulation, could be explained by that group's lower ICT skills and need for clear instructions and support (table 1). The ICT adoption profiles of students are no longer an excuse for not incorporating TEL opportunities. Educators must ensure that TEL opportunities are properly designed to add value to students' learning experience.

The findings could assist educators in the development and implementation of technologically enhanced learning (TEL) opportunities as the ICT adoption profiles of accounting students at this University are now known. The ways in which the different categories of students approach TEL opportunities can now be incorporated into TEL opportunities developed and implemented by educators to ensure that the preferences of the different categories are catered for. In addition, educators do not have to be hesitant to design and implement TEL opportunities because of concerns

for their students' DOI profiles, as it was found that the vast majority of students benefitted from TEL irrespective of their DOI profiles, provided it had sufficient learning value. Possible areas for further research include extending the compilation of DOI profiles to students registered for other degrees and investigating reasons for the statistically significant differences found. The phenomenon of the white female students' relatively slow ICT adoption should also be confirmed and the implication thereof for TEL ascertained.

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Evaluation of the audit simulation

Thank you for taking part in this survey. The purpose of this questionnaire is to help us evaluate the audit simulation to help us make changes for the future. The questionnaire should take around 10 minutes to complete. Your responses will be treated anonymously.

Section 1:

Are you female or male? Female ❒ Male ❒

What is your age group? 18-19 ❒ 20-21 ❒ 22-24 ❒ 25-29 ❒ 30-39 ❒ 40+ ❒

How would you describe your cultural background?

- ❍ Asian
- ❍ Black
- ❍ Coloured
- ❍ Indian
- ❍ White
- ❍ Other

Use and awareness: Please indicate ***previous*** experience with digital technology and applications on a computer / tablet / smartphone:

	No	Yes
I browse the internet and access online services	❍	❍
I make and share videos (like YouTube or Vimeo)	❍	❍
I have a Twitter account	❍	❍
I have a blog	❍	❍
I have a Facebook account	❍	❍
Webconferencing: I use Skype or Adobe Connect	❍	❍
I read books on an e-reader or tablet	❍	❍
I use cloud-based document creation and storage systems (like Google Drive or Dropbox)	❍	❍
I use an online reference manager (like Mendeley or Endnote)	❍	❍
I play online computer games	❍	❍
I have taken a full e-learning course or MOOC before	❍	❍
I download Apps from the online store	❍	❍
I use WhatsApp groups	❍	❍
I use the Blackboard App	❍	❍

Which of the following best describes you?

- ❍ I love new technologies and I am among the first to experiment with and use them
- ❍ I like new technologies and use them before most people I know
- ❍ I use new technologies when other people start to use them
- ❍ I usually use technologies when most people I know are already using them
- ❍ I am usually one of the last people I know to use new technologies

Section 2:

The simulation as a whole

Relating to the simulation as a whole, please tick the appropriate box for each of the statements below. Indicate how much you agree with these statements.

	Strongly Disagree	Disagree	Agree	Strongly Agree
The audit simulation helped me to learn about the audit process and the issues involved	❍	❍	❍	❍
I think the simulation has given me an insight into a real life audit	❍	❍	❍	❍
The simulation has helped me to develop professional skills that I will be able to use in the work place	❍	❍	❍	❍
I think I learned more about conducting an audit because of the simulation than I would have by more traditional learning methods (e.g. seminars/tutorials)	❍	❍	❍	❍
I have been able to put classroom theory into practice during the simulation	❍	❍	❍	❍
I enjoyed the subject more because of the simulation	❍	❍	❍	❍