USING THE TECHNOLOGY ADOPTION MODEL FOR THE MODELLING OF TEACHERS' TECHNOLOGY AWARENESS FACTORS

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ABSTRACT

Information and Communication Technologies (ICTs) are omnipresent in the world and that includes the worlds of sport, education and physical education (PE). However, there seems to be a scarcity of PE teachers who are well aware of the benefits of the use of ICTs in PE. The aim of this study is therefore to design a model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

This aim is sub-divided into four research objectives: (a) to select relevant technology adoption theories for the design of a model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE; (b) to design a conceptual model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE; (c) to empirically test the above mentioned conceptual model; and, (d) to make appropriate recommendations from the knowledge of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE. Objectives a, b, and d were accomplished through the review of existing literature on the factors affecting the adoption of e-learning by teachers. As for objective c, it was achieved through the survey of 73 teachers from Camperdown schools in the UMgungundlovu District Municipality of the KwaZulu-Natal province of South Africa.

Here is a summary of how these objectives have been met in this study: (a) The Technology Adoption Model (TAM) serves as the theoretical model behind the choice of the research variables of this study; (b) This study hypothesizes that PE teachers' perceived awareness of the benefits of the use of ICTs is affected by the following variables: demographics, performance expectancy, social influence, and computer attitude; (c) The survey conducted by this study confirms that PE teachers' perceived awareness of the benefits of the use of ICTs is affected by their performance expectancy, and by three teachers' demographics (computer usage, gender, and age group); (d) This study calls for more research on the factors affecting teachers' awareness of the benefits of ICTs, since the study failed to find enough literature on this topic.

Keywords: eLearning, ICTs awareness, Physical education

PUBLICATIONS

The following publications were made during the course of this study:

Ntshakala, T. and Obono, S. E. 2013. A Framework of the Factors Affecting the Adoption of ICT for Physical Education. In: Proceedings of *Proceedings of World Academy of Science, Engineering and Technology*. World Academy of Science, Engineering and Technology (WASET), 1985.

Ntshakala, T. T. and Obono, S. D. E. 2014. On the Perceived Awareness of Physical Education Teachers on Adoptable ICTs for PE. *World Academy of Science, Engineering and Technology, International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, 8 (11): 3612-3618.

DECLARATION

I hereby declare that this research work presented in this dissertation is my own and has not been previously submitted in its entirety or in part for a degree in any other university. The right of others are not violate by this research, as all the information in this research has been cited and acknowledged in the list of references.

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Tholokuhle Thobile Ntshakala **Date**

Approved for final submission:

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Supervisor: **Date**
Prof S.D Eyono Obono

DEDICATION

This dissertation is dedicated to my family for their prayers, their support, their encouragement and their motivation throughout the period of this study.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

This chapter starts with a short presentation of the benefits of sports in general, as well as those of Physical Education (PE). The presentation is then followed by a brief description of how Information and Communication Technologies (ICTs) are used in sports, in education and in physical education. The key challenges which are associated with PE are discussed in this chapter just before the statement of the main problem at the centre of this study. The research question, the aim and the rationale of this study are formulated in an attempt to address the above mentioned problem statement. This research question and this aim are furthermore subdivided into relevant research sub-questions and research objectives. The chapter ends with a brief outline of the other chapters of this dissertation.

1.1 Importance of Sports

This section is an overview of the main benefits of sport for social cohesion, economic development and personal health.

1.1.1 Social Cohesion

According to Kleiner (n.d:34, cited in Gilbert and Bennett 2012), "by its very nature sport is about participation, inclusion and citizenship". In fact, sport brings individuals and communities together, it highlights their commonalities and bridges cultural and ethnic divides. For example, having girls alongside boys in sport activities can help overcome stereotypes that often contribute to the social vulnerability of women and girls. Sport is usually associated with tolerance, cooperation and respect (Kleiner n.d:34, cited in Gilbert and Bennett 2012). Moreover, people with disabilities benefit from sport as it helps to build their self-confidence and self-esteem and can enhance their social skills and networks. By so doing, people with disability become more motivated and independent, and communities change their negative perceptions about

disabled people by focusing their attention on the athletes' abilities rather than on their disability (Mulholland 2008).

1.1.2 Personal Health

One of the most obvious positive outcomes of sports is its ability to improve people's physical health, for example, with regards to their motor skills, the prevention of heart diseases, weight control, body pains, and sleeping disorders (Displaced Children and Orphans Fund n.d; Hannon 2005; WHO 2004 cited in Hannon, 2005). Sport is also associated with many mental health benefits for its ability to alleviate depression and anxiety. By doing so, it allows people to take full control of their concentration levels, of their moods and of their emotions (Displaced Children and Orphans Fund n.d; Hannon 2005; Mutrie and Biddle 1995 cited in Coalter 2005). It is not too exaggerated to state that physical activity usually results in self-reported feelings of increased well-being and of happiness (Raglin 1990 cited in Coalter 2005; Steptoe 1992 cited in Coalter 2005).

1.1.3 Economic Development

The economic aspect of sport is mainly visible in the organization of sport mega events such as the Soccer World Cup and the Olympics. For example, the economic impact of the South African 2010 Soccer World Cup was estimated at more than six billion US Dollars, which translates to the creation of more than three hundred and fifty thousand jobs. Other economic benefits were an additional tax income estimated to more than two billion US Dollars and an additional influx of almost half a million tourists (Thornton 2008, cited in Allmers and Maennig 2009). Apart from mega events such as the Soccer World Cup and the Olympics, daily sport activities are also very lucrative. For example, in Europe sport-related employment was estimated at five million jobs in 2005 (European Commission, Directorate-General Education and Culture 2012), and it was estimated at three hundred thousand jobs for Canada in 2004, both representing roughly two percent of the total job market (Mulholland 2008).

1.2 From Sport to PE

This section is an attempt to project the above identified advantages of sports to the context of PE which is the main subject of this study, at least in the context of e-learning. It also seeks to present the current state and status of PE according to the following themes from Hardman and Marshall (2005); Hardman *et al*. (2013): the policies, curriculum, resources, school environment, challenges and best practices.

1.2.1 Benefits of PE

The above identified benefits of sports apply to PE and to school children in terms of their health, academic performance, economic development and socialization.

1.2.1.1 Health and Academic Benefits of PE

A study by Le Masurier and Corbin (2006) finds that PE helps children with disease prevention and promotion of lifetime wellness. Moreover, some cognitive benefits can also be granted to PE because of the well-known traditional claim that a ‘‘healthy body leads to a healthy mind” (Snyder and Spreitzer 1977, cited in Bailey 2006). In fact findings from Rosewater (2009) suggest the following academic outcomes of PE: the improvement of children’s grades even for standardized tests, an increase in the length of time that children spend doing homework, the clarity that children gain regarding their educational goals and occupational aspirations, the improvement of children chances for college enrolment and the reduction of school drop outs.

1.2.1.2 Economic Benefits

The fact that PE is credited for the improvement of children health, means it can contribute to the reduction of current and future health expenses for these children. Moreover, there are many instances where children are granted scholarships or bursaries in schools merely because of their outstanding sport achievements. Such scholarships or bursaries can obviously be considered as an economic benefit for these children and their parents or guardians because they contribute to the payment of their tuition fees (de Varona and Foudy 2003; Kisska-Schulze and Epstein 2014).

1.2.1.3 Social Development

PE is acknowledged for its impact on the reinforcement of social norms, for example, through its strong reliance on fair play, sportspersonship and personal responsibility (Gibbons *et al.* 1995 cited in Bailey 2006; Hellison 1998 cited in Bailey 2006). Other soft skills that are strengthened by PE and also contribute to the reinforcement of social norms include taking orders, leadership, tolerance, respect for others' teamwork, cooperation, cohesion, performing in a regulated system, motivation, discipline, tenacity, competitive spirit, responsibility and perseverance (CorneliBen and Pfeifer 2007). PE also allows individuals from a range of social and economic backgrounds to share a common interest (Bailey 2005).

1.2.2 Current State and Status of PE

The current state and status of PE is hereby presented according to the following themes from Hardman and Marshall (2005); Hardman *et al.* (2013): policies, curriculum, resources and school environment. These four aspects of the current state and status of PE are summarized at the end of this section in order to highlight the main PE challenges and opportunities.

1.2.2.1 Policies

According to Hardman and Marshall (2005), one cannot discuss PE policies without dwelling on their legal status, their responsible authorities, their curriculum time allocation and their examination status.

Legal Status. A study by Hardman and Marshall (2005) found that, since the year 2000, almost every country in the world has a legal requirement for physical education at school for at least some part of the compulsory schooling years. This legal requirement is generally respected worldwide, except for developing countries where PE lessons are more likely to be cancelled from the curriculum compared to other subjects. Moreover, in almost half of Africa, physical education is neither compulsory nor offered to girls.

PE Authorities. These authorities may include role players such as directors, managers, teachers, experts, as identified by Ghofrani and Golsanamlou (2012). Other

role players providing support to PE learners are identified by Van De Berg and Surujlal (2013) as coaches, friends, family members, mental trainers, physical conditioners, and physiotherapists. In the same vein, Rossouw (2004) identifies players, referees, coaches, spectators and organisers as key role players for the development of PE.

Curriculum Time Allocation for PE. There is no agreement among schools on the uniform amount of time that should be allocated to PE despite the existence of legally prescribed curriculum allocation time. Some schools allocate as little as one hour per week for PE while others allocate close to two hours per week. Moreover, this curriculum time allocation has mostly remained steady for PE worldwide and it has even increased in a sizeable proportion of countries (Hardman and Marshall 2005).

PE Examination Status. Research findings from Hardman and Marshall (2005) indicate that PE is not usually treated as a "real" school subject compared to other courses. There are even countries where girls are not allowed to take part in physical education. This, added to a general lack of qualified teachers and facilities, almost automatically making it impossible to expect PE to be an examinable subject. For example, in almost every African country, even though PE is either timetabled or taught, but it is not examinable, except for Nigeria.

1.2.2.2 PE Curriculum

According to Hardman and Marshall (2005), PE curriculum is supposed to be designed in a way that clearly describes its aims and themes. This curriculum should also indicate how its content will be evaluated and how its implementation should be monitored, included for learners from designated gender and disability groups.

Aims and Themes. The main aim of the PE curriculum is to promote exercise and health, physical activity learning, and social and personal development. The four main themes of the PE curriculum are: health-related fitness, motor skills, active lifestyle and personal/social development. These themes are ranked differently between primary education and secondary education. The health theme does not apply to

primary education as opposed to secondary education where it is the highest ranked theme (Hardman *et al*. 2013).

Monitoring the Assessment of PE. Research findings from Hardman *et al*. (2013) indicate that, almost every country alleges it is monitoring the assessment of PE, as required by its laws. However, the frequency and time periods in which the monitoring of the assessment of PE is conducted differs across the globe. For instance, it is usually done every term in Africa, every six months in Asia, Latin America/Caribbean and the Middle East. As for European countries, the monitoring of the assessment of PE is usually done every year and it is done every three to five years in Oceania. The following aspects are at the core of the monitoring of PE assessment: quality assurance, advisory guidance, and "checking the schedule of lessons, use of teaching materials and teaching methods, evaluation of teachers, internal or external moderation and verifying compliance with prescribed legal requirements" (Hardman *et al*. 2013).

Gender. There are many countries where there is a perception that more opportunities are available for boys than for girls with regards to PE. There is also a perception that girls are reluctant to engage in PE because of reasons such as the PE kit issue, religio-cultural dispositions, parental discouragement and societal attitudes (Hardman and Marshal 2005; Hardman *et al*. 2013). For example, in Pakistan cultural and religious constraints limit the scope of physical education for girls, who experience restrictions from taking part in sport and in PE. In India and in Pakistan, girls in many rural areas are also discouraged from participating in PE because of the misconception that it negatively affects their bodies (Hardman and Marshal 2005). However, it is encouraging to learn that a range of mechanisms are employed by many countries to facilitate equality of opportunities between boys and girls for PE (Hardman and Marshal 2005; Hardman *et al*. 2013).

Disability. According to Hardman and Marshal (2005), many countries want to give to their students with disabilities access to PE. However, this is not always possible because of reasons such as the lack of appropriate infrastructure, and the lack of competent teaching and assisting personnel (Hardman and Marshal 2005; Hardman *et al*. 2013). Fortunately, since 1999, a number of countries have strengthened their in-

service training and professional development teachers' programmes in order to accelerate the inclusion of children with disabilities into regular PE classes. In fact, countries such as Australia, Canada, England, Finland, Israel, and Sweden have specific programmes to support the inclusion of children with disabilities into PE; and these programmes are starting to successfully accommodate children from diverse groups (Hardman and Marshal 2005).

1.2.2.3 Resources

There are two types of resources needed for the successful implementation of physical education programmes: infrastructural resources that include facilities and equipment and human resources that include qualified PE teaching personnel (Hardman and Marshall 2005).

Facilities and Equipment. Research findings from Hardman and Marshall (2005) indicate that the adequacy of the provision of facilities and equipment for physical education varies from continent to continent. On the one hand, in Africa, in Central and Latin America, and in Central and Eastern Europe, the quality and quantity of PE facilities and equipment are rated as below average or inadequate. On the other hand, in North America, and in Northern and Western Europe, the quality and quantity of PE facilities and equipment are rated as adequate and in some instances excellent. This is despite the concern that the existing PE facilities and equipment are usually not properly maintained (Hardman and Marshall 2005).

PE Teaching Personnel. A study by Hardman and Marshall (2005) found that there are many instances where PE is taught by non PE teachers in primary schools. Moreover, there are countries where the salary of specialist PE teachers is usually lower than the salary of other teachers (Hardman *et al*. 2013). That situation is significantly improved in secondary schools where PE is mainly taught by specialist PE teachers. These specialist PE teachers are also required by most countries to periodically undergo in-service training (INSET) for their continuing professional development (CPD), even though there are substantial variations between countries on the frequency and the time allocated to these INSET/CPD programmes (Hardman and Marshall 2005).

1.2.2.4 PE Environment

This section briefly describes the status of PE within its internal environment at school, as well as its external environment beyond the school context (Hardman and Marshall 2005; Hardman *et al.* 2013).

Internal Environment of Physical Education. PE has a lower status within the school environment compared to other subjects in most countries because of several reasons. Some of these reasons include students' lack of interest in PE, the fact that PE is generally a non-examinable subject and the low amount of curriculum time allocated to PE. The perceived lower status of PE teachers is also one of the reasons why PE classes are cancelled more often than other so called academic subjects. Continents with high rates of PE classes' cancelations are North America, Oceania, Africa and the Middle East (Hardman *et al.* 2013).

External Environment of Physical Education. According to Hardman *et al.* (2013), many children are not made aware of the diverse pathways to out-of-school PE opportunities, and how to negotiate these pathways. This situation is mostly prevalent in North America where there are no partnerships between schools and their communities. However, Europe has a higher proportion of school-community partnership links; and such links do motivate young people to participate in physical activity during their leisure time and beyond their school life.

1.2.2.5 Challenges and Opportunities

The above sections indicate that the challenges facing PE can be summarized as follows: inadequate curriculum time allocation for PE, lack of competent PE teachers, inadequate provision of facilities and infrastructure for PE, low status of PE and PE teachers and difficult accommodation of female and disabled students in PE. However, the following identified main advantages of PE can be turned into opportunities: PE is generally compulsory by law, the monitoring of the assessment of PE is required by law, and the health, academic and social benefits of PE are highly acknowledged.

1.3 Information and Communication Technologies (ICTs)

ICTs are becoming ubiquitous in the modern world. This section focuses on briefly describing how the world of sports, world of education and world of physical education are no exception to that rule.

1.3.1 ICTs and Sports

This section briefly presents video technologies, databases and sports refereeing technologies as the main Information and Communication Technologies that are used in sport.

Video Technologies. Video technologies are used in sport to record the movements and behaviour of athletes either during training or during competitions. The information recorded by videos can be used to analyse the performance of athletes and teams. This information can also accelerate athletes' learning processes compared with standard coaching techniques by allowing exteroceptive feedback to be combined with internal feedback towards the acquisition of a new skill or the improvement of an old one (Todorov *et al.* 1997 cited in Liebermann *et al.* 2002). Video replays in some sports such as rugby and cricket can clarify problematic refereeing decisions (Garratt 2011).

Databases. Databases are used in sport to store, search, access and modify important information. However, unlike video technologies that are used during training and during competitions, databases are mostly used for management activities outside of training and competition. For example, databases are useful for events scheduling and for the management of information about teams, players, support personnel, rosters, equipment inventories, payments and sales (Dutt 2005).

Sport Refereeing Technologies. The three main ICTs that are used for the facilitation of refereeing in sport are the goal line technology, the snickometer and the hot spot. The goal line technology is used in soccer to monitor the path of the ball and to detect when it crosses the goal line (Kotak and Nayak 2014). Once a goal is detected, a goal alert is instantaneously transmitted to the referees using an encrypted radio signal, with a message displayed on their wristwatches (Shah *et al.* 2014). As for the snickometer

and the hot spot, they are used in cricket to detect whether a ball has touched a bat's edge (Ross 2008, cited in Garratt 2011).

1.3.2 ICTs and Education

This section briefly describes how learning management systems (LMS), video conferencing, personal digital assistants (PDAs) and mobile phones are used in education.

Learning Management Systems. Learning management systems are used in education to allow educators and learners to engage in meaningful online teaching and learning activities. There are two types of learning management systems: Open Source learning management systems which are freely available on the market; and proprietary learning management systems, which can be acquired from the market for a fee. Examples of contemporary Open Source learning management systems are Moodle, Sakai, aTutor, OpenClass, Blackboard CourseSites, and Google classroom.

Videoconferencing. Through the use of videoconferencing, remote students are able to engage with their tutors in interactive tutorials and practicals. Videoconferencing also allows remote students to engage with their peers for group work (Blake and Taji 1997, Gratton 1998, Scanlon 2002 cited in Smyth 2005). Postgraduate research students can also use videoconferencing to discuss their research with their supervisors. Researchers can also present their research findings through videoconferencing in instances where travelling to a conference is not possible for whatever reasons (Smyth 2005).

Personal Digital Assistant. According to Crawford and Vahey (2001, cited in Kim et al. 2006), PDAs help professors to organize their courses and to manage their research materials and information. Moreover, students and faculties use PDAs to write quizzes, to view lecture schedules and to read notes (Ambur *et al*. 2002, cited in Kim *et al*. 2006). PDAs are generally more powerful than cell phones in terms of processing power, memory size, screen size and display resolution. It is these positive characteristics that allow PDAs to support more applications that may be relevant to teaching and learning.

Mobile Phones. There are many ways to use cell phones in a classroom. For example, they can be used by teachers to survey students' responses on a given topic, to give them an immediate feedback from their responses and to quickly assess their understanding of a given topic. Cell phones can also be used in a classroom to gather information from internet using tools such as web searches and social networks (Engel and Green 2011). They also allow students to collect evidence for school projects, for example, through photographs and video recordings. Students also use e-mails and SMSs from their cell phones to exchange information about timetables changes, examinations deadlines and assessments results. E-mail attachments communicated through cell phones may also contain important academic or administrative documents (Keegan 2005).

1.3.3 ICTs and PE

The main information and communication technologies that are used in physical education are visual analysis software, video games, internet and projectors.

Visual Analysis Software. Videotape equipments are used in PE both for the assessment and for the self-assessment of students' performances in terms of motor skill scores and their physical activity levels over a number of months, essays, or log (Silverman 1997). Videotape clips imported from electronic portfolios can be subjected to repetitive interactive multimedia and visual analysis software presentations in order to provide students with a better understanding of various physical education concepts, skills and techniques during PE classes (Ladda *et al*. 2004, cited in Anmol 2014). They can also help improve learners' movements in practical PE classes, mainly due to their ability to highlight to an athlete his or her mistakes as well as his or her skills (Collins 2011).

Video Games. The use of video games helps perfect the athlete's decisions making skills during physical activities (Starkes and Lindley 1994). Video games also help students to acquire more knowledge on the rules, strategies and tactics for their sport code (Hayes and Silberman 2007). In fact, most professional athletes use video games to enhance their learning of new strategies and to become more aware of how to

respond to the strategies that might be used by their opponents (Silberman 2005b, cited in Hayes and Silberman 2007).

Internet. The use of Internet in PE allows information to spread faster in line with the fact that Internet is also known as the main information highway (Yaman 2009). For example, Internet allows physical education teachers to share their experiences with other professionals mainly through tools such as e-mails and social networks (Knapper 2001 cited in Hergüner 2012). Students can also e-mail their PE teachers to ask them health and fitness questions, or to obtain updated details about scheduled PE activities. Internet also allows students to explore new knowledge for their assignment or projects; and to chat, cooperate, and play games with fellow students (Collins 2011).

Projectors. The main advantage of using projectors is its ability to enlarge the content that is fed to them; and that works well for large audiences. In the case of PE, this content is usually made up of text, images and videos from laptops and from computers (Shelly and Vermat 2012). Projectors can assist teachers to present PE concepts in a more meaningful way, as it gives to students the opportunity to optimize their understanding of the lessons presented to them. For example, when presenting a given sports technique, a PE teacher can show a short video clip on that technique through a projector (Aniodo and Ayalogu 2012). This can then be followed by replaying the information and playing the images in slow motions in order to reinforce students' understanding.

1.4 Problem Statement

Five main challenges were above identified as the main problems that are associated with PE. However, the size and period of this study only allow it to focus on one of these five challenges, that is, the lack of competent PE teachers. In other words, the main problem motivating this study is that, in general, there are not enough competent PE teachers to sustain PE as a proper academic discipline. This apparent lack of competent PE teachers is identified by a number of scholars (Hardman and Marshal 2005; Hardman *et al*. 2013; Kovac *et al*. 2008; Abildsnes *et al*. 2015). There are only a few specialist PE teachers in schools who are often replaced by 'generalist' teachers that are sometimes assisted by sport coaches or advisors. Specialist PE teachers rarely

attend PE-related pedagogy courses. Some of them have negative attitude and lack of enthusiasm for physical education. Moreover, there are significant variations in frequency and time allocation for in-service training and continuing professional development for PE teachers (INSET/CPD) (Hardman and Marshal 2005).

1.5 Research Questions, Research Aims and Objectives

This section presents the aim, objectives and research question for this study on the above identified problem on the lack of competent PE teachers in schools.

1.5.1 Main Research Question

At the beginning of this chapter, it was highlighted that ICTs are more and more omnipresent in the world of education. Hence, the lack of competent PE teachers in schools has been identified as the central problem of this study. The main research question of this study is therefore formulated as follows: what are the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE?

1.5.2 Research Sub-questions

The above stated research question can further be sub-divided into the following four research sub-questions:

Research sub-question 1: Which theories can better facilitate the identification of the possible factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE?

Research sub-question 2: Which conceptual model can best represent the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE?

Research sub-question 3: Is the above mentioned conceptual model empirically validated?

Research sub-question 4: What recommendations can be proposed from the identified factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE?

1.5.3 Research Aim

The aim of this study is to design a model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

1.5.4 Research Objectives

The above described research aim can further be sub-divided into the following research objectives:

a) To select from existing literature relevant technology adoption theories for the examination of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.
b) To design a conceptual model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.
c) To empirically test the above mentioned conceptual model.
d) To make appropriate recommendations based on the findings of identified factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

1.6 Expected contribution of the study

This study intends to contribute to a better understanding of the reasons why physical education teachers decide to use or not to use ICTs in their work. This can then contribute to the improvement of their working conditions as well as the improvement of leaners performance and motivation for PE.

1.7 Study Rationale

Existing literature reveals that ICTs have a positive effect on learners' achievements for academic subjects such as geography (Tüzün *et al*. 2009), science (Delen and Bulut 2011; Ziden *et al*. 2011; Park *et al*. 2009) and mathematics (Delen and Bulut 2011; López 2010). It therefore makes sense to examine the perceptions and awareness of teachers on the usefulness of ICTs for teaching and learning for non-academic subjects such as physical education. Such examination could contribute to the improvement of the status of such non-academic subjects in lieu of the so called academic subjects,

especially since these non-academic subjects carry many benefits. For example, some of the benefits that are associated with PE are health, academic, economic and social.

1.8 Structure of the Dissertation

This dissertation comprises of five chapters that are briefly described below.

Chapter One: Introduction. The purpose of this chapter is to briefly present how are the main concepts of this study linked to its research problem, question and aim.

Chapter Two: Theoretical Frameworks. The purpose of this chapter is to briefly present the relevant technology adoption theories as well as a hypothetical model for the examination of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

Chapter Three: Research Design. This chapter gives a detailed description of the methodology used by this study for the empirical testing of the above mentioned hypothetical model of PE teachers.

Chapter Four: Research Results. This chapter presents the results of the empirical testing of the model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

Chapter Five: Literature Review, Discussion and Conclusion. This chapter compares the results of this study with existing literature. It evaluate the conformation or disconfirmation of the empirical testing of the model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE. It then concludes this study after a brief discussion of the findings on the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

1.9 Conclusion

This study aims to design a model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE. Sport and PE are credited for many benefits such as their ability to bring individual and communities together and their strong reliance on fair play. They also promote the organization of lucrative mega

events; they help children to be awarded scholarships and bursaries and they contribute to the improvement of peoples' physical and cognitive health.

The offering of PE and the monitoring of its assessment are usually legally compulsory worldwide. Moreover, all major education role players such as headmasters, family members and coaches are in support of PE. However, PE suffers from inadequate curriculum time allocation. It is not usually an examinable subject and it hardly accommodates female and disabled students. Moreover, the provision of facilities and the availability of competent teachers are usually inadequate for PE compared to other subjects.

This study is motivated by the above identified problem of the lack of competent PE teachers. The angle chosen by this research is to seek to understand the perceived awareness of PE teachers of the benefits of the use of ICTs in PE. Many studies have investigated the awareness of ICTs for teachers of academic subjects such as natural science, social science and mathematics. However, very few, if any, studies have dwelled into non-academic subjects such as PE. This research gap is what makes the contribution of the current study to be significant.

CHAPTER 2

THEORETICAL REVIEW

This chapter fulfils the first objective of this study which is to select from existing literature relevant technology adoption theories for the examination of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE. Technology diffusion and adoption theories are classified in this chapter either as classical or as new. A further differentiation is made between the theories without the awareness construct and those with the awareness construct. All the constructs from the latter theories are then examined in detail in order to find out if they have a relationship with awareness. At the end of the chapter, criteria for the selection of the constructs of the theoretical framework of this study are described. This theoretical framework is then presented, in fulfilment of the second objective of this study which is to design a hypothetical model of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

2.1 Existing Technology Diffusion and Adoption Models without the Awareness Construct

This study only found one technology diffusion and adoption model that does not have the awareness construct, and whose other constructs are not connected to awareness in any of the theories reviewed by this study: the Burkman's User Orientated Instructional Design (UOID) model. The UOID is presented by Figure 2.1. It consists of five implementation steps: identify the potential adopter, measure the relevant potential adopter perceptions, design and develop a user-friendly product, inform the potential adopter of the user-friendliness and provide post-adoption support (Burkman 1987).

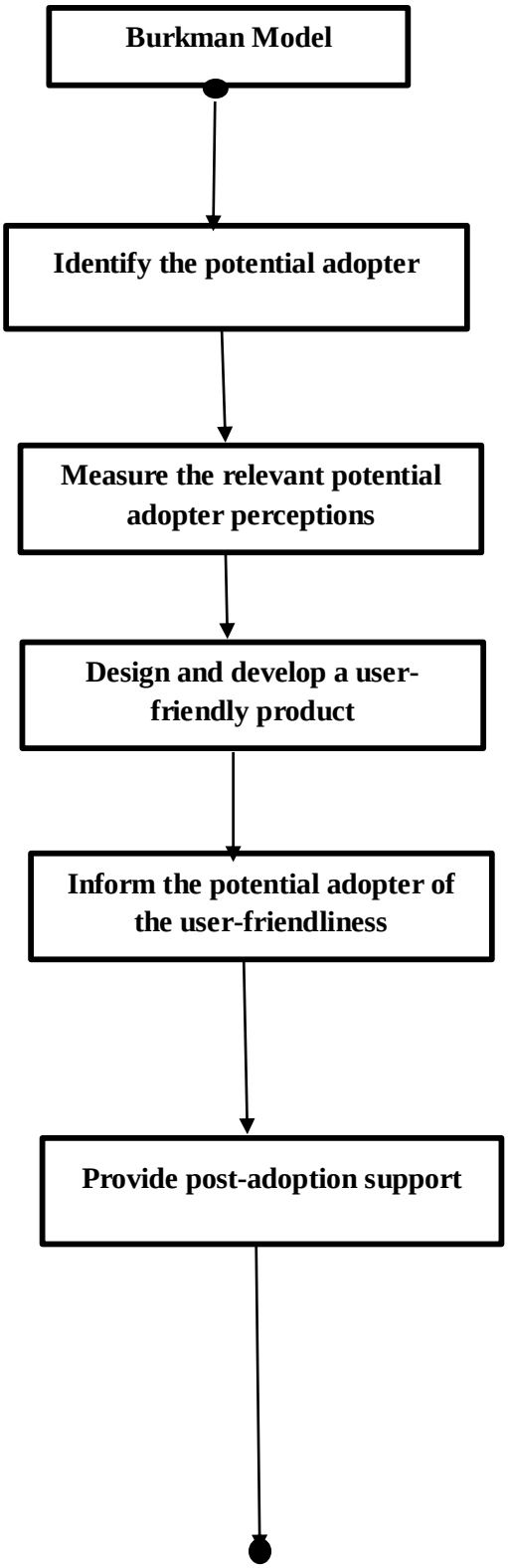

Figure 2.1 User Orientated Instructional Design (Burkman 1987)

2.2 Technology Diffusion and Adoption Models with an Implicit Inclusion of the Awareness Construct

Six of the technology diffusion and adoption models reviewed by this chapter do not contain the awareness construct, but their constructs are connected to awareness by other technology diffusion and adoption models. These models are: the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Decomposed Theory of Planned Behaviour (DTPB), the Technology Acceptance Model (TAM), the Extended Technology Acceptance Model (TAM2) and the Unified Theory of Acceptance and Use of Technology (UTAUT).

2.2.1 Theory of Reasoned Action (TRA)

TRA is represented by Figure 2.2 and the nature of the relationships of its constructs with awareness is captured by Table 2.1. There are six constructs in TRA: behavioural beliefs and outcome evaluations, normative beliefs and motivation to comply, attitude towards the behaviour, subjective norms, behavioural intention and behavioural (Ajzen and Fishbein 1975 cited in Hansen 2006). Even if awareness is absent from these six constructs, it is still possible for some of these constructs to be linked to awareness in the other technology diffusion and adoption models reviewed by this chapter. For example, attitude towards the behaviour is considered as a consequence of awareness by the technology adoption model proposed by Diven and Hu (2007).

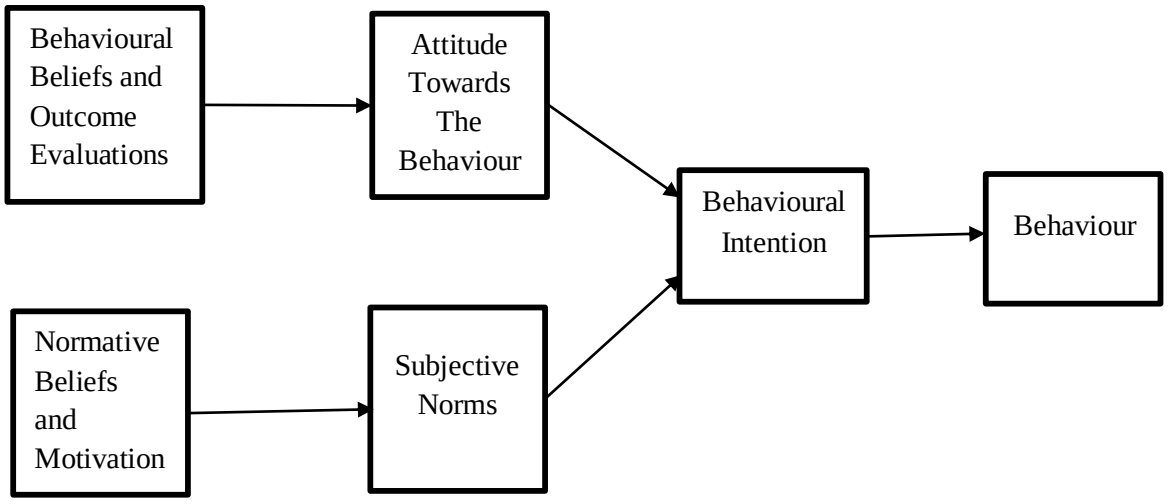

Figure 2.2 Theory of Reasoned Action (Ajzen and Fishbein 1975)

According to Table 2.1, half of the constructs of TRA do not have any relationship with the awareness construct, and this means that the other half have a relationship with the awareness construct. On the one hand, the three constructs with no relationship with awareness are: behavioural beliefs and outcome evaluations, normative beliefs and motivation to comply, and behaviour. On the other hand, the three constructs with a relationship with awareness in other technology diffusion and adoption models are: attitude towards the behaviour, behavioural intention, and subjective norms. Awareness is a mediator of these three constructs when they have a relationship with other constructs. Moreover, attitude towards the behaviour and behavioural intention are consequences of awareness. As for subjective norms, some models show it as a consequence of awareness while others show it as an antecedence of awareness. Some of the names that are synonymous with subjective norms are social influence, social system and social factors (Wu *et al*. 2007).

Table 2.1 Analysis of TRA in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Behavioral Beliefs and Outcome Evaluations	Not found	All the models reviewed
Normative Beliefs and Motivation to Comply	Not found	All the models reviewed
Attitude Towards the Behaviour	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Subjective Norms/Social Influence/Social Factors	Two-way, mediator	Dinev and Hu (2007), Hansen (2006), Saleh *et al*. (2014)
Behavioural Intention	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Behaviour	Not found	All the models reviewed

2.2.2 Theory of Planned Behaviour (TPB)

TPB is represented by Figure 2.3 and the nature of the relationships that exist between the constructs of this model and the awareness construct are captured by Table 2.2. There are eight constructs in TPB: behavioural beliefs and outcome evaluations, normative beliefs and motivation to comply, control beliefs and facilitation, attitude towards the behaviour, subjective norms, perceived behavioural control, behavioural intention and behavioural (Ajzen 1985). Even if awareness is absent from these eight constructs, it is still possible for some of these constructs to be linked to awareness in

the other technology diffusion and adoption models reviewed by this chapter. For example, behavioural intention is considered as a consequence of awareness by the technology adoption model proposed by Diven and Hu (2007).

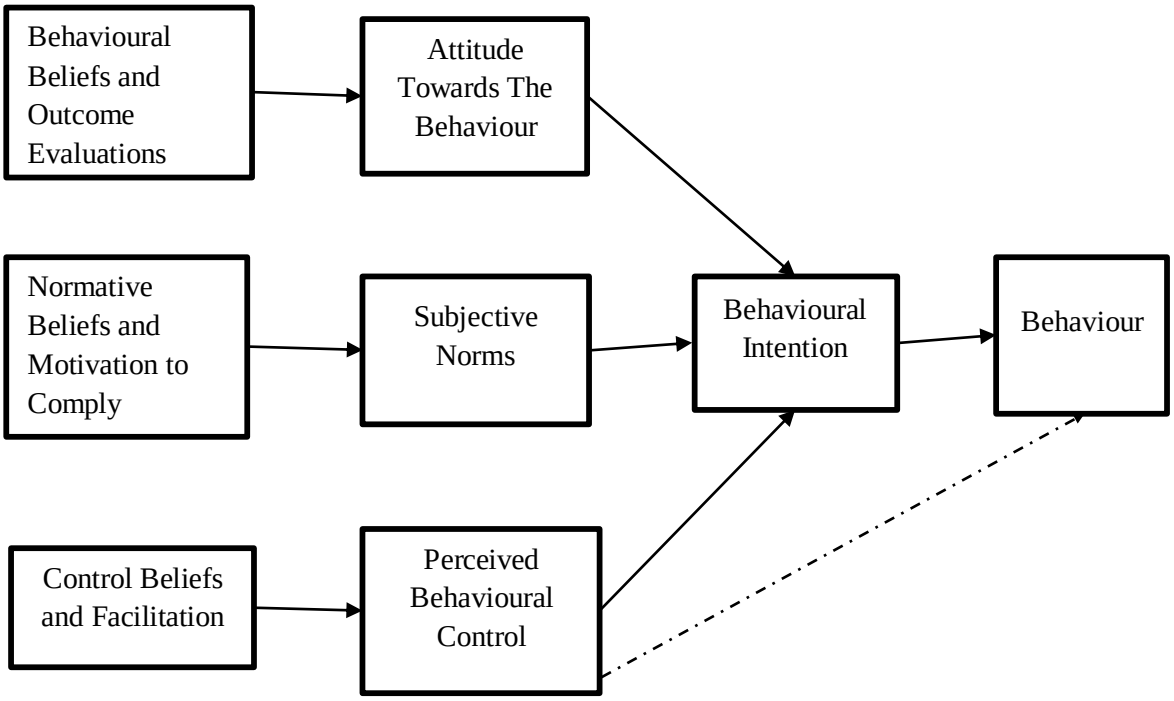

Figure 2.3 Theory of Planned Behaviour (Ajzen 1985)

According to Table 2.2, three constructs of TPB do not have any relationship with the awareness construct, and five constructs have a relationship with the awareness construct. The three constructs with no relationship with awareness are: behavioural beliefs and outcome evaluations, normative beliefs and motivation to comply, and behaviour. The five constructs with a relationship with awareness in other technology diffusion and adoption models are: control beliefs and facilitation, attitude towards the behaviour, subjective norms, perceived behavioural control and behavioural intention. The relationship type of these constructs with awareness is antecedent, consequence or mediator. Control beliefs and facilitation, and perceived behavioural control are an antecedent of awareness. Awareness is a mediator of attitude towards the behaviour, subjective norms and behavioural intention when these constructs have a relationship with other constructs. Moreover, attitude towards the behaviour and behavioural

intention are consequences of awareness. As for subjective norms, some models show it as a consequence of awareness while others show it as an antecedence of awareness. Another name that is synonymous with perceived behavioural control is facilitating conditions (Wu *et al.* 2007).

Table 2.2 Analysis of TPB in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Behavioural Beliefs and Outcome Evaluations	Not found	All the models reviewed
Normative Beliefs and Motivation to Comply	Not found	All the models reviewed
Control Beliefs and Facilitation	Antecedent	Hansen (2006)
Attitude Towards the Behaviour	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Subjective Norms/Social Influence/Social Factors	Two-way, mediator	Dinev and Hu (2007), Hansen (2006), Saleh *et al.* (2014)
Perceived Behavioural Control/Facilitating Conditions	Antecedent	Hansen (2006)
Behavioural Intention	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Behaviour	Not found	Other models reviewed

2.2.3 Decomposed Theory of Planned Behaviour (DTPB)

DTPB is represented by Figure 2.4 and the nature of the relationships that exist between the constructs of this model and the awareness construct are captured by Table 2.3. There are thirteen constructs in DTPB: perceived usefulness, ease of use, peers, superiors, compatibility, self- efficacy, resource facilitating conditions, technology facilitating conditions, attitude towards the behaviour, subjective norms, perceived behavioural control, behavioural intention, and behavioural (Taylor and Todd 1995). Even if awareness is absent from these thirteen constructs, it is still possible for some of these constructs to be linked to awareness in the other technology diffusion and adoption models reviewed by this chapter. For example, subjective norms are considered as an antecedence of awareness by the technology adoption model proposed by Hansen (2006).

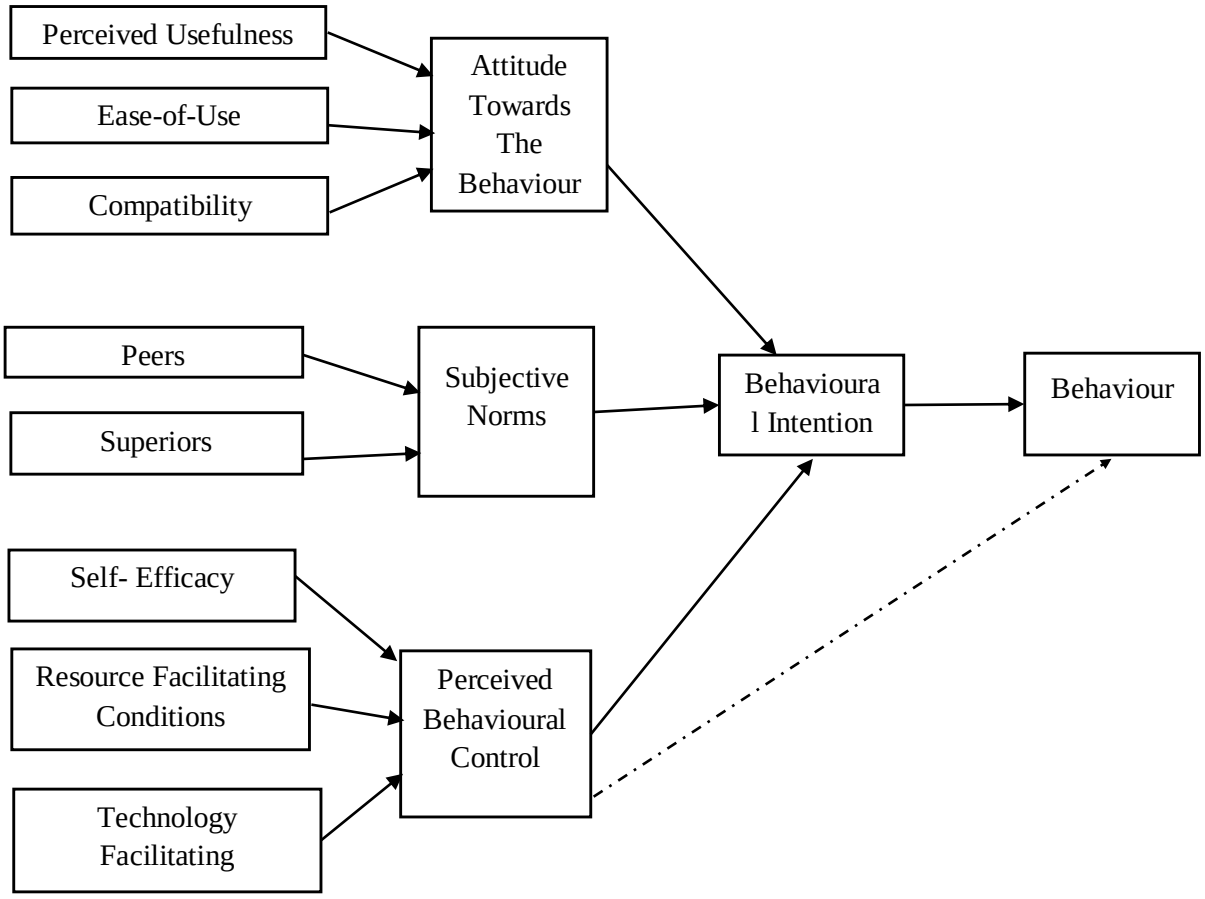

Figure 2.4 Decomposed Theory of Planned Behaviour (Taylor and Todd 1995)

According to Table 2.3, three constructs of DTPB do not have any relationship with the awareness construct. This means that ten constructs have a relationship with the awareness construct. On the one hand, the three constructs with no relationship with awareness are: peers, superiors, and behaviour. On the other hand, the ten constructs with a relationship with awareness in other technology diffusion and adoption models are: perceived usefulness, ease of use, compatibility, self- efficacy, resource facilitating conditions, technology facilitating conditions, attitude towards the behaviour, subjective norms, perceived behavioural control and behavioural intention. The relationship type of these constructs with awareness is antecedent, consequence or mediator. Compatibility, resource facilitating conditions, technology facilitating conditions, perceived usefulness and the perceived behavioural control are an antecedence of awareness. Awareness is a mediator perceived usefulness, ease of use, attitude towards the behaviour, and behavioural intention when these constructs have a relationship with other constructs. Moreover, attitude towards the behaviour and

behavioural intention are consequences of awareness. As for subjective norms and self-efficacy, some models show them as a consequence of awareness and as an antecedence of awareness. Readers are reminded there are other names attached to perceived usefulness, such as, performance expectancy and relative advantage. Another name for compatibility is facilitating conditions. Some of the names that are synonymous with ease of use are effort expectancy and perceived ease of use (Wu *et al*. 2007) and another name for self-efficacy is efficacy beliefs.

Table 2.3 Analysis of DTPB in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Perceived Usefulness/ Performance Expectancy/Relative Advantage	Mediator, antecedent	Saleh *et al*. (2014), Hansen (2006)
Ease of Use/Effort Expectancy/ Perceive Ease of Use	Mediator	Saleh *et al*. (2014)
Compatibility/Facilitating Conditions	Antecedent	Hansen (2006)
Peers	Not found	All the models reviewed
Superiors	Not found	All the models reviewed
Self-Efficacy	Two-way	Charalambous and Philippou (2010), Hansen (2006)
Resource facilitating conditions	Antecedent	Hansen (2006)
Technology facilitating conditions	Antecedent	Hansen (2006)
Attitude Towards the Behaviour	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Subjective Norms/Social Influence/Social Factors	Two-way, mediator	Dinev and Hu (2007), Hansen (2006), Saleh *et al*. (2014)
Perceived Behavioural Control/Facilitating Conditions	Antecedent	Hansen (2006)
Behavioural Intention	Consequence and mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Behaviour	Not found	All the models reviewed

2.2.4 Technology Acceptance Model (TAM)

TAM is represented by Figure 2.5 and the nature of the relationships of its constructs with awareness is captured by Table 2.4. There are four constructs in TAM: perceived usefulness, perceived ease of use, behavioural intention to use and actual system use (Davis 1989). Even if awareness is absent from these six constructs, it is still possible for some of these constructs to be linked to awareness in the other technology diffusion and adoption models reviewed by this chapter. For example, perceived usefulness is considered as an antecedent of awareness by the technology adoption model proposed by Hansen (2006).

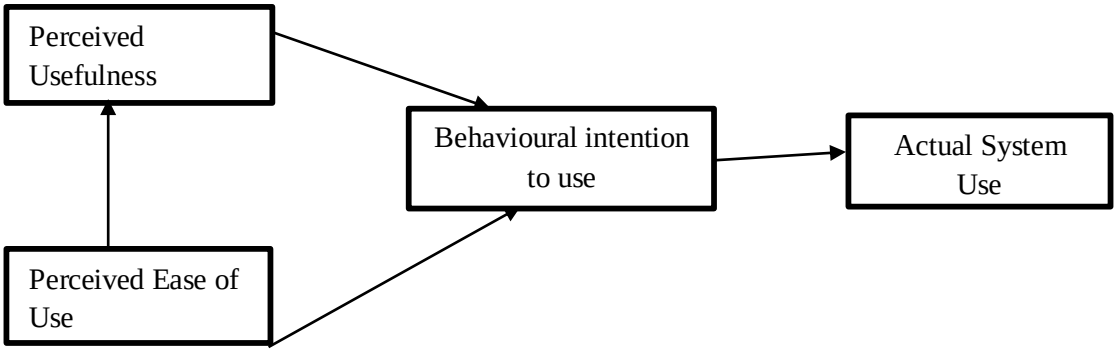

Figure 2.5 Technology Acceptance Model (Davis 1989)

According to Table 2.4, actual system use is the only construct from TAM that does not have any relationship with the awareness construct. The three remaining constructs that have a relationship with awareness in other technology diffusion and adoption models are: perceived usefulness, perceived ease of use and behavioural intention. Awareness is a mediator of these three constructs when they have a relationship with other constructs. Moreover, behavioural intention is a consequence of awareness and perceived usefulness is an antecedent of awareness.

Table 2.4 Analysis of TAM in relation to awareness

Constructs	Relationship with awareness	Evidence
Perceived Usefulness/ Performance Expectancy/ Relative Advantage	Mediator, antecedent	Saleh *et al*. (2014), Hansen (2006)
Perceived Ease of Use/Effort Expectancy/ Ease of Use	Mediator	Saleh *et al*. (2014)
Behavioural Intention	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Actual System Use	Not found	All the models reviewed

2.2.5 Extended Technology Acceptance Model (TAM2)

TAM2 is represented by Figure 2.6 and the nature of the relationships of its constructs with awareness is captured by Table 2.5. There are eleven constructs in TAM2: experience, voluntariness, image, job relevance, output quality, result demonstrability, usage behaviour, subjective norms, perceived usefulness, ease of use and intention to use (Venkatesh and Davis 2000). Even if awareness is absent from these eleven constructs, it is still possible for some of these constructs to be linked to awareness in the other technology diffusion and adoption models reviewed by this chapter. For example, intention to use is considered as a consequence of awareness by the technology adoption model proposed by Diven and Hu (2007).

According to Table 2.5, seven constructs of TAM2 do not have any relationship with the awareness construct, and four constructs have a relationship with the awareness construct. The seven constructs with no relationship with awareness are: experience, voluntariness, image, job relevance, output quality, result demonstrability, and usage behaviour. The other four constructs with a relationship with awareness in other technology diffusion and adoption models are: subjective norms, perceived usefulness, ease of use and intention to use. Awareness is a mediator of these four constructs when they have a relationship with other constructs. Moreover, intention to use is a consequence of awareness and perceived usefulness is an antecedent of awareness. As for subjective norms, some models show it as a consequence of awareness while others show it as an antecedence of awareness.

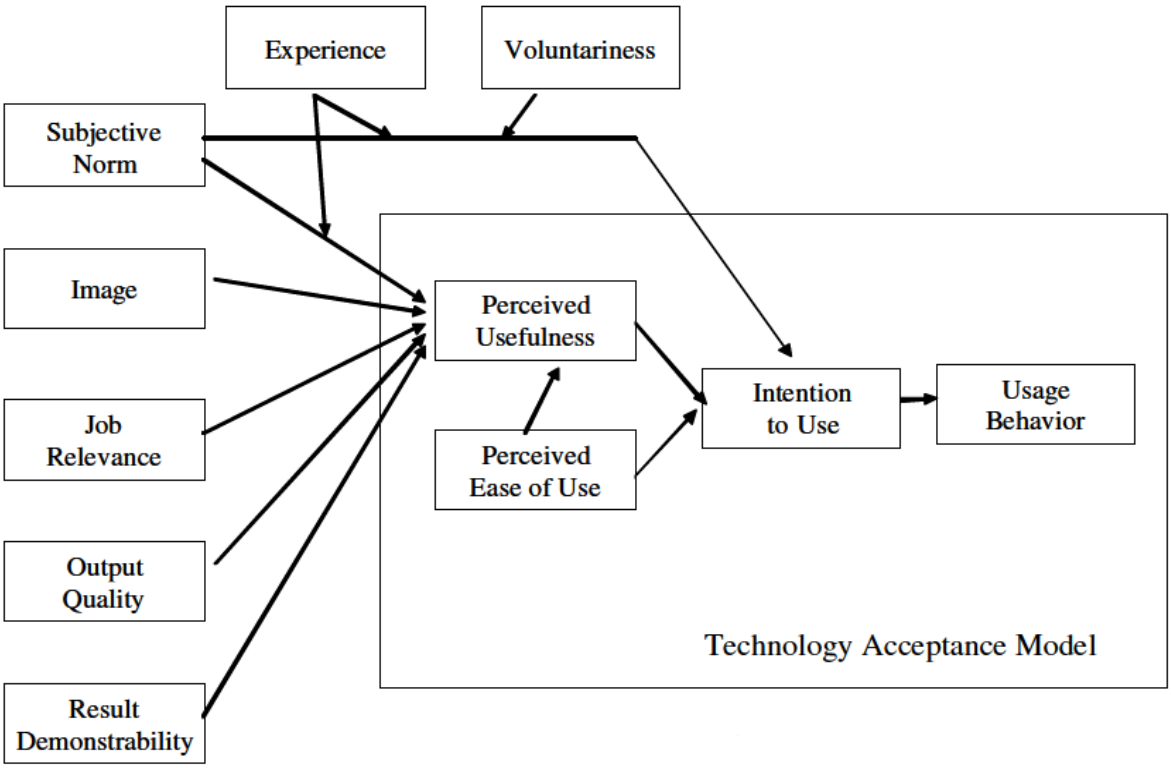

Figure 2.6 Extended Technology Acceptance Model (Venkatesh and Davis 2000)

Table 2.5 Analysis of TAM2 in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Experience	Not found	All the models reviewed
Voluntariness	Not found	All the models reviewed
Subjective Norms/Social Influence/Social Factors	Two-way, mediator	Dinev and Hu (2007), Hansen (2006), Saleh *et al.* (2014)
Image	Not found	All the models reviewed
Job Relevance	Not found	All the models reviewed
Output Quality	Not found	All the models reviewed
Result Demonstrability	Not found	All the models reviewed
Perceived Usefulness/ Performance Expectancy/Relative Advantage	Mediator, antecedent	Saleh *et al.* (2014), Hansen (2006)
Perceived Ease of Use/Effort Expectancy/Ease of Use	Mediator	Saleh *et al.* (2014)
Intention to Use	Consequence, mediator	Dinev and Hu (2007), Saleh *et al.* (2014)
Usage Behaviour	Not found	All the models reviewed

2.2.6 Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT is presented by Figure 2.7 and the nature of the relationships of its constructs with awareness is captured by Table 2.6. There are ten constructs in UTAUT: performance expectancy, effort expectancy, social influence, behavioural intention, facilitation conditions, use behaviour, gender, age, experience, and voluntariness of use (Venkatesh *et al*. 2003). Even if awareness is absent from these ten constructs, it is still possible for some of these constructs to be linked to awareness in the other technology diffusion and adoption models reviewed by this chapter. For example, facilitating conditions is considered as an antecedent of awareness by the technology adoption model proposed by Hansen (2006).

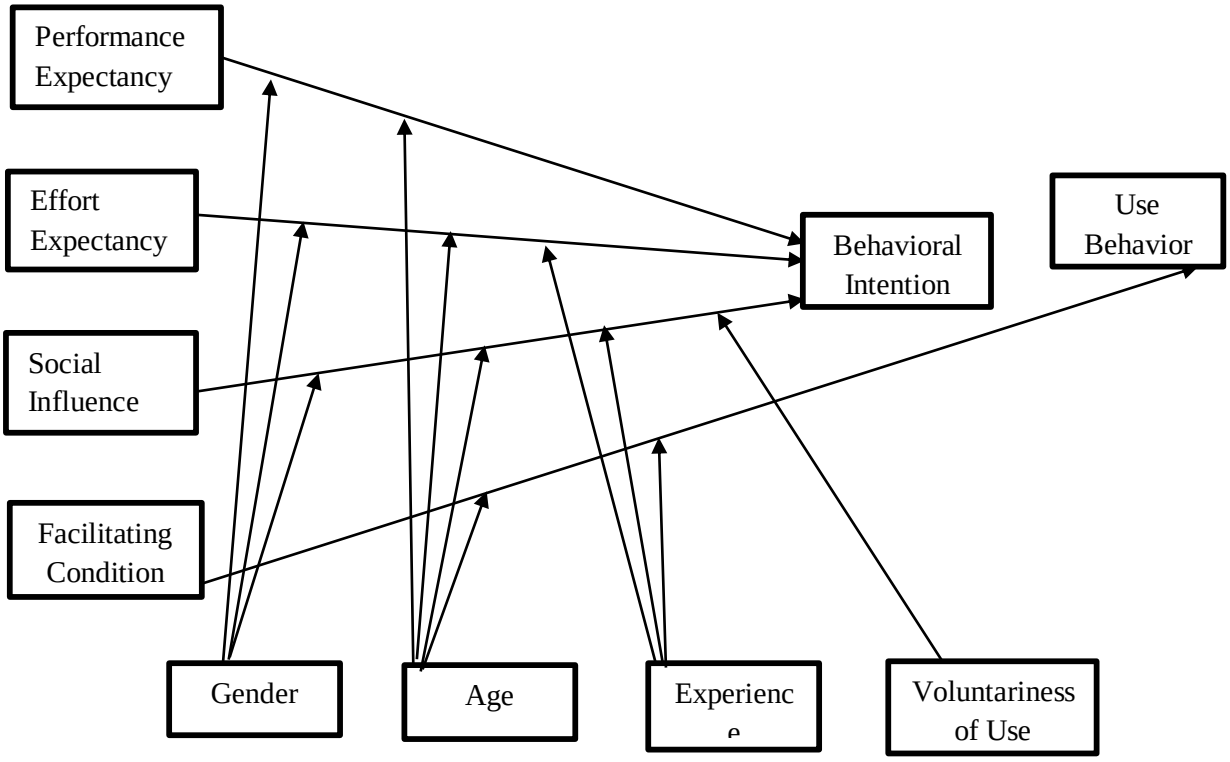

Figure 2.7 Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003)

According to Table 2.6, half of the constructs of UTAUT do not have any relationship with the awareness construct, and this means that the other half have a relationship with the awareness construct. On the one hand, the five constructs with no relationship with awareness are: use behaviour, gender, age, experience and voluntariness of use. On the other hand, the five constructs with a relationship with awareness in other technology diffusion and adoption models are: performance expectancy, effort

expectancy, social influence, behavioural intention and facilitation conditions. Out of these five constructs, facilitating condition is the only construct that is an antecedent of awareness. Awareness is a mediator of the remaining four constructs when they have a relationship with other constructs. Moreover, behavioural intention is consequence of awareness and performance expectancy is an antecedent of awareness. As for subjective norms, some models show it as a consequence of awareness while others show it as an antecedence of awareness.

Table 2.6 Analysis of UTAUT in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Performance Expectancy/ Perceived Usefulness/Relative Advantage	Mediator, antecedent	Saleh *et al*. (2014), Hansen (2006)
Effort Expectancy/ Perceived Ease of Use/Ease of Use	Mediator	Saleh *et al*. (2014)
Social Influence/ Subjective Norms/Social Factors	Two-way, mediator	Dinev and Hu (2007), Hansen (2006), Saleh *et al.* (2014)
Facilitating Conditions/ Perceived Behavioural Control /Compatibility	Antecedent	Hansen (2006)
Behavioral Intention	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*. (2014)
Use Behaviour	Not found	All the models reviewed
Gender	Not found	All the models reviewed
Age	Not found	All the models reviewed
Experience	Not found	All the models reviewed
Voluntariness of Use	Not found	All the models reviewed

2.3 Technology Diffusion and Adoption Models with an Explicit Inclusion of the Awareness Construct

Technology diffusion and adoption models with the awareness constructs are presented in this section, starting with the classical models and ending with the new models.

2.3.1 Classical Models

The Diffusion of Innovation/Innovation Diffusion Theory (DOI/IDT), and the Concerns-Based Adoption Model (CBAM) are the two classical technology diffusion and adoption models found by this sub-section to explicitly contain the awareness construct.

2.3.1.1 Diffusion of Innovation/Innovation Diffusion Theory (DOI/IDT)

DOI/IDT is represented by Figure 2.8 and the nature of the relationships of its constructs with awareness is captured by Table 2.7. There are four constructs in DOI/IDT: characteristics of the design making unit, prior conditions, communication channel and perceived characteristics of innovation (Rogers 1993).

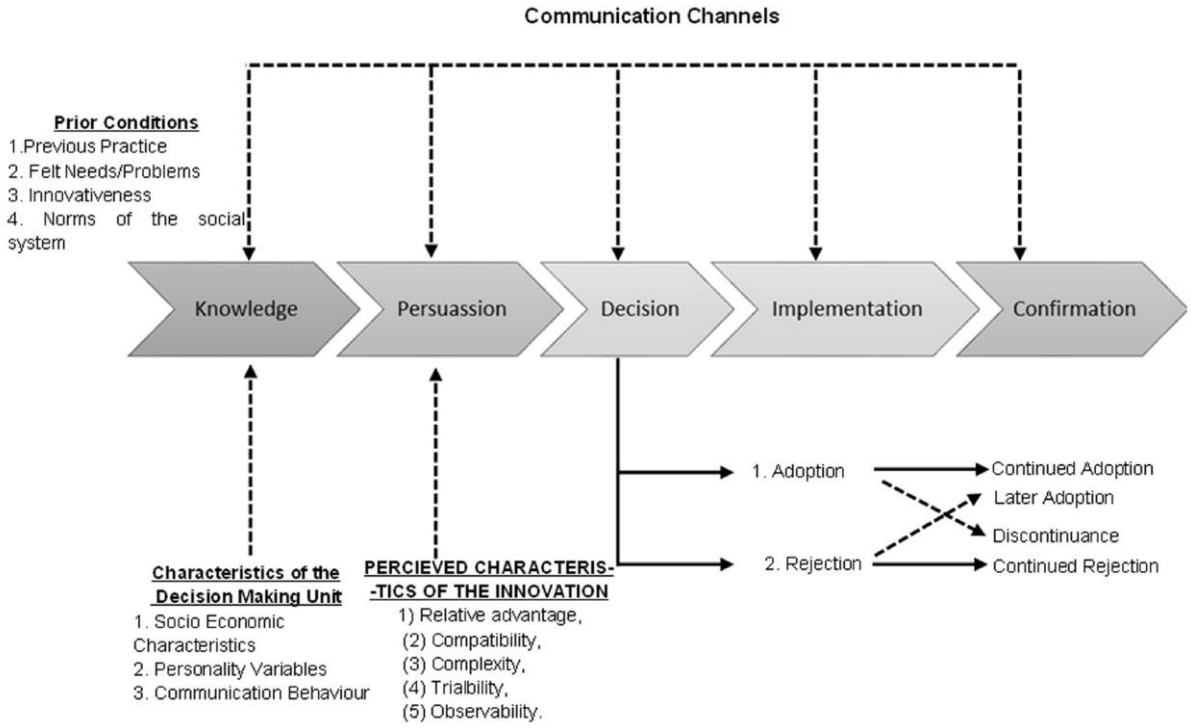

Figure 2.8 Diffusion of Innovation/Innovation Diffusion Theory (Rogers 1983)

According to Table 2.7, four constructs of DOI/IDT have a relationship with the awareness construct: characteristics of the design making unit, prior conditions, communication channel, and perceived characteristics of innovation. All these three constructs are an antecedent of awareness.

Table 2.7 Analysis of DOI/IDT in relation to awareness

Constructs	**Relationship with awareness (part of the adoption stages)**	**Evidence**
Characteristics of the design making unit	Antecedent	DOI/IDT
Prior conditions	Antecedent	DOI/IDT
Communication channel	Antecedent	DOI/IDT
Perceived characteristics of innovation	Antecedent	DOI/IDT

2.3.1.2 Concerns-Based Adoption Model (CBAM)

CBAM is represented by Figure 2.9 and the nature of the relationships of its constructs with awareness is captured in Table 2.8. Apart from the awareness, level of use is the only construct in CBAM (Hall and Hord 1987).

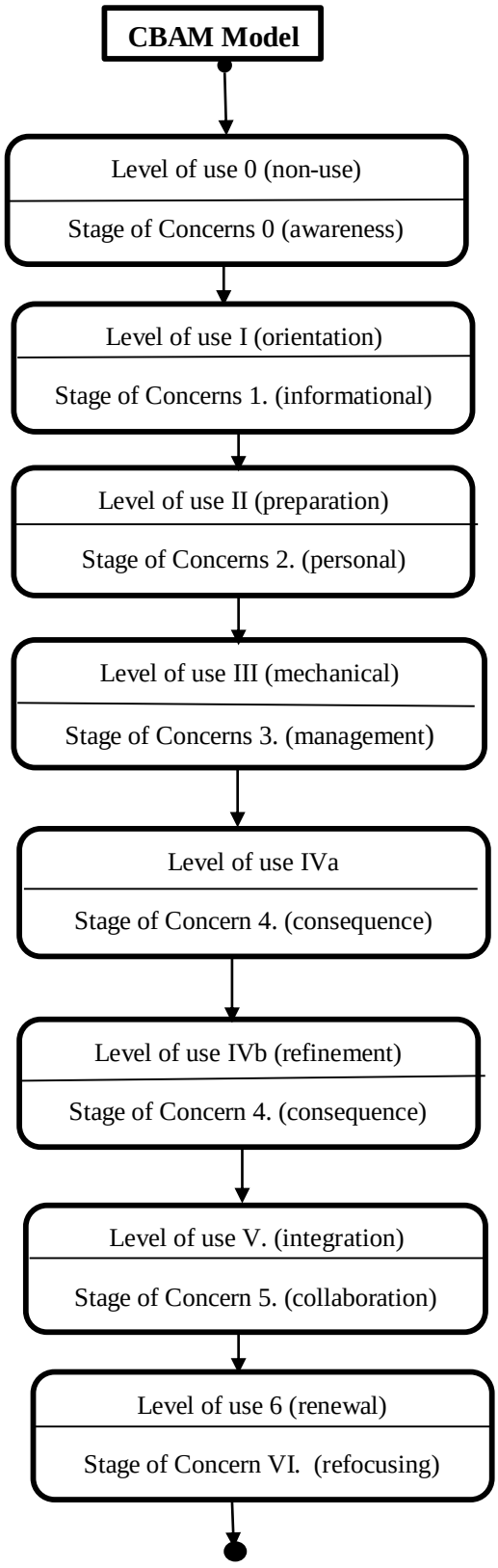

Figure 2.9 Concerns-Based Adoption Model (Hall and Hord 1987)

According to Table 2.8, level of use construct of CBAM has a two-way relationship with the awareness construct.

Table 2.8 Analysis of CBAM in relation to awareness

Constructs	**Relationship with awareness (stage of concern)**	**Evidence**
Level of Use	Two-way	CBAM

2.3.2 New Researchers

2.3.2.1 Saleh *et al*.

Saleh *et al*. technology adoption model is represented by Figure 2.10 and the nature of the relationships of its constructs with awareness is captured by Table 2.9. There are six constructs in Saleh *et al*. technology adoption model: performance expectancy, effort expectancy, social influence, attitude towards usage, behavioural intention and environmental concern (Saleh *et al*. 2014).

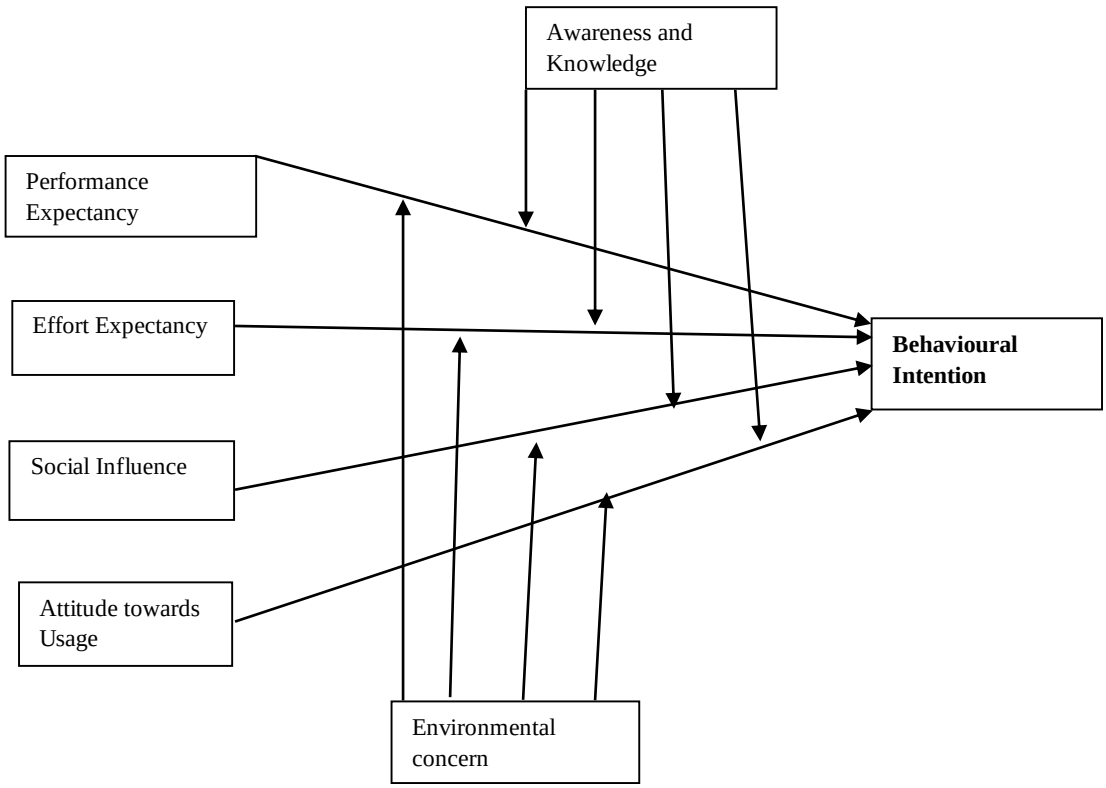

Figure 2.10 Saleh et al. technology adoption model (2014)

According to Table 2.9, environmental concern is the only construct from Saleh *et al*. technology adoption model that do not have any relationship with the awareness construct. This naturally means that five constructs have a relationship with awareness. The five constructs with a relationship with awareness are: performance expectancy, effort expectancy, social influence, attitude towards usage and behavioural intention. Awareness is a mediator of these five constructs when they have a relationship with other constructs.

Table 2.9 Analysis of Saleh et al. technology adoption model in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Performance expectancy	Mediator	Saleh *et al*. (2014), UTAUT, TAM/TAM2, MM, C-TAM-TPB, MPCU, IDT, SCT
Effort expectancy	Mediator	Saleh *et al*. (2014), UTAUT,TAM/TAM2, MPCU, IDT
Social Influence	Mediator	Saleh *et al*. (2014), UTAUT, TRA, TAM2, TPB/DTPB, C-TAM-TPB
Attitude towards usage	Mediator	Saleh *et al*. (2014), TPB/DTPB, TRA
Environmental concern	Not found	All the models reviewed
Behavioral intention	Mediator	Saleh *et al*. (2014), UTAUT, TRA, TAM/TAM2, TPB/DTPB

2.3.2.2 Dinev and Hu

Dinev and Hu technology adoption model is represented by Figure 2.11 and the nature of the relationships of its constructs with awareness is captured by Table 2.10. There are eight constructs in Dinev and Hu technology adoption model: perceived usefulness, perceived ease of use, self-efficacy, controllability, perceived behavioural control, attitude, subjective norm and behavioural intention (Dinev and Hu 2007).

According to Table 2.10, six constructs from Dinev and Hu technology adoption model do not have any relationship with the awareness construct, and three constructs have a relationship with the awareness construct. The six constructs with no relationship with awareness are: technology awareness, the perceived usefulness, perceived ease of use, self-efficacy, controllability and perceived behavioural control construct. The three remaining constructs with a relationship with awareness are: attitude, subjective norm, and behavioural intention. All these three constructs are a consequence of awareness.

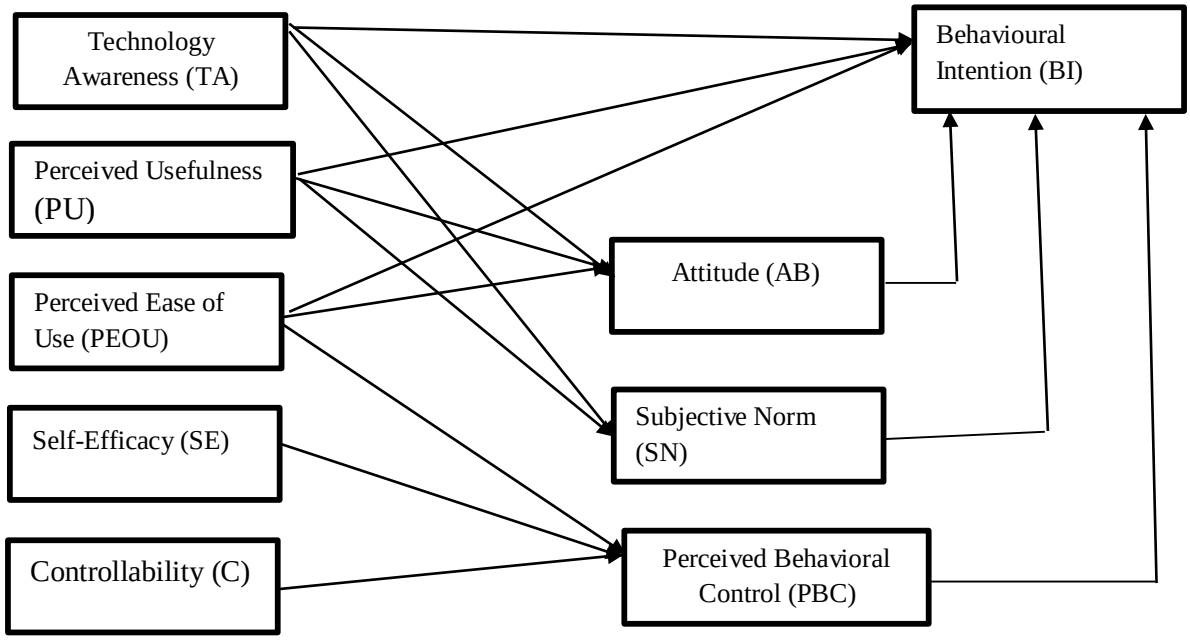

Figure 2.11 Dinev and Hu technology adoption model (2007)

Table 2.10 Analysis of Dinev and Hu technology adoption model in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Technology Awareness	Not found	All the models reviewed
Perceived usefulness	Not found	All the models reviewed
Perceived ease of use	Not found	All the models reviewed
Self-efficacy	Not found	All the models reviewed
Controllability	Not found	All the models reviewed
Attitude	Consequence	Dinev and Hu (2007), TBP,TRA
Subjective norm	Consequence	Dinev and Hu (2007), TPB,TRA
Perceived behavioral control	Not found	All the models reviewed
Behavioral intention	Consequence	Dinev and Hu (2007), TPB ,TRA

2.3.2.3 Charalambous and Philippou

Charalambous and Philippou technology adoption model is represented by Figure 2.12 and the nature of the relationships of its constructs with awareness is captured by Table 2.11. Apart from the awareness, efficacy beliefs is the only construct in Charalambous and Philippou technology adoption model (2010).

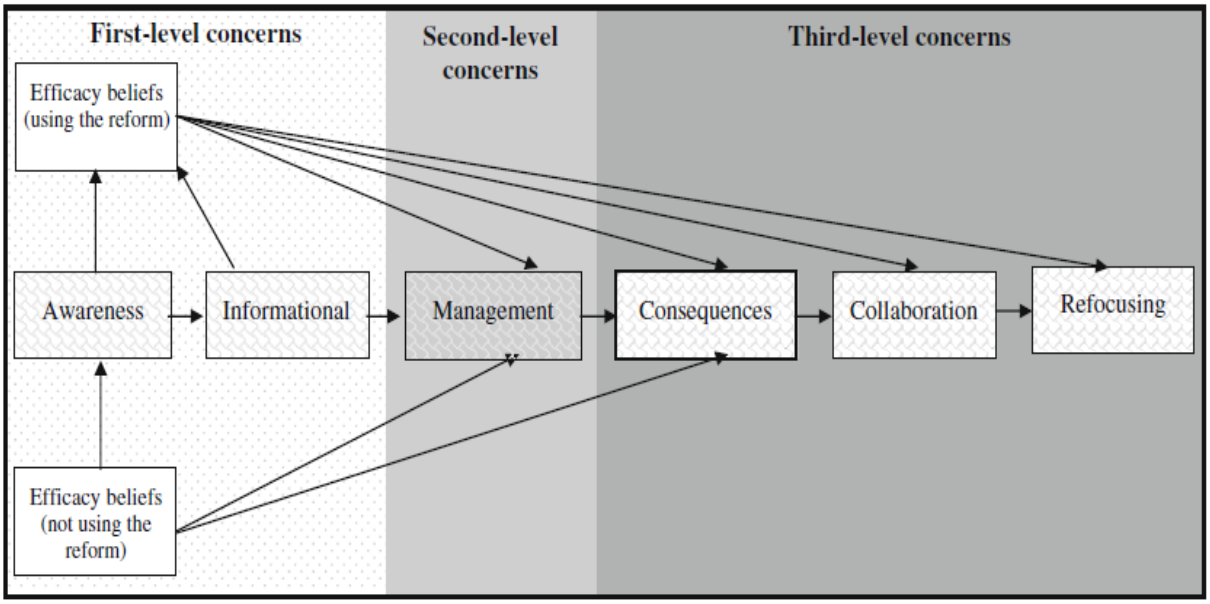

Figure 2.12 Charalambous and Philippou technology adoption model (2010)

According to Table 2.11, efficacy beliefs constructs of Charalambous and Philippou technology adoption model have a two-way relationship with the awareness construct.

Table 2.11 Analysis of Charalambous and Philippou technology adoption model in relation to awareness

Constructs	**Relationship with awareness (part of the adoption stages)**	**Evidence**
Efficacy beliefs	Two-way	Charalambous and Philippou (2010)

2.3.2.4 Hansen

Hansen technology adoption model is represented by Figure 2.13 and the nature of the relationships of its constructs with awareness is captured by Table 2.12. There are six constructs in Hansen technology adoption model: perceived attributes of the innovation, facilitating conditions, social system, adopter categories, communication channels and types of innovation decision (Hansen 2006).

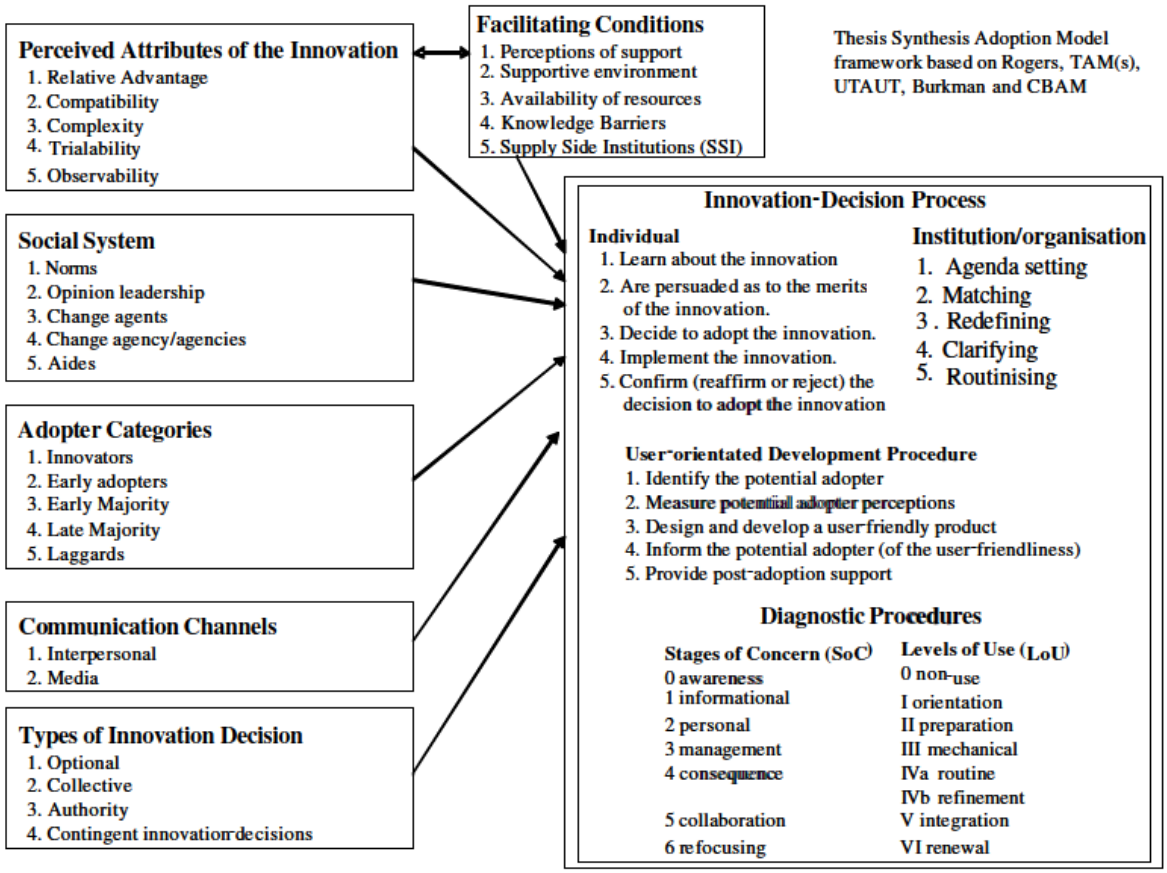

Figure 2.13 Hansen technology adoption model (2006)

According to Table 2.12, all six constructs of Hansen technology adoption model have a relationship with awareness. The five constructs are: perceived attributes of the innovation, facilitating conditions, social system, adopter categories, communication channels and types of innovation decision. All these six constructs are an antecedent of awareness construct.

Table 2.12 Analysis of Hansen technology adoption model in relation to awareness

Constructs	Relationship with awareness (part of innovation decision process)	Evidence
Perceived Attributes of the Innovation	Antecedent	Hansen (2006), DOI/IDT
Facilitating Conditions	Antecedent	Hansen (2006), TPB/DTPB, MPCU, UTAUT, IDT, C-TAM-TPB
Social System	Antecedent	Hansen (2006), DOI/IDT,TPB, TRA, DTPB, TAM2, UTAUT
Adopter Categories	Antecedent	Hansen (2006), DOI/IDT
Communication Channels	Antecedent	Hansen (2006), DOI/IDT
Types of Innovation Decision	Antecedent	Hansen (2006), DOI/IDT

2.4 Synthetic analysis of technology diffusion and adoption models in relation to the awareness construct

This section starts with the identification of the technology diffusion and adoption constructs that do not have a relationship with awareness. Thereafter, a criterion for the selection of the constructs of this study is defined, based on the analysis of the technology diffusion and adoption constructs that are linked to awareness. Finally, a proposed theoretical framework of technology awareness factors is presented in response to the second objective of this study.

2.4.1 Constructs with no relationship with awareness

The following technology diffusion and adoption constructs do not have a relationship with awareness: behavioural beliefs and outcome evaluations, normative beliefs and motivation to comply, peers, superiors, behaviour/usage behaviour/use behaviour/actual system use, experience, voluntariness, image, job relevance, output quality, result demonstrability, gender, age, experience, voluntariness of use, environmental concern and controllability.

2.4.2 Constructs with a relationship with awareness

The technology diffusion and adoption constructs that have a relationship with awareness are presented in Table 2.13.

Table 2.13 Analysis of technology diffusion and adoption constructs in relation to awareness

Constructs	**Relationship with awareness**	**Evidence**
Attitude/Attitude Towards the Behaviour/ Attitude Towards the Usage	Consequence, mediator	Dinev and Hu (2007), Saleh *et al*., TPB/DTPB, TRA
Subjective Norms/Social Factors/Social Influence	Two-way, mediator	Dinev and Hu, Hansen, Saleh *et al*., UTAUT, TRA, TAM2, TPB, DTPB, C-TAM-TPB
Behavioural Intention	Consequence, mediator	Dinev and Hu, Saleh *et al*., TRA, TPB/DTPB, TAM/TAM2, UTAUT
Control Beliefs and Facilitation/ Perceived Behavioural Control /Compatibility /Resource Facilitating Conditions/ Technology facilitating conditions	Antecedent	Hansen (2006), TPB/DTPB, MPCU, UTAUT, IDT, C-TAM-TPB
Performance Expectancy/Perceived Usefulness/Relative advantage	Mediator, antecedent	Saleh *et al*. (2014), Hansen (2006, UTAUT, TAM/TAM2, MM, C-TAM-TPB, MPCU, IDT, SCT
Perceived Ease of Use/Ease of Use/Effort Expectancy	Mediator	Saleh *et al*. (2014), UTAUT,TAM/TAM2, MPCU, IDT
Self-Efficacy/Efficacy beliefs	Two-way	Charalambous and Philippou (2010)
Characteristics of the design making unit	Antecedent	DOI/IDT
Prior conditions	Antecedent	DOI/IDT
Communication Channels	Antecedent	Hansen, DOI/IDT
Level of Use	Two-way	CBAM
Perceived Attributes of the Innovation	Antecedent	Hansen (2006, DOI/IDT
Adopter Categories	Antecedent	Hansen (2006, DOI/IDT
Types of Innovation Decision	Antecedent	Hansen (2006, DOI/IDT

According to Table 2.13, the technology diffusion and adoption models reviewed by this study are unanimous on the fact that none of the constructs from these theories is a consequence of awareness unless when it is both seen as a consequence and as an antecedent of awareness. Half of these constructs are clearly considered as only being antecedent of awareness. For one of the construct, awareness is considered as being a

mediator. There are four constructs whose relationship with awareness is perceived differently from one theory to another: as a consequence, as an antecedent, both as a consequence and an antecedent and as a mediator. These four constructs are: attitude towards the behaviour, social influence, behavioural intention and performance expectancy. Out of these four constructs, behavioural intention is the only one whose relationship with awareness is not examined furthermore by this study. The choice of excluding behavioural intention from the constructs to be examined by this study is simply motivated by the need to limit the number of research variables for this study.

2.4.3 Main advantages and disadvantages of the above listed models

This section briefly highlight the main advantages and disadvantages of some of the above listed models.

TPB. The main strength of TPB is that attitude and perceived control have proven to account for large proportions of the variance in intentions compared to subjective norms (Godin and Kok 1996 cited in Armitage and Arden 2002). However, this weakness of the subjective norms is seen as a weakness of TPB itself (Trafimow 1988 cited in Armitage and Arden 2002).

DTPB. According to Taylor and Todd (1995) cited in Mauro and Afonso (2007), one of the main advantages of the DTPB is that it can be applied to a variety of situations. However, Al-Qeisi (2009) cited in Obeidat and Turgay (2012) criticises DTPB as being too complex.

TAM. This model has been associated with a high degree of validity and reliability (Adams, Nelson and Todd 1992 cited in Obeidat and Turgay 2012), simplicity, and higher predictive ability compared to TRA and TPB (David, Bagozzi and Warshaw 1989; Mathieson 1991 cited in Obeidat and Turgay 2012). However, TAM has been criticized for its small number of constructs compared to other models and this prevents it to capture more relevant technology adoption factors (Chuttur 2009 cited in Obeidat and Turgay 2012).

TAM2. This model is usually considered as a more robust model compared to TAM (Chuttur 2009 cited by Obeidat and Turgay 2012), however, it is also criticized for its failure to incorporate the attitude variable which is well known for its impact on technology adoption (Bagozzi 2007; Burton-Jones and Hubona 2005 cited by Obeidat and Turgay 2012).

2.4.4 Proposed theoretical framework for this study

Figure 2.14 is the conceptual model of this study with the above selected research variables except that attitude towards the behaviour is considered to be synonymous with computer attitude. It symbolises the following hypotheses of this research on the analysis of the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

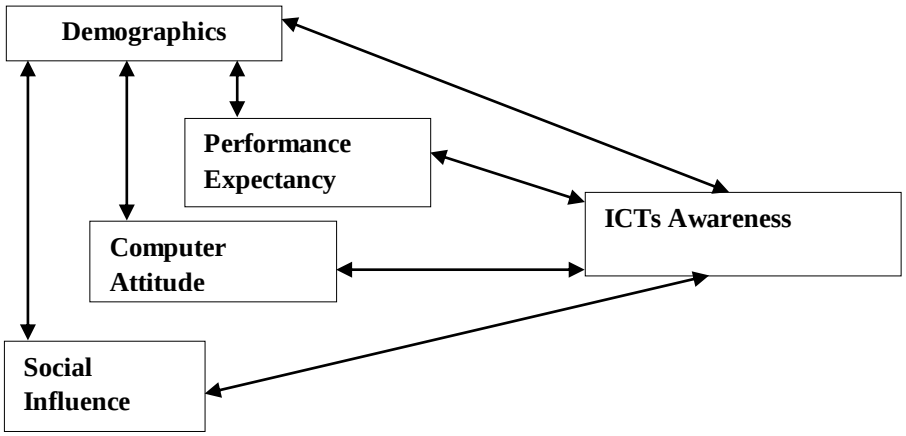

Figure 2.14 Conceptual model of this study

- Ha0: There is a relationship between the demographics of a PE teacher and his or her perceived awareness of the benefits of the use of ICTs in PE.
- Hb0: There is a relationship between the demographics of a PE teacher and his or her perceived performance expectancy from the benefits of the use of ICTs in PE.
- Hc0: There is a relationship between the demographics of a PE teacher and his or her perceived attitude towards computers.

- Hd0: There is a relationship between the demographics of a PE teacher and the perceived social influence applied to him or her with regards to the benefits of the use of ICTs in PE.
- He0: There is a relationship between the performance expectancy of a PE teacher from the use of ICTs in PE and his or her perceived awareness of the benefits of the use of ICTs in PE.
- Hf0: There is a relationship between computer attitude of a PE teachers and his or her perceived awareness of the benefits of the use of ICTs in PE.
- Hg0: There is a relationship between the social influence applied to a PE teacher with regards to the use ICTs in PE, and his or perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

2.5 Conclusion

Thirteen technology diffusion and adoption theories were reviewed by this chapter. Only one of them does not have the awareness construct. Six of them contain the awareness construct; and even though the remaining six theories do not contain the awareness construct, some of their constructs are connected to awareness in other technology diffusion and adoption models. The three research variables selected from these six theories for the design of the conceptual model of this study are: computer attitude, social influence and performance expectancy. This selection is motivated by the need to limit the number of research variables for this study and by the fact that existing literature is not conclusive on the nature of the relationships that these research variables have with awareness. The next chapter is dedicated to the description of the methodology used for the empirical validation of the conceptual model proposed by this chapter.

CHAPTER 3

RESEARCH DESIGN

In this chapter, the research methodology of this study is presented for the validation of the conceptual model proposed by the previous chapter. This model was validated through a survey whose population, data sampling, data collection and data analysis methods are presented by this chapter.

3.1 Research Population

The population of the survey conducted by this study was made up of primary, senior secondary and combined Camperdown school teachers for the 2014 academic year. Camperdown belongs to the UMgungundlovu District Municipality in the KwaZulu-Natal province of South Africa (see Figure 3.1). At the time when this survey was conducted (between June and July 2014), there were 652 teachers from the 42 Camperdown schools (Department of Eeducation 2013). However, this study restricted itself to PE teachers only, mainly because of the PE focus as its aim and objectives. All PE teachers from grade R to grade 12 were considered in this study. There were 42 schools in Camperdown; twenty-eight of them were considered as urban schools and fourteen of them were considered as rural schools. Nineteen of the urban schools were considered as big schools and nine of the urban schools were considered as small schools. Eleven of the rural schools were considered as big schools and three of the rural schools were considered as small schools. A map of Camperdown can be seen on Figure 3.1. This survey mostly covered the following localities from the southern side of Camperdown even though Camperdown is made of twelve localities: Catoridge, Inchanga, Inchangapark, Hammarsdale and Mpumalanga. Other Camperdown localities not covered by this study are: Pelham, Cleland, Hornville, Thornville, Umlaasweg, Hopewell and Silverton.

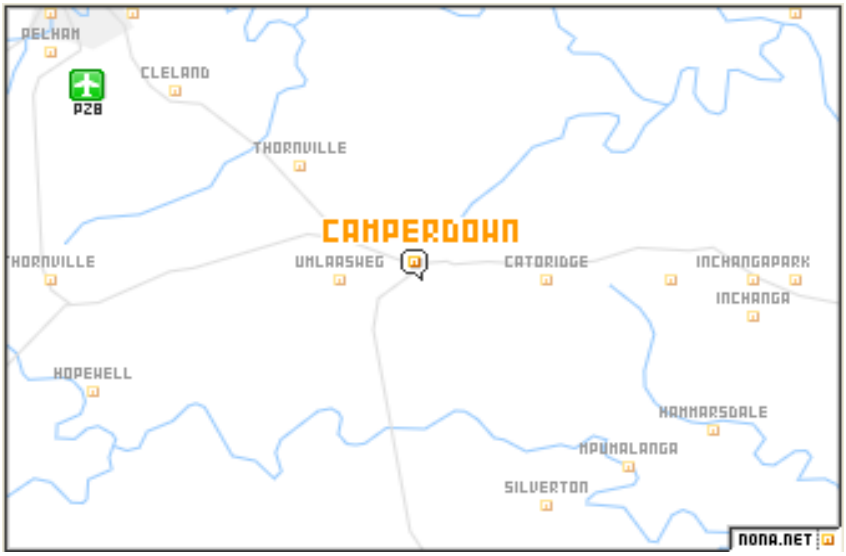

Figure 3.1 Camperdown, KwaZulu-Natal, South Africa

3.2 Sampling

The sample size of this survey was calculated using Equation 3.1 as proposed by Naing *et al*. (2006) for finite populations. This equation can be described as follows: n is the sample size, Z is the confidence level, P is the estimated proportion, d is the precision or acceptable margin of error and N is the population size. The value of n was calculated using the following parameters: Z=1.96, P=0.05, d=0.0471 and N= 652 teachers. This gave a sample size of 73 teachers. This sample was further stratified as explained below.

$$n = \frac{Z^2 P(1-P)}{d^2(N-1)+Z^2 P(1-P)} \qquad \text{Equation 3.1}$$

There are 224 teachers in the Camperdown rural schools and 428 teachers in the Camperdown urban schools. This gives a proportion of 34% of rural schools teachers and 66% of urban schools teachers. These two proportions translate to a sample size of 25 rural schools teachers and 48 urban schools teachers (Table 3.1).

Table 3.1 Total population and sample size of Camperdown teachers

Camperdown			
	Teachers	**Proportion**	**Sample size**
Rural Educators	224	0.343558282	25
Urban Educators	428	0.656441718	48
Total	**652**	**1**	**73**

Out of the 224 Camperdown rural schools teachers, 200 teachers are from big schools and 24 teachers are from small schools. This gives a proportion of 89% of teachers from big rural schools and 11% of teachers from small rural schools; and these two proportions translate to a sample size of 22 teachers from big rural schools and 3 teachers from small rural schools (Table 3.2).

Table 3.2 Population and sample size of rural teachers

Rural	**Teachers**	**Proportion**	**Sample size**
Big Schools	200	0.892857143	22
Small Schools	24	0.107142857	3
Total	**224**	**1**	**25**

Out of the 428 Camperdown urban schools teachers, 364 teachers are from big schools and 64 teachers are from small schools. This gives a proportion of 85% of teachers from big urban schools and 15% of teachers from small urban schools. These two proportions translate to a sample size of 41 teachers from big urban schools and 7 teachers from small urban schools (Table 3.3).

Table 3.3 Population and sample size of urban teachers

Urban	**Teachers**	**Proportion**	**Sample size**
Big Schools	364	0.850467	41
Small Schools	64	0.149533	7
Total	**428**	**1**	**48**

A summary of the sizes of the populations and of the samples considered by this study can be found in Table 3.4 both for teachers and for schools. The first value represents the number of schools, the second value the teacher's population size and the third value the teachers sample size.

Table 3.4 Population and sample sizes for schools and for teachers

		Approximate number of PE teachers per school
Rural 14, 224, 25	Big 11, 200, 22	2
	Small 3, 24,3	1
Urban 28, 428, 48	Big 19, 364, 41	2
	Small 9, 64, 7	1

3.3 Data Collection

A questionnaire was a research tool used for the collection of the data of this study. The five variables of this questionnaire were extracted from the conceptual model proposed by the previous chapter: demographics, performance expectancy, computer attitude, social influence and awareness of ICTs. The last four variables were all built from five point Likert-scale items (strongly disagree, fairly disagree, weakly agree, fairly agree, and strongly agree).

A: Demographics. The following 10 categorical items were designed for the identification of the demographic background of the teachers.

- A1. Gender: PE teachers could indicate whether they were male or female.
- A2. School Location: PE teachers could indicate whether their school was in a rural or in an urban area.
- A3 School Type: PE teachers could indicate whether they were located in a primary school, a secondary school, or a combined school.
- A4. Age Group: PE teachers could select one of the following as an indication of their age group: less than 30 years, 30 to 40 years, 41 to 50 years and above 50 years.

- A5. Grade Level (s) Coaching: PE teachers could choose one of the following as an indication of the grade level of the learners they were coaching: Grade R to 3, Grade 4 to 6, Grade 7 to 9 and Grade 10 to 12.
- A6. Highest Level of Education: PE teachers could indicate one of the following qualifications they held: Diploma, Bachelors, Honours or Masters.
- A7 Number of Learners Coaching: PE teachers could indicate the size of their classes as follows: less than 10, 10 to 19, 20 to 29, and above 29.
- A8. Computer Usage: PE teachers could indicate the frequency of their use of computers as following: none, daily, weekly, monthly.
- A9. Ethnicity: PE teachers could indicate their ethnic group as follows: African, Indian, Coloured, White, and others.
- A10. PE experience (in years): PE teachers could indicate their number of years of PE teaching experience as follows: 0 to 5 years, 6 to 10 years, 11 to 15 years, 16 to 20 years and above 20 years.

B: Performance Expectancy. The following 10 Likert Scale items were designed for the measurement of the performance expectancy of teachers as adapted from the scale proposed by the South African National Curriculum Statement (2011).

- B1. Performance in fitness programmes such as aerobics, running, push ups, etc.: PE teachers could rate their performance expectations from the use of ICTs in fitness programmes.
- B2. Successful participation in individual or team sports such as athletics, cricket, soccer, etc.: PE teachers could rate their performance expectations from the use of ICTs in individual and team sports.
- B3. Successful execution of game plans for individual or team sports such as soccer or golf: PE teachers could rate their performance expectations from the use of ICTs in the execution of a game plan.
- B4. Adherence to safety rules such as applying basic first-aid, warming up, and wearing adequate kit: PE teachers could rate their performance expectations from the use of ICTs in the reinforcement of safety rules.

- B5. Successful participation in community or indigenous games that include the concept of invasion: PE teachers could rate their performance expectations from the use of ICTs in indigenous games.
- B6. Successful performance in sequences of physical activities such as rotation, balance, elevation, etc.: PE teachers could rate their performance expectations from the use of ICTs in the execution of physical movements.
- B7. Successful participation in outdoor recreations such as dancing, gymnastics, self-defence, etc.: PE teachers could rate their performance expectations from the use of ICTs in outdoor recreations.
- B8. Successful participation in programmes that improve movement techniques: PE teachers could rate their performance expectations from the use of ICTs in movement techniques improvement programmes.
- B9. Understanding of the connection between physical education and other subjects: PE teachers could rate their performance expectations from the use of ICTs in the understanding of the connection between PE and other subjects.
- B10. Understanding of the physiological aspects of physical education: PE teachers could rate their performance expectations from the use of ICTs in the physiological aspects of physical education.

C: Attitude Towards Computers. The following 10 Likert Scale items were designed for the measurement of teachers' attitude towards computers as adapted from the list of Computer Attitude Scale for Secondary Students (CASS) proposed by Jones and Clarke (1994).

- C1. Importance of computers in career development: PE teachers could indicate whether they think that computers are important for their career.
- C2. Impact of computers on creativity: PE teachers could indicate whether they think that computers affect creativity.
- C3. Impact of computers on socialisation: PE teachers could indicate whether they think that computers isolate them from other people.
- C4. Ability to perform a task on the computer: PE teachers could indicate whether they think that they are able to perform a task on a computer.

- C5. Computer excitement: PE teachers could indicate whether they think that computers are boring.
- C6. Confusing nature of computers: PE teachers could indicate whether they think that computers are confusing.
- C7. Technicality of computer language: PE teachers could indicate whether they think that computer people talk a strange and technical language.
- C8. Exclusive nature of computers: PE teachers could indicate whether they think that computers are only for people with advanced skills.
- C9. Time consuming nature of computers. PE teachers could indicate whether they like spending a lot of time using computers.
- C10. Willingness to learn more about computers: PE teachers could indicate whether they are willing to learn more about computers.

D: Social Influence. The following 10 Likert Scale items were designed for the measurement of the influence exerted by society on teachers with regards to the use of ICTs. This scale is adapted from the social influence scale proposed by Venkatesh *et al*. (2003).

- D1. Influence of role models on the use ICTs for PE: PE teachers could indicate whether they think that their role models were influencing them to use ICTs for PE.
- D2. Influence of close entourage on the use ICTs for PE: PE teachers could indicate whether they think that people who are important to them influence their use of ICTs for PE.
- D3. Influence of colleagues on the use ICTs for PE: PE teachers could indicate whether they think that their colleagues were influencing them to use ICTs for PE.
- D4. Influence of the Principal and of the Deputy Principal on the use ICTs for PE: PE teachers could indicate whether they think that their Principal and their Deputy Principal were influencing them to use ICTs for PE.
- D5. Influence of the Head of Department on the use ICTs for PE: PE teachers could indicate whether they think that their Head of Department were influencing them to use ICTs for PE.

- D6. Influence of the entire school on the use ICTs for PE: PE teachers could indicate whether they think that their entire school were influencing them to use ICTs for PE.
- D7. Prestige enjoyed by ICTs users: PE teachers could indicate whether they think that people who use ICTs for PE have more prestige than those who do not.
- D8. High profile of ICTs users. PE teachers could indicate whether they think that people who use ICTs have a high profile.
- D9. High status of ICT systems owners: PE teachers could indicate whether they think schools that own ICT systems for PE have a higher status symbol than those who do not.
- D10. Influence of students on the use ICTs for PE: PE teachers could indicate whether they think that their students were influencing them to use ICTs for PE.

E: ICTs Awareness. The following 10 Likert Scale items were designed for the measurement of teachers' awareness of the benefits of using ICT tools for the teaching of PE. This scale is adapted from the ICT usage scale proposed by Gulbahar and Guven (2008).

- E1. Word processors (e.g. Word): PE teachers could rate their awareness of the benefits of using word processors for the teaching of PE.
- E2. Presentation software (e.g. PowerPoint): PE teachers could rate their awareness of the benefit of using presentation software for the teaching of PE.
- E3. Computer aided instruction software (e.g. Blackboard): PE teachers could rate their awareness of the benefit of using computer aided instruction software for the teaching of PE.
- E4. Search engines (e.g. google, yahoo etc.): PE teachers could rate their awareness of the benefits of using search engines for finding information on the internet for the teaching of PE.
- E5. Electronic mails (e.g. Gmail, webmail, outlook etc.): PE teachers could rate their awareness of the benefits using electronic mails for the teaching of PE.

- E6. Electronic encyclopaedia and/Atlas: PE teachers could rate their awareness of the benefits of using electronic encyclopaedia and/Atlas for the teaching of PE.
- E7. Instructional file (e.g. CDs, DVDs, and VCDs etc.): PE teachers could rate their awareness of the benefits of using instructional files storing for the teaching of PE.
- E8. Overhead projectors: PE teachers could rate their awareness of the benefits of using overhead projectors for the teaching of PE.
- E9. Chat rooms and/or forums (e.g. Facebook, Twitter etc.): PE teachers could rate their awareness of the benefits of using social media networks for the teaching of PE.
- E10. Electronic boards: PE teachers could rate their awareness of the benefits of using electronic boards for the teaching of PE.

3.4 Data Analysis

Statistical Package for Social Sciences (SPSS) version 21.0 was used for the analysis of the data collected by this survey on the perceived awareness of PE teachers on the benefits of the use of ICTs in PE. This analysis started with the calculation of Cronbach Alpha coefficients for the determination of reliability and validity of the data. Both descriptive and inferential statistical tests were conducted by this study. Means and frequencies were the two main descriptive statistics used by this study, and Pearson's correlation, ANOVA and ANCOVA were its two main inferential statistical tests. These tests were all performed with a level of confidence of 95% and with a significance p-value between 0.00 and 0.05.

3.5 Conclusion

The sample of this study is made up of 73 PE teachers selected from a population of 652 teachers working in Camperdown in the period between June 2014 and July 2014. The following five variables were used to structure the questionnaire of this survey: teachers' demographics, their performance expectancy from available ICTs tools for PE, their computer attitude, the influence applied to them by other people with regards

to the use of ICTs, and their perceived awareness of the ICTs that are adoptable for the teaching of PE. The performance expectancy scale was adapted from National Curriculum Statement (2011); the computer attitude scale was adapted from Jones and Clarke (1994); the social influence scale was adapted from Venkatesh *et al*. (2003); and the ICTs awareness scale was adapted from Gulbahar and Guven (2008). The data collected by this study was subjected to the following statistical tests in SPSS (Statistical Package for Social Sciences); means, frequencies, Pearson's correlation, ANOVA, and ANCOVA.

CHAPTER 4

RESULTS

The statistical results of the survey conducted by this study are presented in this chapter. These results are subdivided into three categories: validity and reliability results, descriptive results and inferential results. All these results are directly linked to the third objective of this study which is to empirically test the model proposed by Chapter 2. This model identifies factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.

4.1 Validity and Reliability

The data collected by this questionnaire-based survey was found to be reliable as evidenced by the fact that all its Likert-scale research variables have a Cronbach's alpha (α) coefficient greater than 0.7 (See Table 4.1).

Table 4.1 Reliability table for the research variables

Research Variable	**No of items**	**Cronbach's Alpha (*α*)**
Performance Expectancy	10	0.855
Social Influence	10	0.787
Computer Attitude	10	0.925
Awareness of ICTs	10	0.905

4.2 Descriptive Statistics

This section starts with the presentation of the descriptive statistics of the demographics of the PE teachers who participated in this survey. The remaining descriptive statistics are presented at the end of this section according to the data input

by the surveyed PE teachers for the following research variables: performance expectancy, computer attitude, social influence and ICT awareness.

4.2.1 Demographics

Table 4.2 shows that the respondents of this study are predominantly female teachers mostly from primary urban schools. They are all African, all fully qualified and almost half of them indicated that they are using computers. The age and the teaching experiences of the participating teachers are almost equally distributed amongst the different groups. Only a third of the PE teachers indicated that they were in charge of a class of less than 30 learners.

Table 4.2 Descriptive statistics for demographics

A		**Percentage (%)**
A1	Male	37
	Female	63
A2	Urban	72.6
	Rural	27.4
A3	Primary	76.7
	Senior Secondary	16.4
	Combined	6.8
A4	Less 30	20.5
	30-40	32.9
	41-50	35.6
	Above 50	11
A5	Grade R-3	23.3
	Grade 4-6	43.8
	Grade 7-9	8.2
	Grade 10-12	5.5
	Grade R-6	6.8
	Grade 3-4	5.5
	Grade 4-9	4.1
	Grade R-9	2.7
A6	Diploma	53.4
	Bachelors	31.5
	Honors	15.1
A7	Less 10	11
	10-19	15.1

	20-29	9.6
	Above 29	64.4
A8	None	43.8
	Daily	19.2
	Weekly	30.1
	Monthly	6.8
A9	African	100
A10	0-5	34.2
	6-10	34.2
	16-20	20.5
	Above 20Years	2.7

4.2.2 Performance Expectancy

Table 4.3 shows that the respondents of this survey have high expectations from the use of ICT tools in physical education (PE). This is notably true for the following two expectations: the ability for ICTs to help leaners adhere to PE safety rules and its ability to help leaners understand the connection between PE and other subjects.

Table 4.3 Descriptive statistics on PE teachers' overall performance expectations from available ICTs tools for PE

B	**SD**	**FD**	**WA**	**FA**	**SA**	**Mean**	**Std. Dev.**
B1	1	4	8	34	52	4.32	.896
B2	5	7	8	30	49	4.11	1.161
B3	4	1	15	37	42	4.12	.999
B4	1	4	8	30	56	4.36	.903
B5	3	4	18	36	40	4.05	.998
B6	3	7	8	41	41	4.11	1.008
B7	1	5	7	40	47	4.25	.910
B8	4	5	11	22	58	4.23	1.112
B9	1	5	10	26	58	4.33	.958
B10	4	5	8	36	47	4.15	1.063
Average	2.7	4.7	10.1	33.2	49		

SD= Strongly Disagree, **FD**= Fairly Disagree, **WA**= Weakly Agree, **FA**=Fairly Agree, **SA**=Strongly Agree

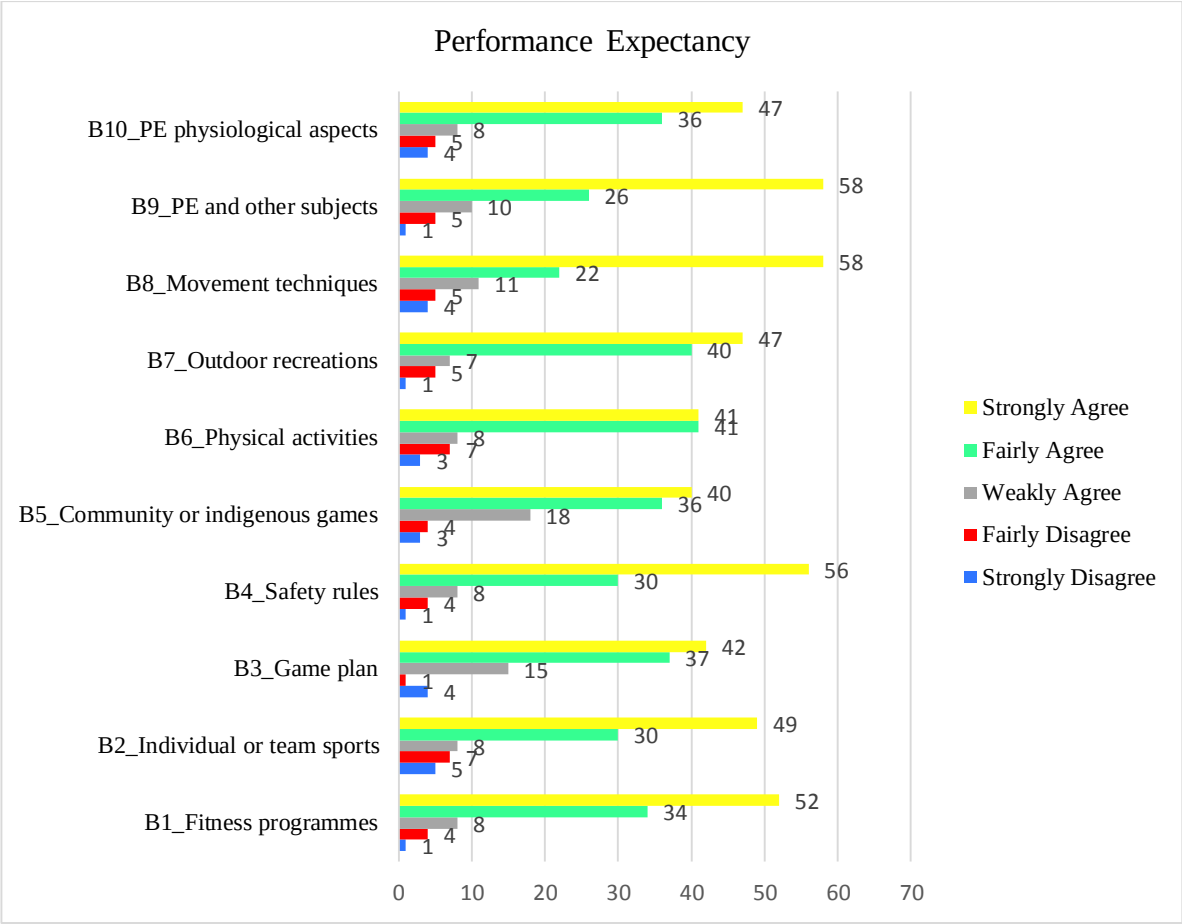

Figure 4.1 PE teachers' performance expectations from available ICTs tools for PE

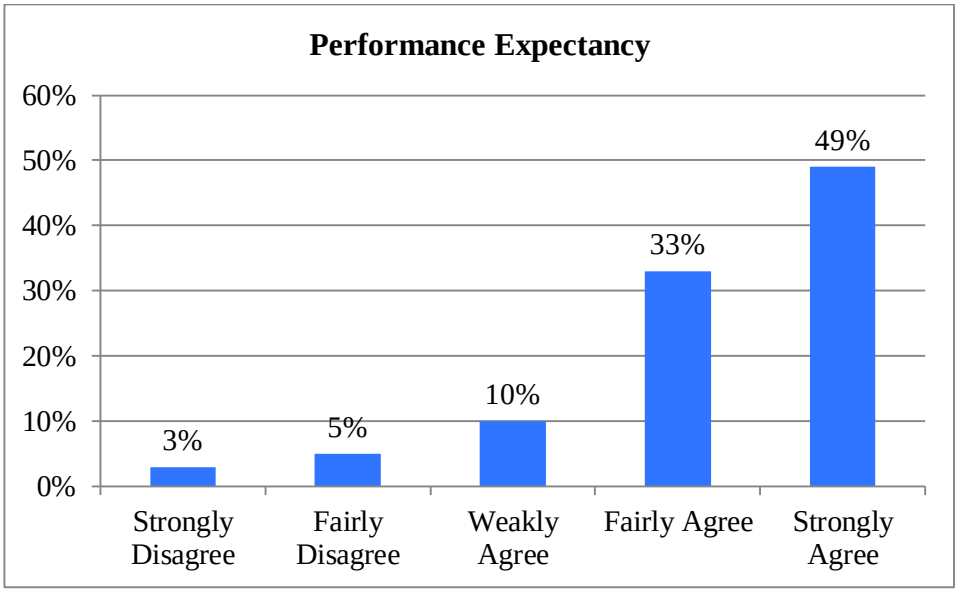

Figure 4.2 PE teachers' overall performance expectations from available ICTs tools for PE

4.2.3 Attitude Towards Computers

Table 4.4 shows that the respondents of this survey have a very positive attitude towards computers. This is notably true for the following two aspects: the willingness to learn more about computers and the ability of computers to accommodate everybody.

Table 4.4 Descriptive statistics on PE teacher's attitude towards computers

C	SD	FD	WA	FA	SA	Mean	Std. Dev.
C1	68	14	4	4	10	1.73	1.304
C2	71	11	3	10	5	1.67	1.237
C3	70	14	10	4	3	1.56	1.014
C4	60	11	16	5	7	1.88	1.269
C5	81	10	3	4	3	1.38	.937
C6	60	19	12	3	5	1.74	1.131
C7	42	22	16	5	14	2.26	1.414
C8	88	8	0	0	4	1.25	.830
C9	60	22	4	8	5	1.77	1.196
C10	90	3	3	0	4	1.25	.863
Average	69	13.4	7.1	4.3	6		

SD= Strongly Disagree, **FD**= Fairly Disagree, **WA**= Weakly Agree, **FA**=Fairly Agree, **SA**=Strongly Agree

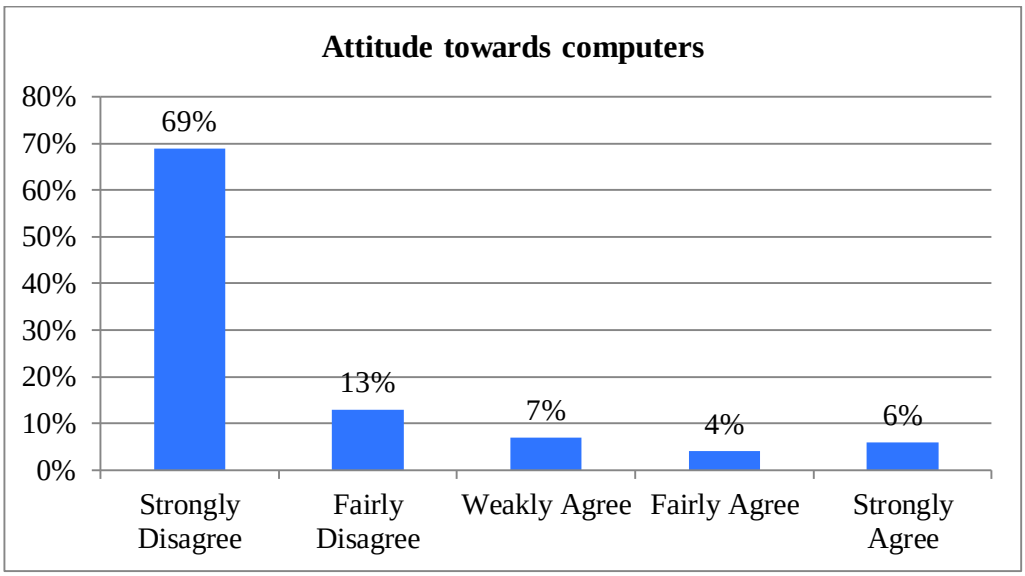

Figure 4.3 PE teachers' overall attitude towards computers

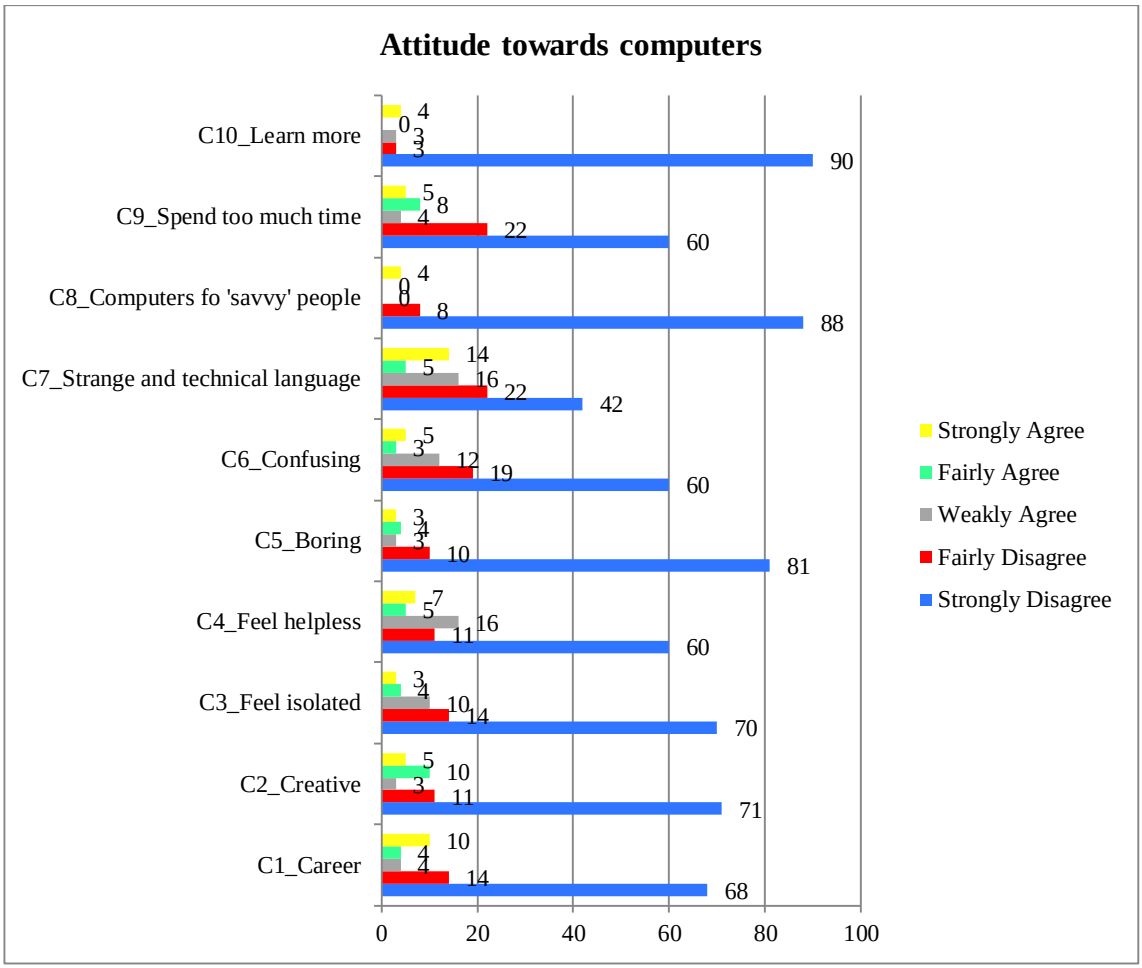

Figure 4.4 PE teachers' attitude towards computers

4.2.4 Social Influence

Table 4.5 shows that the respondents of this survey were receiving a low level of influence from other people with regards to the use ICTs for physical education. This is notably true for the following two sources of influences: the Principal and the Deputy Principal. Table 4.5 also shows that the use of ICTs by a PE teacher does not necessary increase his or her profile at school.

Table 4.5 Descriptive statistics on PE teachers overall influence applied to them by other people with regards to the use of ICTs

D	SD	FD	WA	FA	SA	Mean	Std. Dev.
D1	16	15	10	26	33	3.44	1.491
D2	15	14	12	22	37	3.52	1.482
D3	38	14	12	15	21	2.66	1.601
D4	53	11	5	14	16	2.29	1.603
D5	45	15	7	14	19	2.47	1.617
D6	41	10	8	23	18	2.67	1.616
D7	45	15	10	14	16	2.41	1.562
D8	49	11	5	21	14	2.38	1.578
D9	40	14	10	16	21	2.64	1.619
D10	36	10	12	11	32	2.93	1.710
Average	37.8	12.9	9.1	17.6	22.7		

SD= Strongly Disagree, **FD**= Fairly Disagree, **WA**= Weakly Agree, **FA**=Fairly Agree, **SA**=Strongly Agree

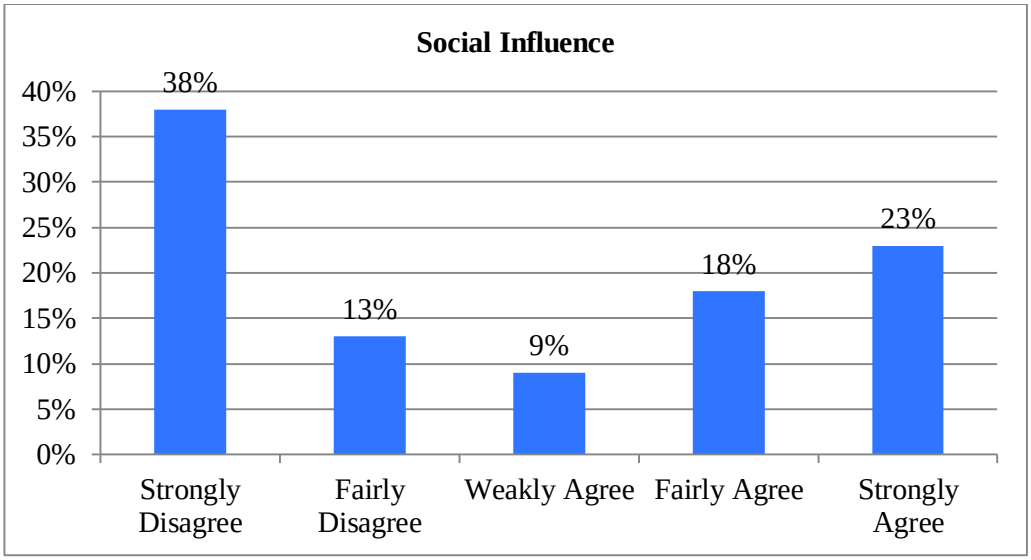

Figure 4.5 PE teachers overall influence applied to them by other people with regards to the use of ICTs

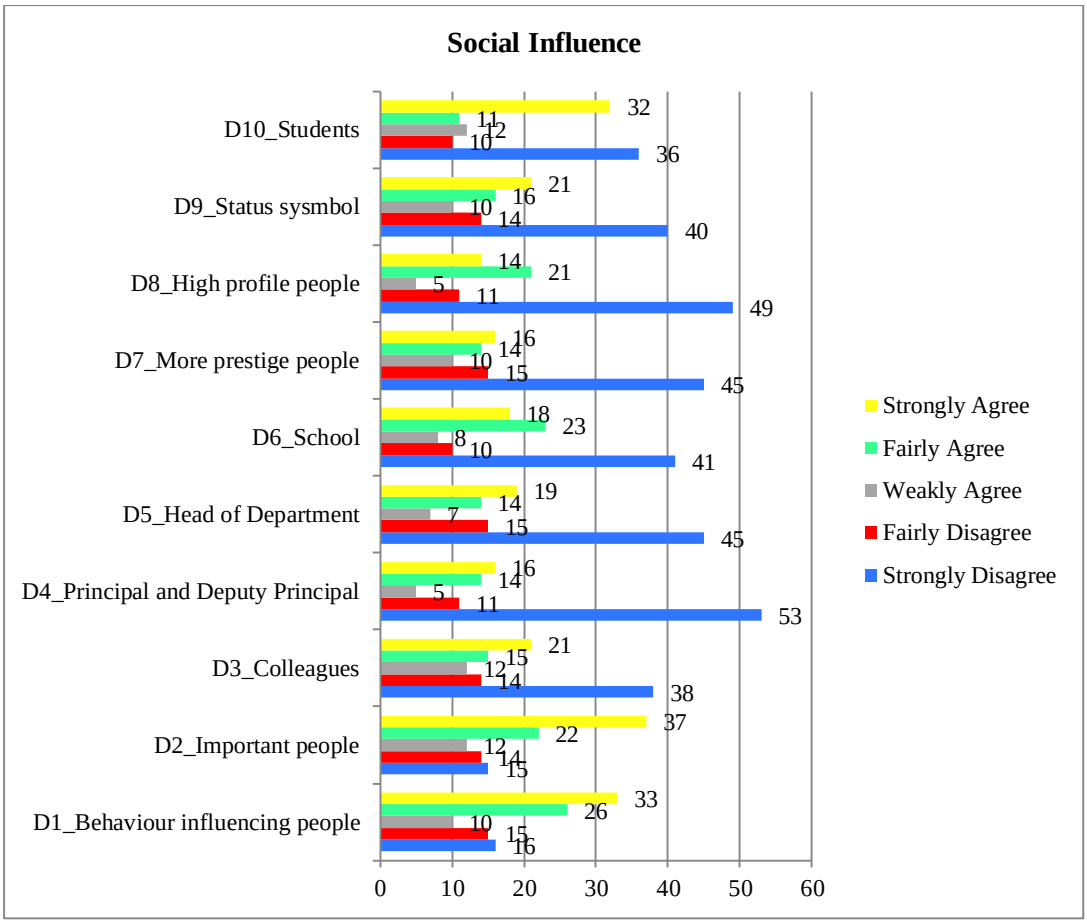

Figure 4.6 PE teachers influence applied to them by other people with regards to the use of ICTs

4.2.5 ICTs Awareness

Table 4.6 shows that the respondents of this survey have a high level of awareness of the benefits of ICTs for PE. This is notably true for the following two types of ICT tools: Search engines and instructional films (CDs, DVDs, VCDs, etc.).

Table 4.6 Descriptive statistics on PE teachers' perceived awareness of the ICTs that are adoptable for the teaching of PE

E	SD	FD	WA	FA	SA	Mean	Std. Dev.
E1	10	10	3	22	56	4.05	1.363
E2	8	8	3	26	55	4.11	1.286
E3	8	7	14	21	51	3.99	1.296
E4	4	5	3	11	77	4.51	1.069
E5	5	7	4	18	66	4.32	1.177
E6	11	3	15	21	51	3.97	1.333
E7	4	7	10	10	70	4.34	1.157
E8	7	7	10	18	59	4.15	1.255
E9	8	12	10	15	55	3.96	1.379
E10	16	14	10	19	41	3.55	1.357
Average	8.1	8	8.2	18.1	58.1		

SD= Strongly Disagree, **FD**= Fairly Disagree, **WA**= Weakly Agree, **FA**=Fairly Agree, **SA**=Strongly Agree

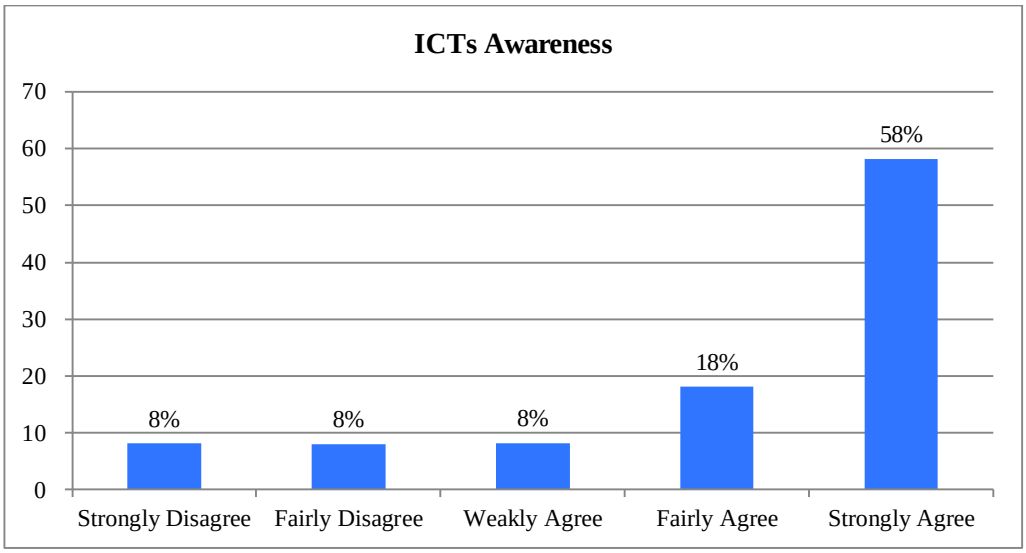

Figure 4.7 PE teachers' perceived awareness of the ICTs that are adoptable for the teaching of PE

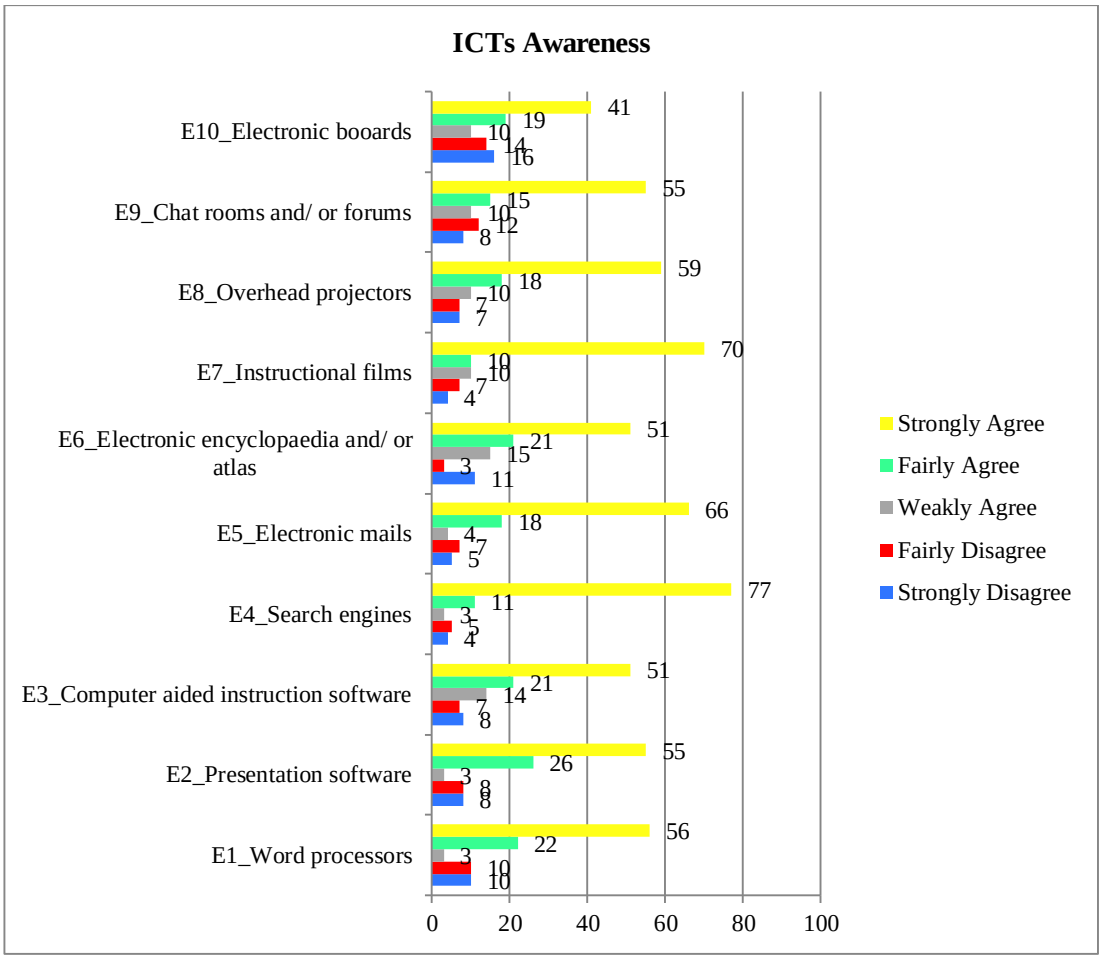

Figure 4.8 PE teachers' overall perceived awareness of the ICTs that are adoptable for the teaching of PE

4.3 Inferential Statistics

This section presents the tests results for the assessment of the correlations between the research variables of this study. This includes ANOVA tests results and the Pearson's correlation tests results.

4.3.1 ANOVA Test Results

The results of the ANOVA tests conducted by this study are hereby presented (See Table 4.7 to 4.15) in terms of their confirmation (sig. < 0.05) or disconfirmation (sig. > 0.05) of the hypotheses of this study.

- HaA0: Gender is one of the demographic factors that affects the perceived awareness of PE teachers of the benefits of the use of ICTs

in PE.

- HaB0: School type is one of the demographic factors that affects the perceived awareness of PE teachers of the benefits of the use of ICTs in PE.
- Hb0: Computer usage is one of the demographic factors that affect PE teachers' performance expectations from the ICT tools that are used for physical education.
- HcA0: Highest level of education is one of the demographic factors that affect PE teachers' attitude towards the use of computers for the teaching of physical education.
- HcB0: Computer usage is one of the demographic factors that affect PE teachers' attitude towards the use of computers for the teaching of physical education.
- Hd0: School type is one of the demographic factors that affect the social influence applied to PE teachers' with regards to the use of ICTs.

Table 4.7 ANOVA test result for PE teachers' gender

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Performance Expectancy	Between Groups	61.170	1	61.170	1.407	.240
	Within Groups	3086.775	71	43.476		
	Total	3147.945	72			
Computer Attitude	Between Groups	39.900	1	39.900	.903	.345
	Within Groups	3138.319	71	44.202		
	Total	3178.219	72			
Social Influence	Between Groups	496.445	1	496.445	3.412	.069
	Within Groups	10331.226	71	145.510		
	Total	10827.671	72			
ICT Awareness	Between Groups	481.173	1	481.173	5.707	.020
	Within Groups	5986.608	71	84.318		
	Total	6467.781	72			

Table 4.8 ANOVA test result for PE teacher' school location

		Sum of Squares	df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	77.508	1	77.508	1.792	.185
	Within Groups	3070.437	71	43.246		
	Total	3147.945	72			
Computer Attitude	Between Groups	10.608	1	10.608	.238	.627
	Within Groups	3167.611	71	44.614		
	Total	3178.219	72			
Social Influence	Between Groups	275.242	1	275.242	1.852	.178
	Within Groups	10552.429	71	148.626		
	Total	10827.671	72			
ICT Awareness	Between Groups	158.038	1	158.038	1.778	.187
	Within Groups	6309.742	71	88.870		
	Total	6467.781	72			

Table 4.9 ANOVA test result for PE teachers' school type

		Sum of Squares	Df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	132.163	2	66.082	1.534	.223
	Within Groups	3015.782	70	43.083		
	Total	3147.945	72			
Computer Attitude	Between Groups	101.370	2	50.685	1.153	.322
	Within Groups	3076.849	70	43.955		
	Total	3178.219	72			
Social Influence	Between Groups	977.822	2	488.911	3.475	.036
	Within Groups	9849.849	70	140.712		
	Total	10827.671	72			
ICT Awareness	Between Groups	822.539	2	411.270	5.100	.009
	Within Groups	5645.242	70	80.646		
	Total	6467.781	72			

Table 4.10 ANOVA test result for PE teachers' age group

		Sum of Squares	df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	258.352	3	86.117	2.056	.114
	Within Groups	2889.593	69	41.878		
	Total	3147.945	72			
Computer Attitude	Between Groups	15.545	3	5.182	.113	.952
	Within Groups	3162.674	69	45.836		
	Total	3178.219	72			
Social Influence	Between Groups	271.443	3	90.481	.591	.623
	Within Groups	10556.228	69	152.989		
	Total	10827.671	72			
ICT Awareness	Between Groups	232.614	3	77.538	.858	.467
	Within Groups	6235.167	69	90.365		
	Total	6467.781	72			

Table 4.11 ANOVA test result for PE teachers' grade level (s) coaching

		Sum of Squares	df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	254.525	7	36.361	.817	.577
	Within Groups	2893.421	65	44.514		
	Total	3147.945	72			
Computer Attitude	Between Groups	458.509	7	65.501	1.565	.162
	Within Groups	2719.710	65	41.842		
	Total	3178.219	72			
Social Influence	Between Groups	1004.483	7	143.498	.950	.475
	Within Groups	9823.188	65	151.126		
	Total	10827.671	72			
ICT Awareness	Between Groups	437.561	7	62.509	.674	.693
	Within Groups	6030.220	65	92.773		
	Total	6467.781	72			

Table 4.12 ANOVA test result for PE teachers' highest level of education

		Sum of Squares	df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	111.326	2	55.663	1.283	.284
	Within Groups	3036.619	70	43.380		
	Total	3147.945	72			
Computer Attitude	Between Groups	303.790	2	151.895	3.699	.030
	Within Groups	2874.430	70	41.063		
	Total	3178.219	72			
Social Influence	Between Groups	120.678	2	60.339	.394	.676
	Within Groups	10706.994	70	152.957		
	Total	10827.671	72			
Behavioral Awareness	Between Groups	42.816	2	21.408	.233	.793
	Within Groups	6424.965	70	91.785		
	Total	6467.781	72			

Table 4.13 ANOVA test result for PE teachers' number of learners coaching

		Sum of Squares	df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	163.055	3	54.352	1.256	.296
	Within Groups	2984.890	69	43.259		
	Total	3147.945	72			
Computer Attitude	Between Groups	214.931	3	71.644	1.668	.182
	Within Groups	2963.288	69	42.946		
	Total	3178.219	72			
Social Influence	Between Groups	947.558	3	315.853	2.206	.095
	Within Groups	9880.113	69	143.190		
	Total	10827.671	72			
Behavioral Awareness	Between Groups	199.334	3	66.445	.731	.537
	Within Groups	6268.447	69	90.847		
	Total	6467.781	72			

Table 4.14 ANOVA test result for PE teachers' computer usage

		Sum of Squares	Df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	407.293	3	135.764	3.418	.022
	Within Groups	2740.652	69	39.720		
	Total	3147.945	72			
Computer Attitude	Between Groups	385.744	3	128.581	3.177	.029
	Within Groups	2792.475	69	40.471		
	Total	3178.219	72			
Social Influence	Between Groups	1002.839	3	334.280	2.348	.080
	Within Groups	9824.832	69	142.389		
	Total	10827.671	72			
Behavioral Awareness	Between Groups	255.993	3	85.331	.948	.422
	Within Groups	6211.788	69	90.026		
	Total	6467.781	72			

Table 4.15 ANOVA test result for PE teachers' experience (in years)

		Sum of Squares	Df	Mean Square	F	Sig.
Performance Expectancy	Between Groups	117.512	4	29.378	.659	.622
	Within Groups	3030.433	68	44.565		
	Total	3147.945	72			
Computer Attitude	Between Groups	269.586	4	67.396	1.576	.191
	Within Groups	2908.633	68	42.774		
	Total	3178.219	72			
Social Influence	Between Groups	1125.545	4	281.386	1.972	.109
	Within Groups	9702.127	68	142.678		
	Total	10827.671	72			
Behavioral Awareness	Between Groups	155.514	4	38.879	.419	.795
	Within Groups	6312.267	68	92.827		
	Total	6467.781	72			

4.3.2 Differences between groups

ANOVA found that the demographic items of this study have a significant relationship with other Likert Scale variables: Gender, school type, level of education and computer usage. This section compares the performance of the different subgroups on each of these demographic items in comparison to their respective Likert Scale variables. Table 4.16 shows that male PE teachers are more aware of ICTs for PE compared to female PE teachers. Table 4.17 and Table 18 show that combined school PE teachers are more influenced by other people with regards to the use of ICT for PE compared to secondary school PE teachers. Table 4.19 and Table 20 show that primary school PE teachers are more aware of ICTs for PE compared to combined school PE teachers. Table 4.21 and Table 22 show that PE teachers that have honours qualification have a very positive attitude towards computers compared to PE teachers that have Bachelors qualification. Table 4.23 and Table 24 show that PE teachers that use computers monthly have high expectations from the use of ICT tools in PE compared to PE teachers who do not use computers at all. Table 4.25 and Table 26 show that PE teachers that use computers monthly have a very positive attitude towards computers compared to PE teachers that use computers daily.

Table 4.16 Descriptive of difference between PE teachers' awareness of ICTs for physical education and gender

Gender	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	27	44.2963	5.94083	1.14331	41.9462	46.6464	29.00	50.00
Female	46	38.9783	10.61339	1.56486	35.8265	42.1300	10.00	50.00
Total	73	40.9452	9.47788	1.10930	38.7339	43.1566	10.00	50.00

Table 4.17 Descriptive of difference between PE teachers' influence applied to them by other people with regards to the use of ICTs and school type

School Type	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Primary	56	28.9821	12.04460	1.60953	25.7566	32.2077	10.00	50.00
Secondary	12	19.1667	11.36048	3.27949	11.9486	26.3848	10.00	40.00
Combined	5	29.6000	10.62073	4.74974	16.4126	42.7874	20.00	46.00
Total	73	27.4110	12.26313	1.43529	24.5498	30.2722	10.00	50.00

Table 4.18 Multiple comparisons between PE teachers' influence applied to them by other people with regards to the use of ICTs and school type

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social Influence	Primary (P)	S	9.81548*	3.77342	.030	.7798	18.8512
		C	-.61786	5.53671	.993	-13.8758	12.6401
	Secondary (S)	P	-9.81548*	3.77342	.030	-18.8512	-.7798
		C	-10.43333	6.31415	.231	-25.5529	4.6863
	Combined (C)	P	.61786	5.53671	.993	-12.6401	13.8758
		S	10.43333	6.31415	.231	-4.6863	25.5529

*. The mean difference is significant at the 0.05 level.

Table 4.19 Descriptive of difference between PE teachers' awareness of ICTs for physical education and school type

School Type	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Primary	56	42.3750	8.19659	1.09532	40.1799	44.5701	14.00	50.00
Secondary	12	39.0833	8.47948	2.44781	33.6957	44.4709	29.00	50.00
Combined	5	29.4000	17.02351	7.61315	8.2625	50.5375	10.00	46.00
Total	73	40.9452	9.47788	1.10930	38.7339	43.1566	10.00	50.00

Table 4.20 Multiple comparisons between PE teachers' awareness of ICTs for physical education and school type

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
ICTs Awareness	Primary (P)	S	3.29167	2.85668	.486	-3.5488	10.1322
		C	12.97500*	4.19158	.008	2.9380	23.0120
	Secondary (S)	P	-3.29167	2.85668	.486	-10.1322	3.5488
		C	9.68333	4.78015	.114	-1.7630	21.1297
	Combined (C)	P	-12.97500*	4.19158	.008	-23.0120	-2.9380
		S	-9.68333	4.78015	.114	-21.1297	1.7630

*. The mean difference is significant at the 0.05 level.

Table 4.21 Descriptive of difference between PE teachers' attitude towards the use of computers for the teaching of PE and highest level of education

Highest Level of Education	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Diploma	39	17.3333	6.68200	1.06998	15.1673	19.4994	10.00	37.00
Bachelors	23	13.6522	3.79723	.79178	12.0101	15.2942	10.00	23.00
Honours	11	19.3636	9.27656	2.79699	13.1316	25.5957	10.00	38.00
Total	73	16.4795	6.64394	.77761	14.9293	18.0296	10.00	38.00

Table 4.22 Multiple comparisons between PE teachers' attitude towards the use of computers for the teaching of PE and highest level of education

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Computer Attitude	Degree (D)	B	3.68116	1.68471	.081	-.3530	7.7153
		H	-2.03030	2.18768	.624	-7.2688	3.2082
	Bachelors (B)	D	-3.68116	1.68471	.081	-7.7153	.3530
		H	-5.71146*	2.34912	.046	-11.3366	-.0863
	Honours (H)	D	2.03030	2.18768	.624	-3.2082	7.2688
		B	5.71146*	2.34912	.046	.0863	11.3366

*. The mean difference is significant at the 0.05 level.

Table 4.23 Descriptive of difference between PE teachers' performance expectations from available ICTs tools for physical education and computer usage

Computer Usage	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
None	32	39.5313	6.19044	1.09433	37.2994	41.7631	24.00	50.00
Daily	14	44.9286	5.73068	1.53159	41.6198	48.2374	34.00	50.00
Weekly	22	42.9545	6.98623	1.48947	39.8570	46.0521	30.00	50.00
Monthly	5	45.8000	5.01996	2.24499	39.5669	52.0331	38.00	50.00
Total	73	42.0274	6.61222	.77390	40.4847	43.5701	24.00	50.00

Table 4.24 Multiple comparisons between PE teachers' performance expectations from available ICTs tools for physical education and computer usage

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Performance Expectancy	None (N)	D	-5.39732*	2.01949	.045	-10.7142	-.0805
		W	-3.42330	1.74547	.213	-8.0187	1.1721
		M	-6.26875	3.03070	.174	-14.2479	1.7104
	Daily (D)	N	5.39732*	2.01949	.045	.0805	10.7142
		W	1.97403	2.15466	.796	-3.6987	7.6467
		M	-.87143	3.28345	.993	-9.5160	7.7731
	Weekly (W)	N	3.42330	1.74547	.213	-1.1721	8.0187
		D	-1.97403	2.15466	.796	-7.6467	3.6987
		M	-2.84545	3.12240	.799	-11.0660	5.3751
	Monthly (M)	N	6.26875	3.03070	.174	-1.7104	14.2479
		D	.87143	3.28345	.993	-7.7731	9.5160
		W	2.84545	3.12240	.799	-5.3751	11.0660

*. The mean difference is significant at the 0.05 level.

Table 4.25 Descriptive of difference between PE teachers' attitude towards the use of computers for the teaching of physical education and computer usage

Computer Usage	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
None	32	17.6250	6.13162	1.08393	15.4143	19.8357	10.00	37.00
Daily	14	13.7857	3.90618	1.04397	11.5304	16.0411	10.00	23.00
Weekly	22	15.0909	7.03670	1.50023	11.9710	18.2108	10.00	38.00
Monthly	5	22.8000	9.85901	4.40908	10.5584	35.0416	11.00	35.00
Total	73	16.4795	6.64394	.77761	14.9293	18.0296	10.00	38.00

Table 4.26 Multiple comparisons between PE teachers' attitude towards the use of computers for the teaching of physical education and computer usage

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Computer Attitude	None (N)	D	3.83929	2.03850	.245	-1.5276	9.2062
		W	2.53409	1.76190	.480	-2.1046	7.1727
		M	-5.17500	3.05922	.336	-13.2292	2.8792
	Daily (D)	N	-3.83929	2.03850	.245	-9.2062	1.5276
		W	-1.30519	2.17493	.932	-7.0313	4.4209
		M	-9.01429*	3.31435	.040	-17.7402	-.2884
	Weekly (W)	N	-2.53409	1.76190	.480	-7.1727	2.1046
		D	1.30519	2.17493	.932	-4.4209	7.0313
		M	-7.70909	3.15178	.078	-16.0070	.5888
	Monthly (M)	N	5.17500	3.05922	.336	-2.8792	13.2292
		D	9.01429*	3.31435	.040	.2884	17.7402
		W	7.70909	3.15178	.078	-.5888	16.0070

*. The mean difference is significant at the 0.05 level.

4.3.3 Pearson Correlations Results

The results of the Pearson's correlation tests conducted by this study are hereby presented (See Table 4.27) in terms of their confirmation (sig. < 0.05) or disconfirmation (sig. > 0.05) of the hypotheses of this study.

- He0: There is a direct relationship between PE teachers' performance expectations from the ICT tools that are used for PE and their awareness of ICTs to be used for PE.
- Ra0: There is a direct relationship between the PE teachers' performance expectations from the ICT tools that are used for PE and social influence applied to them with regards to the use of ICTs.

Table 4.27 Correlations between Likert Scale variables

Variables		B	C	D	E
B	Pearson Correlation	1	.016	.369**	.293*
	Sig. (2-tailed)		.896	.001	.012
	N	73	73	73	73
C	Pearson Correlation	.016	1	-.082	.013
	Sig. (2-tailed)	.896		.491	.912
	N	73	73	73	73
D	Pearson Correlation	.369**	-.082	1	.136
	Sig. (2-tailed)	.001	.491		.250
	N	73	73	73	73
E	Pearson Correlation	.293*	.013	.136	1
	Sig. (2-tailed)	.012	.912	.250	
	N	73	73	73	73

**. Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Figure 4.9 can be considered as an empirical validation of the model proposed by chapter two when taking into account the results of the ANOVA tests and Pearson correlation tests reported by this chapter.

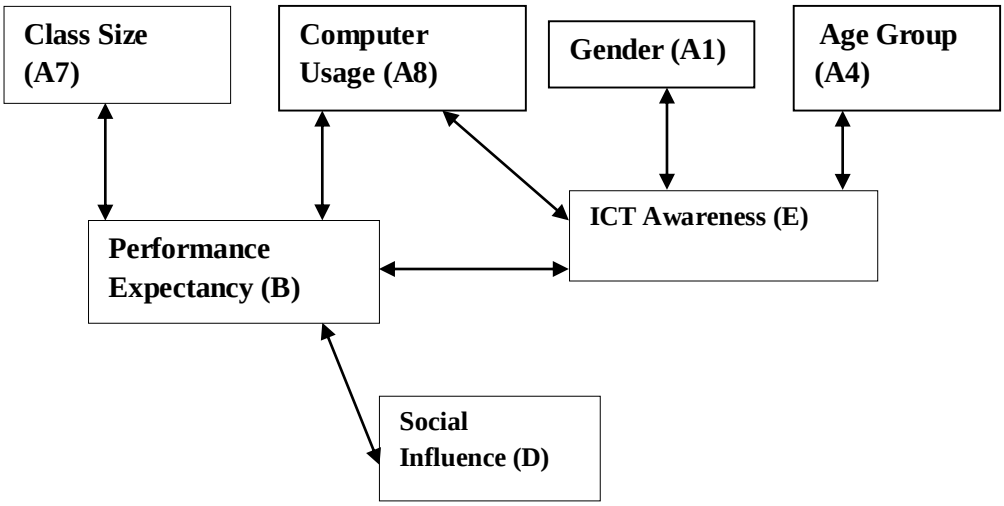

Figure 4.9 Validated Model

4.3.4 Linear Regression Test Results

Table 4.28 and Equation 4.1 present the results of the linear regression test between PE teachers ICT awareness (dependent variable); and their performance expectations from ICTs for PE, and influence applied to them by other people independents variables).

Table 4.28 Linear regression table

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.301	6.964		3.346	.001
	Performance Expectancy	.403	.176	.281	2.290	.025
	Social Influence	.025	.095	.033	.266	.791

a. Dependent Variable: ICT Awareness

$$\text{ICT Awareness} = .403 + .025 + 23.301 \qquad \text{Equation 4.1}$$

4.4 Expansion of the Results

The empirical findings of this research are further explained in this section especially in connection with the dependent variable, ICTs awareness. The first noticeable finding from this empirical survey is that computer attitude does not have a relationship with any of the other constructs of theoretical model of this study. This is not surprising because none of the adoption theories reviewed by this chapter is showing a relationship between computer attitude and the other constructs of this study.

4.5 Conclusion

The descriptive statistics results indicate that the demographics of the respondents of this study are predominantly female teachers mostly from primary urban schools. They were all African, they were all fully qualified, and almost half of them indicated that they were using computers. The age and the teaching experiences of these teachers

were almost equally distributed amongst the different groups. Only a third of the PE teachers indicated that they were in charge of a class of less than 30 learners.

The results of the inferential tests performed among demographic items further revealed that computer usage, gender and age group of PE teachers had a direct relationship with awareness of the ICTs to be used for physical education. The class size and computer usage therefore have a direct relationship with PE teachers performance expectations from the ICT tools that are used for PE.

CHAPTER 5

LITERATURE REVIEW, DISCUSSION, AND CONCLUSION

The purpose of this chapter is to review existing literature on the factors affecting the adoption of e-learning by teachers. This review will then be discussed in comparison with the results of this study on the factors affecting the perceived awareness of PE teachers of the benefits of the use of ICTs in PE. The highlights of this discussion will ultimately lead to the conclusion of this study.

5.1 Existing Studies on E-learning Adoption Factors for Teachers

This section starts with a description of the methodology that was used for the selection of the studies included in this review. These papers are then presented in three dedicated tables.

5.1.1 Review Methodology

This review was conducted during the month of March 2016 with the help of Google Scholar. The search keywords used were: literature review on teachers e-learning adoption factors, literature review on e-learning adoption factors in primary and secondary school teachers, literature review on factors affecting teachers' use of ICTs and literature review on factors affecting primary and secondary school use of ICTs. All freely available papers were included in this review to determine if their variables coincided with those of this research (e.g. Demographics, Performance Expectancy, Computer Attitude, Social Influence and ICTs Awareness). Studies older than 10 years were excluded from this review; the same applied to studies not focusing on teachers.

5.1.2 Review Results

Table 5.1, Table 5.2, Table 5.3 and Table 5.4 contain the details of the results of this literature review. Table 5.1 and Table 5.2 present existing literature on the relationships between teachers' demographics and the Likert Scale variables of this

study, with the literature results being represented by Table 5.1 and their associated studies being identified in Table 5.2. As for Table 5.3, it is dedicated to the presentation of existing literature on the relationships between the Likert Scale variables of this study. Finally, Table 5.4 is a presentation of the context of the papers reviewed by this chapter in terms of their authors, their publication years, their methodologies and their theories.

5.1.2.1 Demographics

According to Table 5.1 and Table 5.2, existing literature seems silent on the relationship between teachers' demographics and ICTs awareness. It is also silent on the relationship between teachers' demographics and social influence in the context of the adoption of e-learning by teachers. The same applies to the examination of the relationship between the following demographic items and the Likert Scale variables of this study: teachers' school types, their number of learners and their ethnicity. However, the relationship between teachers' demographics and performance expectancy and the relationship between teachers' demographics and computer attitude seem to be more represented in the existing literature.

The following relationships seem to appear in many studies from existing literature on the impact of teachers' demographics on their adoption of technology: gender and computer attitude, age group and computer attitude, computer usage and computer attitude, gender and performance expectancy, computer usage and performance expectancy, school location and computer attitude, age group and performance expectancy, grade level and computer attitude, highest level of education and computer attitude, and experience and computer attitude. The relationship between computer usage and computer attitude, gender and performance expectancy, gender and computer attitude, age group and computer attitude deserves more attention because of its prevalence in the existing literature. Therefore, the other relationship will not be commented on here.

Five studies were found from the accessed literature on the relationship between computer usage and computer attitude. It was noted with interest that all these studies concurred on the existence of a significant relationship between computer usage and

computer attitude. As for the examination of the relationship between gender and performance expectancy, from the four studies found from existing literature, three studies did not indicate a significant relationship between gender and performance expectancy. However, out of nine studies that were found from existing literature on the relationship between gender and computer attitude, only two found a significant relationship between gender and computer attitude. It is encouraging to note that out of the six studies identified in the existing literature on the relationship between age group and computer attitude, half found that there is a significant relationship between these two variables.

Table 5.1 Literature results on the relationships between teachers' demographics and the Likert Scale variables

		Performance Expectancy (B)	**Computer Attitude (C)**	**Social Influence (D)**	**ICTs Awareness (E)**
D1	Gender	N,Y,N,N	N,N,Y,N,Y,N,N,N,N		
D2	School Location,		N		
D3	School Type				
D4	Age Group	N	Y,N,Y,N,N,Y		
D5	Grade Level(s)		Y		
D6	Highest Level of Education		N		
D7	Number of Learners				
D8	Computer Usage	Y,N	Y,Y,Y,Y,Y		
DI9	Ethnicity				
D10	Experience (in years)		N		

Table 5.2 Literature studies on the relationships between teachers' demographics and the Likert Scale variables

		Performance Expectancy (B)	**Computer Attitude (C)**	**Social Influence (D)**	**ICTs awareness (E)**
D1	Gender	2,11,25,35	1,2,9,13,19,24,28,29,31		
D2	School Location,		28		
D3	School Type				
D4	Age Group	25	5,9,12,25,28,29		
D5	Grade Level(s)		5		
D6	Highest Level of Education		9		
D7	Number of Learners				
D8	Computer Usage	23,25	5,9,14,23,25		
DI9	Ethnicity				
D10	Experience (in years)		28		

5.1.2.2 Likert Scale Variables

Table 5.3 shows that accessed literature seems to contain more studies on the relationship between computer attitude and performance expectancy and on the relationship between performance expectancy and social influence. In contrast, literature seems silent on the relationship between teachers' awareness of ICTs and their performance expectancy; the same applies to the relationship between teachers' awareness of ICTs and their computer attitude. Three papers were found from the existing literature on the relationship between teachers' attitude towards computers and social influence, and only one paper was found on the relationship between teachers' awareness of ICTs and social influence.

Thirteen studies were found from existing literature on the relationship between performance expectancy and computer attitude, and all these studies corroborate the existence of a significant relationship between performance expectancy and computer attitude. However, out of ten studies that were accessed on the relationship between performance expectancy and social influence, only two studies did not find a significant relationship between gender and computer attitude.

Table 5.3 Literature results on the relationship between Likert Scale variables

		Performance Expectancy (B)	**Computer Attitude (C)**	**Social Influence (D)**	**ICTs Awareness (E)**
B	**Performance Expectancy**		Y,Y,Y,Y,Y,Y,Y,Y,Y,Y,Y,Y	Y,N,Y,Y,Y,Y,N,Y,Y,Y	
C	**Computer Attitude**	3,4,6,7,10,15,16,17,20,27,30,33,34		Y,N,N	
D	**Social Influence**	4,8,16,18,21,22,26,32,33,34	4,26,33		Y
E	**ICTs awareness**			19	

5.1.3 Discussion and Areas for Future Research

This section compares the theories and methodologies of the current study with those of the studies presented by Table 5.4 in order to explain possible similarities or differences between their findings.

5.1.3.1 Demographics

The fact that existing e-learning literature seems silent on the relationship between teachers' demographics and ICTs awareness and on the relationship between teachers' demographics and social influence, clearly points to the need for more research in these areas. The same applies to the relationship between the following demographic items and the Likert Scale variables of this study: teachers' school types, their number of learners and their ethnicity. This therefore also clearly points to the need for more research in these areas. Readers are reminded that the Likert Scale variables of this study are: performance expectancy, social influence, computer attitude and ICTs awareness. The interesting fact is that the current study found a significant relationship between the following variables while existing literature did not find any study between them: teachers' demographics (computer usage, gender, and age group) and ICTs awareness; and a significant relationship between teachers' demographics (class size, and computer usage) and performance expectancy.

Continent. Asia appears to be the continent where most studies on the demographic factors affecting teachers' awareness of the benefits of ICTs are conducted. Out of these sixteen studies, eleven were conducted in Asia, two were conducted in Africa, another two were conducted in North America and only one study was conducted in Europe. This therefore calls for more research from different continents on the factors affecting the awareness of the benefits of ICTs by their teachers. However, the fact that the current study was conducted in Africa increases the number of African studies, even if it is only by one.

Subject Matters. The subjects taught by teachers are not specified by the majority of the studies found on the demographic factors affecting teachers' awareness of the benefits of ICTs. Out of these sixteen studies, twelve do not specify their subject matter. Out of the other four studies where the subject matter is specified, one is on science, one is on English, one is on mathematics and science and the last one is on all subjects. This therefore calls for more research from different subject matters on the factors affecting the awareness of the benefits of ICTs by their teachers. The current study seems to be the first one on physical education.

Teachers Status. There are two types of teachers that are used as subjects by existing studies on the demographic factors affecting teachers' awareness of the benefits of ICTs: pre-service teachers and fully qualified teachers. Out of these sixteen studies, eight are using pre-service teachers and the other eight are using fully qualified teachers. The current study used fully qualified teachers.

Theories. The majority of studies on the factors affecting teachers' awareness of the benefits of ICTs are not specifying their underlining theories. Out of these sixteen studies, twelve are not specifying underlining theories and the other four studies use TAM. The current study uses TAM. This therefore calls for more research from different theories on the factors affecting teachers' awareness of the benefits of ICTs.

5.1.3.2 Likert Scale

The fact that existing e-learning literature seems silent on the relationship between performance expectancy and teacher's awareness of ICTs, clearly points to the need for more research in these areas. The same applies to relationship between computer attitude and teacher's awareness of ICTs. It is also interesting to note that the current study found a significant relationship between performance expectancy and teacher's awareness of ICTs the variables mentioned in this paragraph. Another point worth bringing to the fore is the fact that the current study found a significant relationship between the following variables while existing literature did not find any significant relationship between them: performance expectancy and teacher's awareness of ICTs and a significant relationship between performance expectancy and social influence.

Continent. Most studies found on the non-demographic factors affecting teachers' awareness of the benefits of ICTs were conducted in Asia. In fact, out of these twenty studies, sixteen were conducted in Asia, three were conducted in Europe and only one study was conducted in Africa. This therefore calls for a more balanced research to cover different continents on the factors affecting the awareness of the benefits of ICTs by their teachers. However, the fact that the current study was conducted in Africa increases the number of African studies, even if it is only by one.

Subject Matter. The subjects taught by teachers are not specified by the majority of the studies found on the non-demographic factors affecting teachers' awareness of the benefits of ICTs. This is the case for nineteen studies out of the twenty studies found. The other study uses mathematics and science teachers. This therefore calls for more research from different subject matters on the factors affecting the teachers' awareness of the benefits of ICTs. The current study seems to be the first one on physical education.

Teachers Status. Out of twenty studies found on the non-demographic factors affecting teachers' awareness of the benefits of ICTs, thirteen used pre-service teachers and the remaining seven used fully qualified teachers. The current study uses fully qualified teachers.

Theories. The majority of accessed studies on the non-demographic factors affecting teachers' awareness of the benefit of ICTs specified their underlining theories. In fact, only one study did not specify its underlining theory. Out of the other nineteen theories, sixteen indicated having used TAM, one used TAM2, one used TAM and TBP and the last one used TAM, TPB and UTAUT. The current study uses TAM.

Table 5.4 Context of Existing Studies

		Methodology			
Paper Number	**Author and Year**	**Country**	**Subject/s**	**Teachers status**	**Theory/s**
1	Buabeng-Andoh (2012)	Ghana	Not specified	Teachers	Not specified
2	Toe et al. (2015)	South East Asian country	Not specified	Pre-service	TAM
3	Wong and Toe (2009)	Singapore and Malaysia	Not specified	Pre-service	TAM
4	Toe et al. (2008)	Singapore	Not specified	Pre-service	TAM
5	Lau and Sim (2008)	Malaysia	Mathematics and Science	Teachers	Not specified
6	Toe and Noyes (2011)	Singapore	Not specified	Pre-service	TAM
7	Wong *et al.* (2012)	Malaysia	Not specified	Pre-service	TAM
8	Bourgonjon et al. (2013)	Belgium	Not specified	Teachers	TAM

9	Goktas (2012)	Turkey	Not specified	Pre-service	Not specified
10	Tella *et al.* (2007)	Nigeria	Not specified	Teachers	TAM
11	Chinyamurindi and Shava (2015)	South Africa	Not specified	Pre-service	TAM
12	Afshari *et al.* (2009)	Malaysia	Not specified	Teachers	Not specified
13	Wong and Hanafi (2007)	Malaysia	Not specified	Pre-service	Not specified
14	Gibbone *et al*. (2010)	US	Not specified	Teachers	Not specified
15	Toe *et al.* (2008)	Singapore and Malaysia	Not specified	Pre-service	TAM
16	Toe(2010)	Singapore	Not specified	Pre-service	TAM
17	Moses *et al*. (2013)	Malaysia	Science and Mathematics	Teachers	TAM
18	De Smet *et al*. (2012)	Belgium	Various subjects	Teachers	TAM2
19	Papanastasiou and Angeli (2008)	Greek	Not specified	Teachers	Not specified
20	Toe (2008)	Singapore	Not specified	Pre-service	TAM
21	Hu *et al*. (2003)	Hong Kong	Not specified	Teachers	TAM
22	Toe (2011)	Singapore	Not specified	Teachers	TAM, TPB, UTAUT
23	Kumar *et al*. (2008)	Malaysia	All subjects	Teachers	TAM
24	Kay (2006)	Canada	Not Specified	Pre-service teachers	Not specified
25	Toe (2009)	Singapore	Not specified	Pre-service	Not specified
26	Toe and van Schaik (2009)	Singapore	Not specified	Pre-service	TAM
27	Luan and Toe (2008)	Malaysia	Not specified	Pre-service	TAM
28	Albirini (2006)	Syria	English	Teachers	Not specified
29	Cavas *et al.* (2009)	Turkey	Science	Teachers	Not specified
30	Luan and Toe (2009)	Malaysia	Not specified	Pre-service	TAM
31	Tezci (2011)	Turkey	Not specified	Pre-service	Not specified
32	Yuen and Ma (2008)	Hong Kong	Not specified	Pre-service teachers	TAM
33	Toe (2012)	Singapore	Not specified	Pre-service	TAM and TPB

34	Toe (2010)	Singapore	Not specified	Pre-service	TAM
35	Yuen and Ma (2002)	Hong Kong	Not specified	Pre-service	TAM

5.1.3.3 Comparisons with current study

This section presents the similarities in findings, differences in findings, similarities in methodologies and differences in methodologies between the studies of the existing literature and the findings of the current study.

Similarities in Findings. The findings from existing literature on the relationship between performance expectancy and social influence are similar with those of the current study. This is so in the sense that most of the studies from existing literature likewise found a significant relationship between these variables.

Differences in Finding. The findings from existing literature differ from the findings of the current study on the relationships between the following variables: gender and computer attitude, computer usage and computer attitude, age group and computer attitude, gender and performance expectancy and computer attitude and performance expectancy. While the accessed studies indicated a significant relationship between these variables, the current study did not.

Similarities in methodologies. There are methodological similarities between the existing literature and the current study on the following relationships: computer usage and computer attitude and age group and computer attitude. The reason behind this similarity can be found in that most studies from existing literature used qualified teachers and the current study also used qualified teachers. There are also methodological similarities between the existing literature and the current study on the following relationship: gender and performance expectancy and computer attitude and performance expectancy. This is due to that most studies from existing literature and the current study used TAM.

Differences in methodologies. Even though the similarities in methodologies were found on the above mentioned relationships, some of the above mentioned relationships also have differences in methodologies. The methodological differences

between the existing literature and the current study were on the following relationships: gender and computer attitude, computer usage and computer attitude, age group and computer attitude, gender and performance expectancy and computer attitude and performance expectancy. This difference can be attributed to the fact that while most of the studies from existing literature were conducted in Asia and they used pre-service teachers, however, the current study was conducted in Africa and among qualified teachers.

5.2 Conclusion

Out of the thirty-five studies found from accessed existing literature on the relationships between the factors affecting the adoption of e-learning by teachers, only six relationships are worth mentioning in this conclusion. There are just too few studies on the other relationships. These six relationships are: computer usage and computer attitude, gender and computer attitude, age group and computer attitude, performance expectancy and computer attitude and performance expectancy and social influence. It is interesting to note that none of these six relationships has more than fifteen studies found from existing literature. This clearly shows that existing literature does not seem to contain too many studies on the factors affecting teachers' awareness of ICTs. This suggests that the current study is adding value to the existing literature on the factors affecting teachers' awareness of ICTs. This is more so because most of the studies found from existing literature on the factors affecting teachers' awareness of ICTs were conducted in Asia and they did not specify their subject matter, as opposed to the current study that was conducted in Africa on physical education teachers. As for the actual results of the current study, it is not worth comparing them with those from existing literature mainly because of the small size of the accessed literature. This therefore calls for more research on the factors affecting teachers' awareness of the benefits of ICTs.

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Appendix

QUESTIONNAIRE ON THE FRAMEWORK OF THE FACTORS AFFECTING THE ADOPTION OF ICTs FOR PHYSICAL EDUCATION

Dear participant,

This questionnaire will only be used for research purposes and information provided by you will always remain anonymous. Please tick the box that best describes your answer for each item.

Thank you

A. Demographics

A1.	Gender	Male	☐	Female	☐				
A2.	School Location	Urban	☐	Rural	☐				
A3.	School Type	Primary School	Senior Secondary School		Combined School				
		☐	☐		☐				
A4.	Age Group	Less than 30	30 - 40		41 - 50	Above 50			
		☐	☐		☐	☐			
A5.	Grade Level(s) Coaching	R – 3	4 - 6		7 - 9	10 -12			
		☐	☐		☐	☐			
A6.	Highest Level of Education	Diploma	Bachelors		Honours	Masters			
		☐	☐		☐	☐			
A7.	Number of Learners Coaching	Less 10	10 - 19		20 - 29	Above 29			
		☐	☐		☐	☐			
A8.	Computer Usage	None	Daily		Weekly	Monthly			
		☐	☐		☐	☐			
A9.	Ethnicity	African	Indian		Coloured	White	Others		
		☐	☐		☐	☐	☐		
A10.	PE Experience (in years)	0 – 5	6 - 10		11 - 15	16 - 20	Above 20		
		☐	☐		☐	☐	☐		

B. Performance Expectancy My expectations from available ICTs tools for physical education are to help my learners:		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
B1.	Perform well in fitness programmes such as aerobics, running, push-ups, etc.					
B2	Successfully participate in individual or team sports such as athletics, cricket, soccer, etc.					
B3.	Successfully execute a game plan for individual or team sports such as soccer and golf.					
B4.	Follow safety rules such as applying basic first-aid, warming up, and wearing adequate kit.					
B5.	Successfully participate in community or indigenous games that include the concept of invasion.					
B6.	Successfully perform sequences of physical activities such as rotation, balance, elevation, etc.					
B7.	Successfully participate in outdoor recreations such as dancing, gymnastics, self-defense, etc.					
B8.	Successfully participate in programmes that improve movement techniques.					
B9.	Understand the connection between physical education and other subjects.					
B10.	Anticipate the physiological aspects of physical education					

C. Attitude towards computers The following statements are true reflection of my attitude towards computers:		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
C1.	Working with computers is not that important to me for my career.					
C2.	Using computers prevents me from being creative.					
C3.	Working with computers makes me feel isolated from other people.					
C4.	I feel helpless when asked to perform a task on the computer.					
C5.	Computers bore me.					
C6.	Computers are confusing.					
C7.	Computer people talk a strange and technical language.					
C8.	Computers are not for everybody but only for computer 'savvy' people.					
C9.	I wouldn't like to spend too much time using computers.					
C10.	I do not wish to learn more about computers.					

D. Social Influence The following statements are true reflection on the influence applied to me by others on the use of ICTs:		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
D1	People who influence my behaviour think that l should use ICTs for physical education.					
D2	People who are important to me think that l should use ICTs for physical education.					
D3	A high proportion of my colleagues use ICTs for physical education.					
D4	My Principal and Deputy Principal have been helpful in the use of ICTs for physical education.					
D5	My Head of Department is very supportive of the use of ICTs for physical education.					
D6	In general, the school has supported the use of ICTs for physical education.					
D7	People who use ICTs for PE in my school have more prestige than those who do not.					
D8	People who use ICTs for physical education in my school have a high profile.					
D9	Owning an ICT system for physical education is a status symbol in my school.					
D10	My students want me to use ICTs for physical education.					

E. ICTs Awareness I am aware of the **benefits** of using the following ICTs for the **teaching of physical education**.		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
E1.	Word Processors (e.g. Word)					
E2.	Presentation Software (e.g. PowerPoint)					
E3.	Computer Aided Instruction Software (e.g. Blackboard)					
E4.	Search Engines (google, yahoo etc.)					
E5.	Electronic Mails (Gmail, webmail, outlook etc.)					
E6.	Electronic Encyclopaedia and/or Atlas					
E7.	Instructional Films (CDs, DVDs, VCDs etc.)					
E8.	Overhead Projectors					
E9.	Chat rooms and/ Forums (Facebook, Twitter etc.)					
E10.	Electronic Boards					