PERCEIVED ACCEPTANCE AND INTENTION TO USE EXERGAMES AS A TEACHING AID AMONG PHYSICAL EDUCATION PRE-SERVICE TEACHERS

GEMMA NDATOROMBA INNOCENCIA USIKU

SULTAN IDRIS EDUCATION UNIVERSITY

2022

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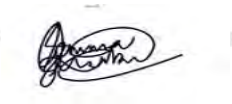

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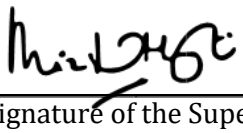

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ABSTRACT

This study aimed to determine the levels of perceived acceptance and intention to use *exergames* as a teaching aid among pre-service physical education teachers. This study was based on a quantitative approach involving an online survey method. The conceptual framework of this study was based on the Technology Acceptance Model (TAM) involving *perceived compatibility* as an additional variable. The study sample consisted of 103 Physical Education students, comprising 53 males and 50 females, of Sultan Idris Education University, who were selected through purposive sampling. Ordinal Logistic Regression, Spearman Rank Correlation, and Chi Square Goodness-of-Fit were used to analyse the data using SPSS version 23.0. The findings of the analysis showed there were significant relationships between intention to use and the independent variables, namely perceived usefulness, perceived ease of use, and perceived compatibility. In conclusion, the intention to use *exergames* among the respondents had significant correlations with perceived usefulness, perceived ease of use, and perceived compatibility of the application. As such, these findings have an implication in that pre-service physical education teachers who perceive *exergames* as a useful, easy to use, and compatible teaching aid will have a strong intention to use it in their teaching practices.

PERSEPSI PENERIMAAN DAN NIAT PENGGUNAAN *EXERGAMES* SEBAGAI ALAT BANTU MENGAJAR DALAM KALANGAN GURU PENDIDIKAN JASMANI PRA-PERKHIDMATAN

ABSTRAK

Kajian ini bertujuan untuk menentukan tahap penerimaan dan niat penggunaan *exergames* sebagai alat bantu mengajar dalam kalangan guru pendidikan jasmani pra-perkhidmatan. Kajian ini berdasarkan pendekatan kuantitatif yang melibatkan kaedah tinjauan atas talian. Rangka kerja konsep kajian adalah berdasarkan Model Penerimaan Teknologi (TAM) yang melibatkan persepsi keserasian sebagai pemboleh ubah tambahan. Sampel kajian melibatkan 103 orang pelajar pendidikan jasmani Universiti Pendidikan Sultan Idris yang terdiri daripada 53 pelajar lelaki dan 50 pelajar perempuan. *Ordinal Logistic Regression*, *Spearman Rank Correlation*, and *Chi Square Goodness-of-Fit* digunakan untuk menganalisis data kajian dengan perisian SPSS versi 23.0. Dapatan analisis menunjukkan terdapat hubungan yang signifikan antara niat penggunaan dan pemboleh ubah-pemboleh ubah tidak bersandar, iaitu persepsi kebergunaan, persepsi kemudahgunaan, dan persepsi keserasian. Kesimpulannya, niat penggunaan *exergames* dalam kalangan responden mempunyai hubungan yang signifikan dengan persepsi kebergunaan, kemudahgunaan, dan keserasian aplikasi berkenaan. Dapatan kajian ini mempunyai implikasi di mana para guru pendidikan jasmani pra-perkhidmatan yang menganggap *exergames* sebagai alat bantu mengajar yang berguna, mudah digunakan, dan serasi akan mempunyai niat yang tinggi untuk menggunakannya dalam amalan pengajaran mereka.

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LIST OF ABBREVIATIONS

DDR	Dance Dance Revolution
ITU	Intention to Use
NCDs	Non-communicable Diseases
PA	Physical Activity
PC	Perceived Compatibility
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UPSI	Universiti Pendidikan Sultan Idris
VLE	Virtual Learning Environments
WHO	World Health Organisation

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CHAPTER 1

INTRODUCTION

1.1 Overview of the Study

The concern for the physical inactivity of the youth today in many parts of the world continues to increase (Andrade et al., 2020; Ramírez-Granizo et al., 2020; Rudolf et al., 2020). This is partly, due to the amount of time spent engaging in sedentary lifestyle habits such as increased screen time on smartphones and especially playing sedentary video games which have increased even more compared to the past (Benzing & Schmidt, 2018; Best, 2014; Kari, 2017; Lozano-Sánchez et al., 2018).

According to the WHO, one of the major problems faced by adolescents is the lack of daily exercise. Due to this problem, creating supportive environments and opportunities that help increase the physical activity among youth has been a major demand. In addition, WHO, (2018) has suggested at least one hour of moderate to high intensity daily exercise in the form of games, play, sports or physical education (PE) among youth. Furthermore, in the WHO's report, it was mentioned that only one in five adolescents are estimated to meet these routines, while one in four adults is categorized as having not enough activity for their daily exercise.

In addition, the WHO and member states aim to achieve at least "a 10% relative reduction in the prevalence of insufficient physical activity by 2025"(*Global Action Plan on Physical Activity 2018-2030:More Active People for a Healthier World.*, 2018, p. 13, para.1) and "15% relative reduction in the prevalence of insufficient physical activity" by the year 2030 (*Global Action Plan on Physical Activity 2018-2030:More Active People for a Healthier World.*, 2018, p. 46, para. 1). There are nine global targets to improve the prevention and treatment of non-communicable diseases (NCDs) and physical inactivity (insufficient physical activity) which is one of the leading risk factors for NCDs and death worldwide (*Global Action Plan on Physical Activity 2018-2030:More Active People for a Healthier World.*, 2018, p. 21, para.1). According to the website of the World Health Organisation , as quoted:

> To individuals, the failure to enjoy adequate levels of physical activity increases the risk of cancer, heart disease, stroke, and diabetes by 20-30% and shortens lifespan by 3-5 years. Moreover, physical inactivity burdens society

through the hidden and growing cost of medical care and loss of productivity. (World Health Organisation, n.d, Physical activity in South-East Asia section, para. 2)

Numerous studies associate sedentary video games with the increased habits of screen time which may be one of the factors that contribute to the physical inactivity of young people and increase in sedentary lifestyles (Benzing, 2020; Rudolf et al., 2020; Wärnberg et al., 2021). However, there are video games known as active video games or exergames that have been included in a number of research studies. Additionally, research studies are increasingly also concerned about whether exergames can address this issue and whether they have the potential ability to change the reputation of video games from the causes of sedentary habits and lifestyles to becoming the remedy for increasing physical inactivity and promoting active lifestyles through active gaming experiences (Andrade et al., 2020; Benzing & Schmidt, 2018; Williams & Ayres, 2020).

Some studies have suggested that the potential use of exergames going "beyond the textbook" in specifically physical education. The youth spend a considerable amount of time at school and therefore this provides an opportunity for the physical education taking place at school to assist in increasing the desired amount of physical activity needed for psychological and physical health (Andrade et al., 2020).

Although digital games usage has been emerging in the field of education (Dele-Ajayi et al., 2017; Dele-Ajayi et al., 2019) the use of gamification to enhance the learning experience is still limited within curriculum development, planning or proposals in physical education.

The perspectives of the user, which in this study, are physical education pre-service teachers should not be overlooked as they may highlight the barriers to successfully integrate technology in teaching and learning activities. A study by Almusawi, Durugbo, and Bugawa (2021) aimed to address the major research gap which may have been constituted by the tendency to frequently discount the perspectives of physical education teachers on the technology integration of wearable technologies such as fitness trackers and smart watches (Almusawi et al., 2021). Another study mentions the scarcity of active video games research in curriculum planning, proposals including tackling mental health issues has been mentioned in some studies (Ennis, 2013).

This study investigated the perceived acceptance and intention to use exergames as a teaching aid among physical education pre-service teachers. In this chapter, the background of the study, statements of problems, research objectives, research questions, significance of the study, importance of the study, study limitation as well as operational definitions are discussed followed by a summary of the study.

1.2 Background of the Study

The introduction of exergames also referred to as active video games had humble beginnings since the 1980s. However it was only in the late 1990s with *Dance Dance Revolution* (DDR) ,developed by Konami, becoming popular that exergames made history (Behrenshausen, 2007; Best, 2014). Later evolving into high tech movement tracking technology such as Microsoft Kinect played with the Xbox 360 released in 2010 (Behrenshausen,2007; Best, 2014; Finco & Maass, 2014; Hashim, Kamaruddin, & Jantan, 2019).

Figure 1.1. Dance Dance Revolution. Adapted from Dance Dance Revolution, 2022

According to Finco and Maass (2014), exergames are a specific group of video games that are known to embrace exercise, physical movement or physical exercise within the gaming experience. Furthermore, some exergames make use of advanced technology systems that capture the motion of the user whilst engaging in gameplay activities, of which may range from dancing, skipping, hitting, kicking, running, or any movements associated with sports (Finco & Maass, 2014). Therefore, in practice the act of playing exergames is engaging in a playful workout, of which the intensity may vary depending on factors such as the specific activity, sport or movement during the interaction between user and the technology utilized in the gaming experience (Finco & Maass, 2014; Mansart, Sukitphittayanon, Pantongkhum, & Thaicharoen, 2016).

In the 2019 Horizon Report, Alexander et al., (2019), reported that, digital gaming interest had been developing in the education sector as a tool for learning and academic research for decades. However, from the year 2015 , interest in gaming and gamification in the education industry had been on the decline (Alexander et al., 2019). The reasons mentioned by Alexander et al., (2019) include the 2008 financial situation that resulted in " budget cuts across much of American higher education" , "anxiety over tuition" and "reduced enrolment maintained pressure on campus budgets" (p.38, para.2). Furthermore, Alexander et al. (2019), stated that gaming for educational purposes is generally considered "a very unproven, and experimental technology for learning" when compared to the other more demanding educational requirements that need to be fulfilled. In addition, Alexander et al. (2019) explains that commercial video gaming supports millions of users, however, in contrast, "educational gaming has always been aimed at very small populations" (p.38 para.3).

It is noted that there is a major lack of research studies that focus on digital gaming within the education sector, which may indicate that digital games are not utilised despite positive attitudes of teachers towards digital games Noraddin E.M. and Tse Kian N. (2015). Digital games are generally known to lead to a sedentary lifestyle by increasing screen time (Kohorst et al., 2018). However, this perception may have changed since the introduction of digital video games such as the famously known Dance Dance Revolution which is known to be the pioneering exergames, first introduced to the consumer market in the late 1990s (Thin et al., 2013).

Playing games is one of the physical activities mentioned that could potentially assist in combating the lack of physical activity among the youth. Furthermore, the WHO (2018) report mentions that "globally only 1 in 5 adolescents are estimated to meet these guidelines" and that "1 in 4 adults is not active enough". Therefore, World Health Organisation (2018) insists on the construction of encouraging environments and opportunities to increase the physical activity of the youth, with the endorsement of at least 60 minutes of moderate to high intensity daily exercise in the form of games, play, sports and physical education.

Digital games are known for increasing sedentary lifestyle through increasing screen time, however, with the introduction of active video games instead of sedentary video games, video games could therefore then also be associated with physical activity. In addition, the intention to use exergames as tools for motivating physical activity or as aids for teaching or learning activities.

Exergames have been a focus of study as a tool in physical education. The intention to use digital video exergames to gamify the classroom has been a focus of research recently. In fact a few studies focus primarily on the effectiveness of exergaming on teaching and learning activities (Pedersen, Cooley, & Cruickshank, 2017; Staiano & Calvert, 2011) and neglect to study the intention to use exergames.

1.3 Statement of Problems

The World Health Organisation had been in the process of planning to make use of digital solutions to encourage more physical activity as stated on the official WHO website (World Health Organisation., n.d, Digital solutions for promoting physical activity section, para. 1). Recently, WHO have stated on the official WHO website that the use of mobile and wireless technologies for instance mobile phones and wearable devices, have the capability of being accessible to millions of people, these digital solutions offer the possibility of delivering easily accessible solutions that may improve physical activity and discourage sedentary activities (World Health Organisation., n.d, Digital solutions for promoting physical activity section, para. 1). Additionally, WHO has declared that they aspire to collaborate with partners in the scientific community and industry, in order to understand the capabilities and measure the possible scale and influence of digital solutions, for instance, the intention of helping people become more active at any age (World Health Organisation., n.d, Digital solutions for promoting physical activity section, para. 1).

For instance, the Be He@lthy and Be Mobile (BHBM) are both initiatives of the WHO and the International Telecommunication Union (ITU), and at the time of the writing this study, WHO had been in the process of creating a program known as mActive which is described as a "4- week mobile phone-based walking programme"(World Health Organisation., n.d, Digital solutions for promoting physical activity section, para. 2). Moreover, the World Health Organisation had also mentioned a collaboration with Google Fit (World Health Organisation., n.d, Digital solutions for promoting physical activity section, para. 2). The aim is to provide guidance on health including digital solutions that may assist people in keeping track of the level of physical activity on a weekly basis in addition, motivating people to move more by sharing reasons why this is necessary for good health.

A recent study suggested that a contributing factor to Malaysians being physically inactive may be generally a lack of motivation towards physical activity as a leisure activity (Lian et al., 2016). Furthermore, it had been concluded that future studies needed to find ways to observe the underlying reasons behind the negative attitudes of Malaysians towards physical activity and include solutions on making physical activity motivating enough for participation, especially by those who have the time and resources to do so (Lian et al., 2016). Several researchers agree upon the prevalent problem of the increase in sedentary lifestyles (Kari, 2017; Sullivan & Lachman, 2017; Williams & Ayres, 2020), in particular, Kari (2017) who had mentioned that there is a need to discover novel methods that encourage people to participate further in physical movement or exercise in order to solve the ongoing problem of increase in sedentary way of life currently occurring in society.

Digital games are known for increasing sedentary lifestyle through increasing screen time, however with the introduction of exergames, physical activity may be practiced through the use of exergames (Hashim et al., 2019). The usage of educational digital games have been on the rise in education (Dele-Ajayi, Strachan, Sanderson, & Pickard, 2017) and used as a medium for introducing 'play' and 'challenge' that increase engagement and motivation among students that show signs of disengagement. However, Dele-Ajayi et al. (2017) states that the successful introduction of digital games are threatened by the obstacles that may prevent readiness and acceptance in the classroom. The Technology Acceptance Model (TAM) is widely used in education for studying such obstacles (Athar Imtiaz & Maarop, 2014).

Acceptance is vital to the integration of technology in any field. Previous researchers have highlighted the importance of acceptance testing of digital games in the field of education such as Dele-Ajayi et al., (2017), who have stated that "To support the introduction of digital games in a classroom environment, it is important to understand the barriers to adoption" (Dele-Ajayi et al., 2017, p.961).

The Technology Acceptance Model sets out to investigate the reasons users reject or accept technology. The knowledge gained through this study could be a significant contribution to understanding the acceptance of exergames among pre-service teachers of physical education.

In education there is a major gap for the investigation of the inclusion of exergames in the curriculum (Vaghetti et al., 2018). Several researchers such as Vaghetti, et al. (2018) have highlighted the lack of investigation into exergame integration in the physical education curriculum in comparison to health and recreational sectors. Therefore, this could imply that there is lack of exergame usage in education in general. Also, that exergames are generally not being considered as games for the physical education curriculum. The study of the acceptance of digital games in education is very important as the aim for the future is for successful technology integration of digital games for teaching and learning purposes.

1.4 Research Aim

The main aim of this study had been to investigate the intention in using exergames among physical education pre-service teachers using extended technology acceptance model.

However, this study does not aim to promote digital games in the Education sector, instead it attempts to provide knowledge assisting in the “analytical understanding of the decision making process” that pre-service teachers undertake (Bourgonjon et al., 2013). Furthermore, as stated by Bourgonjon et al. (2013) to “understand, explain and predict changes in behavior” as it pertains to adopting technological tools.

This can be further explained as the intention to use exergames for teaching practice in future lessons, therefore actual usage is not considered within the context of this study.

1.5 Research Objectives

The following had been the research objectives for the study:

1. To determine whether there is a relationship between the perceived usefulness and intention to use exergames among physical education pre-service teachers.
2. To determine whether there is a relationship between the perceived ease of use and intention to use exergames among physical education teachers.
3. To determine whether there is a relationship between the perceived compatibility and intention to use exergames among physical education pre-service teachers.

1.6 Research Questions

The study examined three research questions, as follows:

1. Is there a relationship between the perceived usefulness and intention to use exergames among physical education pre-service teachers?
2. Is there a relationship between the perceived ease of use and intention to use exergames among physical education pre-service teachers?
3. Is there a relationship between the perceived compatibility and intention to use exergames among physical education pre-service teachers?

1.7 Research Hypotheses

This section of the study presents three null hypothesis each followed by its alternative:

Hypothesis 1:

> **H_{01}**: There is no significant relationship between the perceived usefulness and intention to use exergames among physical education pre-service teachers.

Hypothesis 2:

H_{02}: There is no significant relationship between perceived ease of use and intention to use exergames among physical education pre-service teachers.

Hypothesis 3:

H_{03}: There is no significant relationship between perceived compatibility and intention to use exergames among physical education pre-service teachers.

1.8 Significance of Study

To begin with, it is important to include technology in the learning context, as this has been a growing practice and need in education (Reategui et al., 2016). Furthermore, it is motivated by the aim of creating meaningful learning experiences for students that involves deeper engagement and activity in the learning process. In addition, digital games are a reality of daily life for modern students today known as 'digital natives' (Prensky, 2001). Finally, several studies highlight the positive aspects of integrating technology through findings (Nyberg & Meckbach, 2017; Reategui et al., 2016).

The importance of studying the acceptance of video games such as exergames by tertiary students. Firstly, the underestimated impact of students' role during the

technology adoption process and secondly a term stated by Prensky (2001), (as cited in Bourgonjon, Valcke, Soetaert, & Schellens, 2009) that students are referred to as 'digital natives' , that is, they grew up with the existence of technology around them and are accustomed to it (Bourgonjon, Valcke, Soetaert, & Schellens, 2009).

It is therefore important for the education sector to take notice of this known fact as this may be intrinsically motivating for 'digital native' students as demonstrated by Lepper and Malone (1987) and Malone (1980). The current literature highlights the importance of assimilating technological interventions such as exergames in the curriculum (Yuksel, 2019; Vaghetti et al., 2018; Lindberg, Seo, & Laine, 2016). This study intends to investigate the intention to use exergames among preservice teachers for future lessons.

1.9 Research Framework

The research framework had been based on the Technology Acceptance Model (TAM) included one dependent variable and three independent variables as shown, Figure 1.1 represented the framework for this research study. The TAM model included variables such as perceived usefulness (PU), perceived ease of use (PEOU), perceived compatibility (PC) and intention to use (ITU), and only one variable, namely, perceived compatibility had been added to extend the theoretical model.

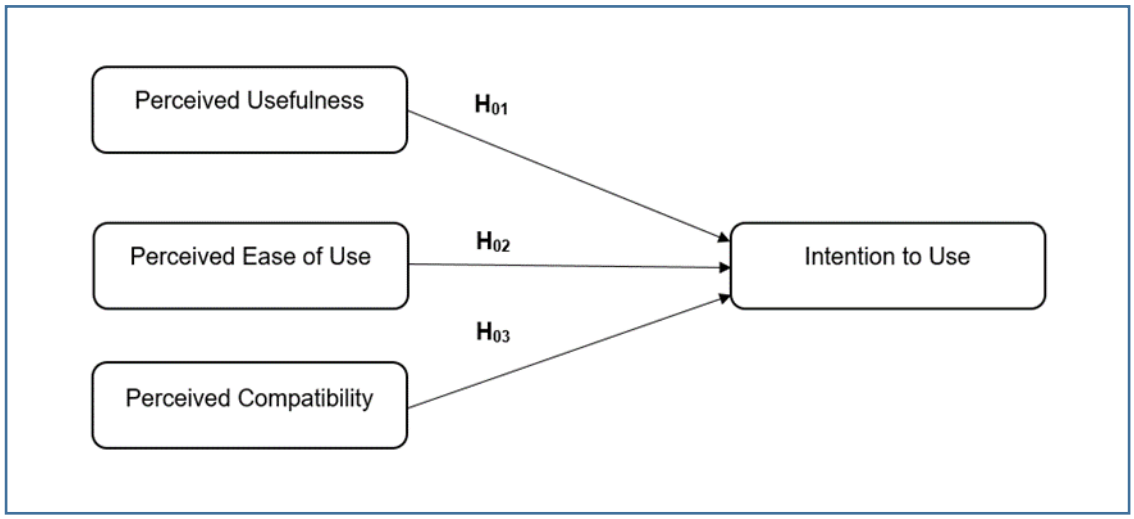

Figure 1.2. Research Framework

The construct of perceived compatibility (PC) is from the innovation diffusion theory (IDT) (Rogers, 1962). It is defined as "the extent to which an innovation is consistent with the potential adopter's existing values, previous experiences and needs"(Prieto et al., 2015). Previous studies have used this construct to establish a research model (Teo et al., 2019; Prieto et al., 2015; Mamat, Yusoff, Abdullah, & Razak, 2015).

perceived usefulness (PU) and items had been adapted from a previous study by Teo et al., (2019) and Prieto et al., (2015):

- The use of exergames can enhance my teaching performance (PU01);
- The use of exergames can make me more effective at my teaching practice (PU02);
- The use of exergames can increase my productivity in my teaching (PU03); and
- Generally, I consider that exergames can be useful in education (PU04).

perceived ease of use (PEOU) and items had been adapted from a previous study by Prieto et al. (2016) and Davis (1989):

- Learning to use exergames in the classroom would be easy for me (PEOU01);
- I think it would be easy for me to interact with exergames (PEOU02);
- I believe that interacting with exergames is flexible (PEOU03); and
- Generally, I consider that exergames are easy to use (PEOU04).

perceived compatibility (PC) and its items were adapted from previous studies (Prieto et al., 2015; Moore, & Benbasat, 1991) and shall consist of the following three items:

- Using exergames to teach would be compatible with my teaching style (PC01);
- Using exergames to teach would be coherent with my way of thinking (PC02);
- Using exergames to teach would fit with my lifestyle (PC03); and
- I think that using an exergame fits well with the way I like to teach (PC04).

intention to use (ITU) had consisted of the following two items adapted from Prieto et al. (2015) and Davis (1989) :

- I intend to use exergames in my future teaching (ITU01);
- I predict that I will use exergames in my future teaching (ITU02);
- I would recommend the use of exergames to my future colleagues (ITU03); and
- I will talk about the positive aspects of using exergames in my future classroom (ITU04).

1.10 Limitation of the Study

Limited resources such as time, specifically time taken in obtaining permission to conduct the study on the target population. This motivated the researcher to select UPSI as the main educational institution for conducting this study, due to convenient access to the target population for the researcher at one of the most respected educational institutes for teachers' education in Malaysia. The study had been further limited to the Faculty of Sports Science and Coaching which was the only faculty at UPSI offering a program specialising in physical education at the bachelor level. Furthermore, the study focused on the Physical Education pre-service teachers enrolled in the Bachelor of Education (Physical Education) with Honours program at the Faculty of Sports Science and Coaching.

The study investigated the intention to use and not the actual usage of exergames. The results of the study were presumed to be useful to stakeholders of Sultan Idris Education University, however due to the study being limited to one University it therefore could not be easily generalized for Malaysia as a whole.

For the purpose of this study, the Just Dance Now mobile application shall be the chosen digital game as shown in Figure 1.3.

Figure 1. 3. Just Dance Now by Ubisoft. Adapted from James, 2014

1.11 Operational Definitions

In this section the operational definition of terms used within the study are defined. All definitions have been modified for the purpose and within the context of the study.

a) Pre-Service Teachers

Pre-service teachers are students in training to become secondary school teachers. These students are either diploma students or undergraduate students and for the purpose of this study students enrolled at Sultan Idris Education University are being considered.

b) Perceived Usefulness

Perceived usefulness, in this study is described as the degree to which a user believes the technology will enhance his/her performance, as defined by Venkatesh & Davis, (2000).

c) Perceived Ease of Use

Perceived ease of use, in this study is described as the extent to which the user believes that using the technology will require little effort, as defined by Venkatesh & Davis,

d) Attitude

Attitude in this study is described as the positive or negative feelings of a user related to performing a specific task (Venkatesh & Davis, 2000).

e) Perceived Compatibility

Perceived compatibility, in this study is defined as “the extent to which an innovation is consistent with the potential adopter's existing values, previous experiences and needs” (Prieto et al., 2015).

f) Intention to Use

Intention is defined as “the subjective probability that an individual will perform a specified behaviour” and may also indicate “how much effort an individual would

commit to performing a behaviour" (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). It is within the context of this study that the Intention to use exergames can be defined as the degree to which the user would like to use exergames in the future(Joo et al., 2018).

1.12 Summary

This section of the study highlighted the background of the research, statement of problems, the research aim, research objectives, research questions, research hypotheses, significance of the study, research framework, and the limitation of the study and finally the operational definition of terms had been discussed. The study had aimed to provide knowledge that allowed for the analysis of the process undertaken by pre-service teachers of physical education when expressing the intent to use exergames or not. This study had not aimed to promote digital games in general nor exergames in particular within the Education sector. It had only been the intent to use the exergames that had been taken into consideration and not the actual usage, further a specific group with specific characteristics had been selected for the purpose of this study. Finally, although the findings may not be easily generalized to larger populations, UPSI stakeholders may use the information obtained, to understand the current status of the intent to use exergames or more generally digital game-based learning, as it is related to the integration of commercial or educational digital games, for educational purposes.