Behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia toward using mobile computer devices in their learning

by

Naif Nasser Alnehari

B.S., King Saud University, 2012
M.S., Emporia State University, 2020

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Curriculum and Instruction
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Abstract

The Kingdom of Saudi Arabia is making crucial progress and development in all fields, including education, as it develops higher education to compete globally. Among these strategies is the effective integration of technology into the educational environment, a key goal of Vision 2030. The spread of mobile computer devices among students has proven effective in student learning. However, there is still a lack of studies about the effectiveness of these mobile computer devices in higher education, especially among Saudi female students. Therefore, processes are involved before integrating any technology into the educational environment; one is to understand students' acceptance of these devices in their learning journey. Thus, the purpose of this study is to predict the behavioral intention of Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to learn with mobile computer devices based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003).

This study employed a quantitative, non-experimental survey design to collect data. The number of responses received was 134; 127 were valid. The multiple linear regression analysis was administered to answer the research questions. The results revealed that effort expectancy and social influence were significantly associated with the female Saudi students' behavioral intentions toward using mobile computer devices in their learning ($\beta = 0.444$, $p < 0.001$; $\beta = 0.174$, $p = 0.033$). Performance expectancy had no statistically significant relationship with the behavioral intentions of Saudi female students regarding the use of mobile computer devices ($\beta = 0.108$, $p = 0.232$). In addition, multiple linear regression results were presented, showing that the model accounted for 39% of the variance in the behavioral intentions of Saudi female students regarding the use of mobile computer devices in their learning.

The current study also revealed some challenges students face when using mobile computer devices for learning. These include classroom infrastructure issues, such as limited Internet access and low-quality hardware, as well as battery and device performance problems when downloading files and applications. Additionally, some educational websites and content were incompatible with these devices. Based on these findings, the current study provides recommendations for future research and for improving educational practices when integrating mobile computer devices.

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Dedication

To my generous country, The Kingdom of Saudi Arabia

For supporting their people and me in all sectors to prepare us for competition around the world and to be competent representatives of our country via inspiration Vision 2030.

To my beloved parents, Nasser and Hailah

Who taught us how to be successful, give, and be beneficial to our country and communities. You raised and guided us until I became what I am today: a successful person.

To my loving and best friend, Ruba, my wife

Who supported me and was the central part of this successful work;

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Your smile and love made this successful.

My dedication to ambitious specialists and educators in Education, especially in Educational Technology, who strive to make education the best it can be for future generations.

Chapter 1 - Introduction

Technology plays a very important role in educational content and methods of education. In this globalized world, technology has made information easily reachable, and people use it to learn from different channels on the Internet. Technology was critical during the pandemic as the world shifted to online; it also affected the activities of students and teachers. Students' attention spans have become very short in face-to-face settings with teachers. Instead of thinking for themselves, they find it easier to get an answer from their technology devices. Furthermore, the use of mobile devices has become accessible to most people, which has facilitated transmitting and receiving information easily and efficiently.

In the twenty-first century, Information and Communication Technology (ICT) has been remarkably embedded in our daily lives. One cannot abandon technology in accomplishing many tasks, especially in educational matters, because it has played a significant role in facilitating the development of life in general, and in education in particular. Therefore, many international and local organizations have taken advantage of technology's privileges to advance ICT in improving the quality of education and in creating equal opportunities for both sexes to achieve high benefits in the educational process by effectively employing technology (Alasmari, 2020). In 2015, the United Nations, in cooperation with ICT, established the Education for All movement (EFL). The aim was to create equal educational opportunities for both genders. Therefore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Mobile Learning Week 2015 initiative to enable girls and women to benefit from mobile computing devices in their learning process and to help them eradicate illiteracy and develop their skills (Traxler & Vosloo, 2014). Challenges and how to effectively employ mobile learning to improve the quality of education were also discussed during the event (UNESCO, 2015b).

Consequently, this study intended to predict Saudi female students' behavioral intentions toward utilizing mobile computing devices in their academic lives. However, the success of the endeavor is reliant on the suitability of the designs of mobile computing devices that serve the educational goals, methods, and users' technical capabilities. This research strives to contribute to the development of the educational process in Saudi Arabia, especially in educational technology. Saudi Arabia is experiencing major development in its academic infrastructure through the construction of new schools and the modernization of the curriculum. The country has a new vision (Vision 2030) to develop all programs in all fields, including education. There are still a limited number of studies and research in the acceptance and application of mobile devices in the educational process. According to Alasmari (2017), some studies were conducted in the "Saudi context" that focused on teachers' and students' attitudes and opinions, in general, towards using mobile learning devices in education without using a certain acceptance model. This study relied on a unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al, 2003) to achieve thorough results for community service.

Background

Technology has become a potent and driving force in education reforms around the world. Technology-based applications and tools have had a tremendous impact on the education systems. To illustrate, the inclusion of technology in the learning process makes it easy to create a dynamic learning environment and helps students to effectively understand the content (Traore, 2011). One of the most common forms of integrating technology into education is the use of information technology resources, such as mobile computers, in the classroom. Mainly, these resources are of greater utility to students to develop their knowledge and their educational progress, because mobile computers assist in efficiently accessing digital content and resources.

According to Gikas & Grant (2013), mobile technology effectively enhances the educational environment and impacts the field of education and students' learning. "Mobile computers" have been amalgamated in nearly every feature of our everyday lives proposing usability, portability, and mobility (Persson & Nouri, 2010). Such technology must be used correctly in the educational environment and fully utilized to benefit both teachers and students.

It is essential to reflect on how mobile computers are used in the university learning process, contributing to educational programs to keep pace with this development, and increasing students' abilities to learn using the latest technical developments. There is a need to determine female students' usability of mobile computers to learn academic skills during their university training. However, some studies concentrate on a specific mobile device or application; therefore, it is difficult to gain a real overview (Alfarwan, 2019). Hence, further research is needed to investigate technology-based classroom resources and tools for teaching and learning in the context of mobile computer programs and applications, especially within female education (Alasmari, 2020). Therefore, the goal of this study is to predict females' desire and willingness to use mobile computer devices in their academic lives.

The Kingdom of Saudi Arabia shapes the most significant part of the Arabian Peninsula. Its area is distinguished as the heart of the peninsula and is located in the southwest of the Asian continent (Masmali, 2020). It is also bordered by Kuwait, Bahrain, Qatar, and the United Arab Emirates to the east; Oman to the southeast; Yemen to the south; Jordan and Iraq to the north; and the Red Sea to the west. The location of Saudi Arabia is distinguished by overlooking the Arabian Gulf to the east and the Red Sea to the west. It contains different terrains, which make it distinct in all economic and political aspects. The area of the Kingdom of Saudi Arabia is approximately 2,000,000 square kilometers, and the population is approximately 32,175,224

(General Authority for Statistics, 2024). The founder, King Abdulaziz bin Abdulrahman, unified the country in 1932. The constitution adopted in the Kingdom of Saudi Arabia is the Holy Quran and Islamic law, and the formal language is Arabic (Masmali, 2020). Education has occupied a significant position in the hearts of Muslims, because the Islamic religion encourages education and learning.

The Prophet Muhammad (peace be upon him), said: "Allah makes the way to Jannah easy for him who treads the path in search of knowledge" (Riyad as-Salihin, p. 1381). Therefore, the stages of education in the Kingdom of Saudi Arabia have gone through two primary phases: The first stage occurred during the era of the Ottoman Empire before the founding of the Kingdom of Saudi Arabia when the Arabian Peninsula was under the rule of the Ottoman Empire from 1290 to 1920 (Althowaini, 2015). Education in the Arabian Peninsula at that time was weak because of the neglect of the rest of the Arabian Peninsula by the Ottoman Empire, except for the *Hijaz* in the west of the Arabian Peninsula because of the presence of Mecca and Medina (Alomar, 2018). For example, the Ottomans built two schools in the *Hijaz* region that taught students in the Turkish language. However, the people spoke Arabic and were influenced by Arab and Islamic culture and their Bedouin customs. People withdrew from these schools and registered their children (males and females) in traditional schools that spoke the Arabic language. The schools were called *katateeb*, where students sit around the teacher in a circle and learn reading, writing and simple arithmetic operations. The tools used were wooden boards on which to write (Masmali, 2020). Girls were separated from boys and had teachers of the same sex (Althowaini, 2015; Al Omar, 2018). The teachers were proficient in reading, writing, and arithmetic; memorizers of the Holy Quran, and they taught students voluntarily for free. However, they received incentive gifts from the parents in honor of their efforts if their children mastered a specific skill (Althowaini, 2015). The *katateeb* flourished during that period, because the community believed in the importance of the Arabic language and the importance of instilling religious and societal principles in the souls of their children (Al-Salman, 1999; Alomar, 2018). However, there were schools founded in the *Hijaz* region by immigrant pilgrims to Makkah and Madeinah where Arabic was used as the primary language in the teaching process. These included the “Sawlati” school, which was established by an immigrant Indian woman in 1874; the “Fakhria” school in 1881; the “Dar Al Faizeen” school in 1886; and the “Al Falah” school in 1912 (Althowaini, 2015; Alomar, 2018; Masmali, 2020).

The second phase of education in Saudi Arabia happened after King Abdulaziz established the Kingdom of Saudi Arabia in 1932. He settled the Bedouins in villages and provided them with a suitable environment for living and education. For instance, before unifying the Kingdom of Saudi Arabia, King Abdulaziz endeavored to continue uniting other cities in Saudi Arabia. In 1925, he became "King of Hijaz and Sultan of Najd and its Dependencies" (Alsharif, 2019, p.13), establishing the education directorate which is called Majlis al-Maarif (Council of Knowledge) in English. He decided modern education in Hijaz should spread into other cities under his rule (Alsharif, 2019; Masmali, 2020). However, at that time, education was limited and was only open in four cities (Mecca, Medinah, Riyadh, and Jeddah), because the Bedouin communities were unfamiliar and minimally accepted modern education (Althowaini, 2015). After the discovery of oil in 1933, education took a new shape in Saudi Arabia because of the country's economic growth. The Aramco Company began building new formal schools in the eastern provinces of Saudi Arabia. In 1936, King Abdulaziz supported "the establishment of a preparatory institute" to prepare students to complete their education abroad and gain university degrees (Alsharif, 2019). In 1945, the Directorate of Education built several formal schools around the Kingdom of Saudi Arabia (Masmali, 2020).

In 1954, Crown Prince Faisal bin Abdulaziz established the Ministry of Education, responsible for creating the curriculum and instruction, buildings school, assigning teachers and principals, and distributing textbooks to all students (Althowaini, 2015, p. 10). The Saudi government is interested in developing education; for example, in 1957, King Saud bin Abdulaziz established the first Saudi university in Riyadh, King Saud University. Thus, the level of education in the Kingdom of Saudi Arabia has developed through generous support from the Saudi government. Experts were called in to improve the education system which is now ranked higher among the world's countries in modern times. This is an overview of the history of Saudi education. Other details related to the history of educational technology in Saudi Arabia are covered in Chapter 2.

Education for females in Saudi Arabia has gone through several stages; these developments have contributed to providing opportunities for females to complete their education in all fields of science. King Faisal, when he was crown prince, and his wife, Queen Iffat Al Thunayan[1], were responsible for the interest in girls' education, as the first school for

[1] Queen Iffat Al-Thunayan was born and raised in Turkey. She is the wife of King Faisal bin Abdulaziz (the third king of Saudi Arabia and the third son of King Abdulaziz). Queen Iffat returned to her ancestral homeland, the Kingdom of Saudi Arabia, in 1932. She was essential in establishing education, especially for females (Kéchichian, 2015).

girls, Dar Al Hanan[2], was established in 1956 (Althowaini, 2015). In 1960, the Kingdom of Saudi Arabia established an organization called the General Presidency for Girls' Education where the government encouraged Saudi Arabian women to complete their education (The Ministry of Information, KSA, 1979, as cited in Alhujaylan, 2014). In 1962, King Saud bin Abdulaziz opened the first official school for girls in Riyadh (Alsharif, 2019). Since the 1970s, Saudi Arabian women have attended universities to pursue higher education (Ministry of Education of Saudi Arabia, 2022). The Kingdom of Saudi Arabia modernized the education system in 2002 by merging the Ministry of Education with the General Presidency for Girls' Education to obtain a high-quality education for both female and male students (Alhujaylan, 2014). The Kingdom of Saudi Arabia has also dedicated its efforts to providing private universities for women, including Effat University and Dar Al-Hekma[3] university, and Princess Nourah Bint Abdulrahman University[4](the largest female university in the world). Appendix I shows pictures of these universities. Additionally, female students can attend other universities across Saudi Arabia that have "gender-separated campuses" (Alghamdi, 2017). The Ministry of Education requested a number of academic and development programs be provided for Saudi women. It has worked to grant Saudi women the right to obtain a free education to prepare them

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[2] Dar Al Hanan is the oldest girls' school in Saudi Arabia. Its name means "House of Affection" (Alomar, 2018, p.10). This school was not limited to the girls of the royal family; several girls from different families outside the royal family also attended (Alsharif, 2019).

[3] Dar Al-Hekma means "House of Wisdom College" (Alomar, 2018).

[4] Princess Nourah Bint Abdulrahman is the elder sister of King Abdulaziz Al Saud, the founder of the Kingdom of Saudi Arabia. She was a prominent figure in her brother's life, and she had an opinion. In appreciation of her efforts, the university was named after her during the reign of King Abdullah bin Abdulaziz.

to serve the country in various fields (Ministry of Education of Saudi Arabia, 2021). More details about female education are covered in Chapter 2.

The Saudi Ministry of Higher Education (2010), started its interest in integrating technology in education by developing plans and strategies such as e-learning and by establishing high-speed educational channels and networks that link Saudi universities. Therefore, the deanships of e-learning began to adopt mobile technology projects in the learning process among Saudi universities. However, Saudi universities have few initiatives to find out students' acceptance of mobile learning technology in the learning process (Alasmari, 2017). Therefore, this study focused on knowing the behavioral intention of Saudi female students in the College of Computer Science and Engineering at Taibah University to use mobile computers during their academic life, using the theory of acceptance and use of technology (UTAUT) as a framework.

Rationale for the Study

Mobile computers were introduced in the curriculum in some countries to increase learners' motivation, their interaction during lessons, and their engagement in the set-up of the classroom (Ok & Bryant, 2016). Technology has great potential for educational advantages for learners (Grant et al., 2015). Mobile computers can provide significant benefits to learners by minimizing learning challenges in the classroom. Although mobile computers cannot be wholly depended upon to solve the learner's problems, they can help their learning needs. Technology was introduced in the education sector to provide instructions to learners using computer-assisted instruction (CAI). The introduction of tablets and their application in the learning process, in addition to the limits of traditional teaching experiences, contributes to increasing the quality of education by learning 21st-century skills, such as critical thinking, problem solving, and communication skills. Persade et al. (2019) show that mobile devices are fundamental tools in education because of the following reasons: First, the immense instrumental applications, inclusive of the benefits they offer to the learners. Second, the devices' advanced features, that is, the storage capacity, their portability and mobility, and Internet connectivity. These aspects make mobile devices ideal in a particular classroom. Mobile applications are always available across different platforms. This aspect makes these devices more comprehensive in providing instructions to learners in regards to diversification of curricular and teaching occurrences.

The global index on the integration of technology into classrooms is inadequate. Technology has enhanced and improved various facets of human life. The pandemic of 2020 exposed and highlighted the inequity of access to technology, especially by individuals in lower income communities. Additionally, Saudi Arabia and other developing countries still lag behind in the implementation of technology into learning programs, especially for females. Research on the use of mobile devices has not yet been carried out intensively concerning factors that help students learn with mobile computers (Watson et al., 2010).

Overcoming this sort of deficiency calls for more research on female students' intention to learn with mobile computers. Therefore, this study serves the endeavors of Taibah University that aligns with the Kingdom of Saudi Arabia's vision (Vision 2030) in merging technology, especially mobile computer devices, into the educational environment efficiently and developing the infrastructure of the classes and labs to be appropriate for using these devices to support female students' learning goals. Additionally, this study seeks to close the existing gap between male and female learners at Taibah University by predicting their behavioral intentions to use mobile technology for learning, considering factors of:

- performance expectancy - female students' belief that mobile computer devices help them while using devices in their learning tasks,
- effort expectancy – female students' ease of use of mobile computer devices in their learning tasks impacts their behavioral intentions to use these devices, and
- social influence - people's viewpoints on the behavioral intentions of female students influences their use of mobile computer devices in their learning (Venkatesh et al., 2003).

Endeavors of Taibah University to Enabling Technology in the Academic Process

Taibah University seeks to support the merging of technical tools in the educational process to create an academic environment that aligns with Vision 2030, which prepares the faculty and students to use technology in their teaching and learning tasks. In 2008, Taibah University established the E-learning Department, which aims to provide training courses and programs related to e-Learning for faculty members and students on how to efficiently use the latest technologies in educational endeavors (Taibah University, 2024a). This reflects the university's belief in the importance of technology in academic environments. The main vision of the E-learning Department is to disseminate, support, and develop e-Learning in line with the university's objectives (Taibah University, 2024a). Moreover, the E-learning Department at Taibah University focuses all of its work on adhering to several central values:

- high efficiency and excellence,
- creativity encouraged by rewarding initiators through distinguished ideas in improving the quality of or finding solutions for the technical issues that e-learning and distance education may face, and

- continuous cooperation with the Madinah community by spreading the importance of technology in education and learning about the latest versions of technology that serve the educational process (Taibah University, 2024a).

Based on the E-learning Department's efforts, it received the Reward Learning Innovation Award in 2023 from the National Learning Center in Saudi Arabia (Taibah University, 2024a). (See Appendix J)

Additionally, to improve the level of technical services among the university sectors, Taibah University established the Dean of Information Technology and Digital Transformation Department. It provides support and technical assistance to raise the quality of technology on the campus, including enabling software and devices so that faculty members and students are able to benefit from the Internet while working on academic tasks. This reduces the mistakes that may happen in the administration and finance departments, and links all sectors in the university by the Internet with advanced secured programs to protect the data (Taibah, 2024b). Furthermore, the Dean of Information Technology and Digital Transformation provides specialized training courses with the cooperation of pioneers in Information Security from specialized companies and institutes worldwide to achieve Vision 2030 for creating a technological environment at the university with high-quality services and security (Taibah, 2024b). The Deanship also recognizes the importance of raising awareness among the university’s teaching staff and students about cyber-attacks and how to deal with them by periodically providing an electronic guide via the university’s email (Taibah, 2024b).

Purpose Statement

The purpose of this study is to predict the behavioral intention of Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to learn with mobile computer devices based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003).

Methodology

This study used the quantitative method to collect data from Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to predict these students' behavioral intentions toward using mobile computer devices in their academic lives. A questionnaire was distributed online to the target audience and is divided into two main sections; the first section, the demographic section, includes questions about age, academic year, major, years of experience in using mobile computer devices, and challenges that may be faced while using these devices. The second section modified the UTAUT instrument that includes four UTAUT constructs—performance expectancy, effort expectancy, social influence, and behavioral intentions. Data analysis used two approaches—descriptive and multiple linear regression analyses by SPSS Statistics. Finally, the findings used tables and figures to present the statistical statements. More details are presented in Chapter 3.

Research Questions

1. To what extent does performance expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?
2. To what extent does effort expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

3. To what extent does social influence predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

Based on the research questions, the researcher developed three hypotheses that tested in the current study:

H_0 1: There is no relationship between performance expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 2: There is no relationship between effort expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 3: There is no relationship between social influence and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

Theoretical Framework

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

Unified Theory of Acceptance and Use of Technology (UTAUT) is a research model used for assessing individual acceptance. It is a combination of eight other theories and models, namely Motivational Model, Theory of Planned Behavior (TPB), Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Innovation Diffusion Theory, Model of PC Utilization, Combined TAM and TPB, and Social Cognitive Theory (Venkatesh, 2003). These theories provide constructs that make the UTAUT a reliable measurement item. The UTAUT model is unique in that it suggests the acceptance and use of technology is identified by the individual's behavioral intention (Venkatesh et al., 2003). Also, Venkatesh et al. (2003) tested the effectiveness of this theoretical framework and determined the variation of the individual's behavioral intention toward using technology was roughly 70%. Additionally, the level of effectiveness toward using information technology was roughly 50%. Figure 1.1 clarifies the relationships between the UTAUT model and the moderating variables:

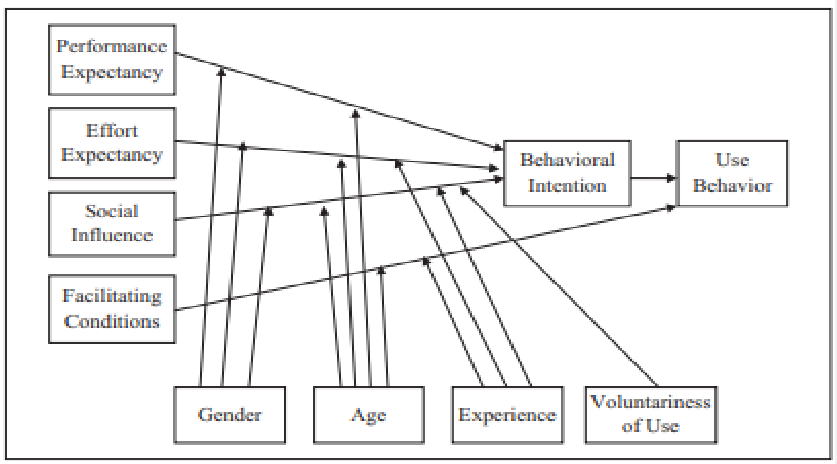

Figure 1.1. UTAUT model. Source: (Venkatesh et al., 2003)

The integration of UTAUT in research was to consider the fragmented theory applicable to the personal acceptance of Information Technology (IT) solutions. The unified theoretical result takes into consideration these eight specific models as determinants of IT dependency and intent to use. The UTAUT model used enabled the comparison of empirical and conceptual similarities of the integrated models (Venkatesh et al, 2003). The unification of widely used theoretical perspectives found in literature and the assimilation of a set of moderators to account for dynamic influences ensured that the UTAUT model worked well with my study. The ideas could be used to predict students' behavioral intentions based on the constructs of performance expectancy, effort expectancy, and social influence to using mobile computers for learning purposes. The model specifically presumes that there are three factors related to the intention to use technology, namely performance expectancy, effort expectancy, and social influence (Venkatesh et al, 2003).

This study focused on performance expectancy, effort expectancy, and social influence as predictors. Performance expectancy is the level to which a person believes that the technology will bring gains in job execution. It indicates the viewpoints of female Saudi students at Taibah University toward using mobile computer devices in their learning. This determinant is added to the model to help determine the results of interest in technology use through users' behavioral intentions (Venkatesh et al., 2003). Effort expectancy is the level of ease that results from using the technology. The less effort Saudi female students at Taibah University perform in their learning process using mobile computing devices, the higher is their motivation to use a variety of technology devices in the educational process. This determinant is included in the model to reveal how the ease of use and complexity of the technology add to users' intent toward the technology (Venkatesh et al., 2003). Social influence is the level to which a person considers their peers when they encourage them to use technology. That is, the impact of community pressures and their effects on the behavioral intentions of Saudi female students at Taibah University toward the use of mobile computer devices. This determinant is built into the model where the user can be influenced by the opinions and viewpoints of others who believe in the importance of merging technology and those who make use of technology (Venkatesh et al., 2003). The model essentially considers the moderating impact of experience, gender, age, and voluntary use of technology.

The theoretical model UTAUT was developed in 2003 by Venkatesh et al. Since then, it has been used extensively in several research studies related to the acceptance of technology use by users' behavioral intention (Alasmari, 2017; Alasmari & Zhang, 2019; Al-Hujran et al., 2014;

Al-Hunaiyyan et al., 2018; Alshahrani, 2016; Alturise et al., 2022; Badwelan et al., 2016; Engotoit et al., 2016; Hsieh & Tsai, 2017; Iqbal & Qureshi, 2012; Khlaif, 2018; Lee, 2013; Moghavvemi et al., 2013; Nassoura, 2012; Padumadasa, 2012; Pullen et al., 2015; Tan, 2013; Williams et al., 2011). All results in these studies were positive regarding the possibility of using the UTAUT model in the educational setting.

Significance of the Study

The focus of this research study is to predict the Taibah University female students' experience and desires toward the use of mobile computer devices in their learning. Therefore, this research study adds value to the educational technology field, because it focuses on understanding the female students' positions in using mobile computer devices. This study also supports the Saudi vision (Vision 2030), which encourages the integration of technology in the educational process, especially mobile computer devices, by using them to help in the learning process. Additionally, the results of this study provided the Ministry of Education in Saudi Arabia with a real vision of enabling the use of mobile computer devices in education. Finally, I hope this research will help female Saudi students better understand their position in using mobile computer devices in their academic lives in Saudi Arabia.

Limitations and Delimitations

This study seeks to verify the determinants that discover the intentions of Saudi female students at Taibah University towards the use of mobile computer devices in their academic lives. Similar to every research study, this research also faced some unavoidable limitations. First of all, it used the quantitative method; the rate of response of the students in this study may create a dilemma using survey methods to collect data. That is, at the beginning of the school year, female students become engrossed in semester work as well as exams, which leads to their lack of focus on research; some students may choose not to participate in the study. Second, students may feel intimidated by presenting adverse outcomes toward this study and thus information obtained may be scant. Third, the participants in the study were not fluent in the English language; therefore, it was necessary for the researcher to translate the instrument into Arabic. As a result, it may lose its quality during translation from one language to another. This method may cause the loss or blurring of some meanings, which affects the response of the participants in the study.

To overcome these limitations, I sent an email to the participants before the beginning of the study to introduce myself and the aims and the procedures of the research. I clarified the importance of their roles in this study to get quality results based on their responses. Also, I encouraged them to answer the questions in the instrument precisely toward using mobile computing devices. Their responses kept confidential, which helped them to respond in good faith. Regarding the dilemma of the accuracy of translating the tool from English to Arabic, the instruments presented in both languages (English and Arabic) to two people specialized in linguistics and proficient in both English and Arabic languages, in order to arbitrate the tool after translation and to be free of any linguistic errors.

Based on delimitations, this research assumes two things: first, the participants engaged in the study and answer the questionnaire accurately and honestly. Second, participants could access the Internet using their smart phones or any other device to participate and answer the research questions.

Key Terms and Definitions

Behavioral intention:

Venkatesh et al. (2012) explained that behavioral intention is a person's express desire to use mobile learning technology practically in his/her future behavior. Also, Warshaw and Davis (1985) stated the definition of behavioral intention is "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (p. 214). Alasmari (2017) defined behavioral intention as a thoughtful decision that an individual makes to conduct a particular behavior or not.

Mobile technology:

Mobile technology encompasses all portable devices with wireless capabilities, allowing users to effectively access websites, use apps, and connect with others at any time and from anywhere. These devices can store data without relying on external storage devices, such as CDs, DVDs, or flash devices (Alshahrani, 2016; Badwelan et al., 2016; Bose & Lowenthal, 2016).

Mobile learning (M-learning):

It is the approach used in the educational process that allows students to smoothly access the content through handheld devices such as cell phones, iPads, tablets, without time or space restrictions, compared to other learning systems that rely on the location of the user (Alshahrani, 2016; Badwelan et al., 2016).

Mobile computer devices:

These are portable devices that contain memory, a wireless connection, and a processor, which helps learners to easily communicate with others and access information sources at any time and any place. Mobile computer devices take many formats based on shape and style; such as iPads, iPods, smartphones, tablets, and laptops (Traxler, 2005; Hu & Garimella, 2014).

University education:

A stage that comes after the secondary stage, where the student can enroll in a public or private university or college according to the conditions set by educational institutions. The Saudi government provides university education free of charge to citizens and to external scholarship students. It also provides a monthly income for the student throughout each academic period for four years (Unified National Platform, 2021).

The College of Computer Science and Engineering:

An academic department in which computer engineering, computer science, and information systems are taught by specialists in the computer field (King Saud University, n.d.).

Taibah University:

One of the Saudi public universities, established in 2003, located in the Al-Madinah Al-Munawwarah region in the western part of the Kingdom of Saudi Arabia (Taibah University, n.d.).

Chapter Summary

This chapter provides the foundation of the study by giving an overview of the importance of the study and a statement of the problem and research questions. This chapter also clarifies the role of the researcher in the study and the research design used in the study, the theoretical framework. The last part of this chapter determines the limitations and delimitations of the study and how the researcher can deal with them. Chapter 2 is a review of the literature on the use of mobile computer devices in the educational process; it addresses technology's role in female students' education in Saudi Arabia by providing some examples of their use of technology. The constructs of the Unified Theory of Acceptance and Use of Technology

(UTAUT) will also be highlighted in this study, because this method will help the reader understand the context of the study more deeply and give an insight into all aspects of the topic.

Chapter 2 - Literature Review

Using efficient technologies is essential to making teaching and learning more profound and meaningful in the modern era. Furthermore, the doors have been significantly opened for more innovative ideas in the planning and execution of lessons centered around information and communication technology (ICT) thanks to recent research and international advancements. Numerous actions have taken place to give this movement purpose and motivation. Investor interest in education has begun to increase with the introduction of mobile technology. More ICT also inexorably led to the opening of new learning domains. Web 2.0, Web 3.0, and Web 4.0 applications, for instance, foster teamwork, critical thinking, and problem-solving abilities. This may also impact the ability to communicate effectively.

Undoubtedly, high ownership rates, including equipment used by teachers and students, have greatly increased the widespread use of mobile technologies in education, such as smartphones, tablets, and phone applications. Similarly, knowledge of technology allows students to conduct effective learning both inside and outside the classroom using research resource tools and the Internet. This greatly affects self-efficacy and self-paced personal learning. It is also the driving force behind higher employment rates and success in improving various real-world learning environments (Boticki et al., 2015). Therefore, mobile devices provide easy access to digital resources and their content. There is an increase in communication tactics and student-teacher engagement when mobile phones are used (Churchill & Wang, 2014). Through the educational process, students are vital to developing technology applications by using them correctly in their education. However, using mobile applications to facilitate educational engagement is how integration through conventional teaching methods is accomplished. However, integration through learning methods is done by acceptance of mobile computer devices and applications as a mechanism to correctly facilitate education engagement.

The researcher's interest began by exploring students' behavioral intentions toward using mobile devices in the educational process; however, few studies discussed these issues in higher education, especially in the Kingdom of Saudi Arabia (Alasmari & Zhang, 2019; Alasmari, 2017; Al-Hujran et al., 2014; Alshahrani, 2016; Alturise et al., 2022; Badwelan et al., 2016; Nassoura, 2012). This chapter provides an overview of the history of integrating technology into Saudi education, highlighting three sub-topics: the emergence of the Internet in higher education, the integration of E-Learning in higher education, and the attitudes of higher education in Saudi Arabia toward technology.

In addition, the literature review discusses the education of Saudi women and its relationship to technology and computing majors. Furthermore, this chapter addresses the role of mobile computer devices in higher education with a special focus on their role in the education of Saudi Arabia. Finally, the literature review discusses the structure of the Unified Theory of Acceptance and Use of Technology (UTAUT) on which this study is based, including its four main determinants: a) performance expectancy, b) effort expectancy, c) social influence, and d) behavioral intention.

History of Educational Technology in Saudi Arabia

The area of the Kingdom of Saudi Arabia is characterized by its vastness, as it is considered the largest country in the Arabian Peninsula (Alfahad, 2012). In the 1930s, oil was discovered in the Kingdom of Saudi Arabia, which led to a quantum leap in social and economic life, specifically in the education sector (Alqarni, 2015). Therefore, oil was the main tributary of the Kingdom of Saudi Arabia, which relied on it to establish logistical services, such as building transport and electricity systems, building schools, and providing the services that people needed to live a decent life. In the year 1930, education in the Kingdom of Saudi Arabia was primitive and simple; this education was called the *Kuttab* and was available for males and females. In this type of education, the teacher used to receive students in his home or in community mosques to teach them some sciences and knowledge, as the possibilities of learning at that time were limited, and it was the recognized education at that time. (Elyas & Picard, 2010).

Rugh (2002, as cited in Abouelnaga et al., 2019) stated that after two decades, education in that era was limited and restricted in terms of quantity and quality because of the massive size of the state, as well as the lack of funds and support, which led to a high rate of illiteracy and a lack of skilled local teachers. The number of students at that time did not exceed 30,000 (Alqarni, 2015). In 1954, after the establishment of the Ministry of Education, the number of students enrolled in education increased. In 1960, the Kingdom of Saudi Arabia began launching and implementing plans to expand and spread education throughout the country (Abouelnaga et al., 2019). Mahboob & Elyas (2014) stated that female education received abundant support from the state and was one of the most developed social sectors over the years. Therefore, the Second National Development Plan (1975-1980) and the Third National Development Plan (1980-1985) focused on introducing new materials and tools into the study plan. Namely, the Kingdom of

Saudi Arabia used the recommendations and opinions of foreign experts to start implementing the education technology project (Alrashed, 2018; Fallatah, 2019). Among the bodies and institutions that cooperated with Saudi Arabia are Indiana University in Bloomington, Indiana (1975) and Wade Media Consultant, Inc. in Arlington, Virginia (1973) (Abouelnaga et al., 2019). In accordance with the efforts of the Saudi government to advance the progress of education, in 1980, the General Organization for Technical Education and Vocational Training (GOTEVT) was established to graduate a high-quality workforce to meet the technological requirements in education (Alqarni, 2015). Additionally, the Third National Development Plan (1980-1985) and the Fourth National Development Plan (1985-1990) highlighted the improvement of previous plans and explored ways to achieve high-quality education. In the Third and Fourth National Development Plans, the government decided to work on merging educational technologies directly into the educational process to improve education quality; this included creating multi-purpose classrooms and establishing an educational technology center (Alqarni, 2015).

In 1985, the General Administration of Education Technology Departments was established and is considered part of the new education system in the Kingdom of Saudi Arabia. It led to a positive transformation in the country in the education system (Chanchary & Islam, 2011). This administration was focused on several tasks, including preparing programs for school leaders and teachers in educational technology and providing educational films and equipment for scientific laboratories such as mathematics and science. This department also contributed to providing personal computers and computers for schools. (Abouelnaga et al., 2019).

Saudi Arabia launched a new Vision (Vision 2030) to develop all of its programs and to make them high-quality in all sectors to compete with developed countries, including the USA, Britain, China, and other countries. The state has focused on digital transformation in all government sectors, including education, to align the teaching and learning process with technical and digital development to prepare the youth in an advanced manner for the labor market (Vision 2030, 2017). In 2016, the Kingdom of Saudi Arabia launched the National Transformation Program to identify the challenges various sectors will face in achieving the goals of Vision 2030 (Vision 2030, 2017). The Ministry of Education has implemented several programs and initiatives, including technical and digital transformation in education (Vision2030, 2017). As a result of these initiatives, the Ministry of Education has created several programs for digital transformation in education.

The first of these initiatives is the Future Gate Platform, which facilitates the teaching and learning process and the effective completion of tasks through the system for teachers and students (Masmali, 2020). This program is under the management and responsibility of "Tatweer[5] Educational Technology Development Company (TETCO) under the Development Company owned by the Public Investment Fund of the Kingdom of Saudi Arabia" (Masmali, 2020, p. 17). However, this initiative still needs to be implemented in all schools, because some schools lack electronic equipment (such as laptops and computers to provide to all students) or there are technical issues (such as Internet access, especially in rural areas). Additionally, some schools need more technology infrastructure, such as in rented buildings (Masmali, 2020).

The second of these initiatives launched by the Ministry of Education is Virtual Schools, a type of blended learning that allows students to benefit from highly experienced teachers in different majors, especially in rural areas. Virtual schools enhanced the educational process

[5] "Tatweer is An Arabic word that means development" (Masmali, 2020, p. 14).

during COVID-19, when all schools were closed, and education shifted to e-learning through virtual schools (Masmali, 2020). Moreover, virtual schools are also appropriate for weather conditions, where the educational process continues without delays in the academic track. Appendix K shows a Saudi student who used the virtual schools through the Future Gate Platform in the Jazan Province, Faifa Village, when school was closed due to weather conditions in August 2024).

The third initiative that the Ministry of Education launched is IEN[6] Channels, which consists of more than 25 educational channels to assist students in developing their skills and reviewing their lessons (The Ministry of Education, 2024). Network Ien channels provide different programs that align with the politics and vision of the Ministry of Education in public and higher education (IEN Website, 2024). The Ministry of Education provided these initiatives to the Saudi community to support and develop digital learning and to achieve a qualitative leap in the e-learning field that aligns with the Saudi vision (Vision 2030). (See Appendix L)

Emergence of the Internet in Higher Education

In 1993, the activation of the Internet began in the country, and higher education had a greater share in linking with the Internet. King Fahd University of Petroleum and Minerals was the first university to start connecting to the Internet. A year later, the Internet was used by medical and research institutions and universities in the country. In 1997, the public was able to connect to the Internet (Alqarni, 2015). The Internet has now become available to all government sectors, including universities and colleges. As a result, the Internet has become mainstream among academics and the government; therefore, Internet access and usage has increased exponentially in the country. For example, when government sectors and the public were able to

[6]IEN is an Arabic word which means “that eye” in the English language.

access the Internet, technology was used and integrated into education. The use of interactive television technology (ITT) by fiber optic technology among Saudi universities helped students living in remote areas engage in the educational process through audio and visual communication (Abouelnaga et al., 2019). This reflects the important role of technology in easing and enhancing the educational process to be available to all students.

Integrating E-Learning in Higher Education

The start of e-learning in higher education in the Kingdom of Saudi Arabia began in 2003, establishing an e-learning center between King Fahd University of Petroleum and Minerals and Umm Al-Qura University. The goal of establishing the center is a collaborative process between the two universities to promote and assist academics in employing and utilizing technology in the educational process (Alqarni, 2015). In 2004, King Abdulaziz University and King Saud University began launching the Deanships of E-Learning and Distance Education (Albalawi, 2007). In 2006 and 2007, the Kingdom of Saudi Arabia witnessed significant progress in e-learning, the establishment of the National Center for e-learning, and in distance education. Also, educational programs were broadcast in all disciplines through Saudi TV channels, with the cooperation of the Ministry of Higher Education and the Ministry of Education, to help students in traditional education and remote villages develop their educational skills (Abouelnaga et al., 2019). Given the importance of e-learning and its integration into teaching, in 2009, the Ministry of Higher Education and the National Center for E-learning and Distance Education organized the first international conference on e-learning and distance education. One of the fruits of this conference was that, in 2010, distance education was launched as part of the options offered by educational institutions in higher education to male and female students. In the same year, the Ministry of Higher Education launched a national plan called AFAQ; a plan for excellence in all sciences and technology. This project focused on several objectives, the most important of which is improving the quality of e-learning and distance education and building and improving high speed educational networks between Saudi universities (Alasmari, 2017). Figure 2.1 illustrates the expansion of the history of educational technology from 1990 to 2015 in Saudi Arabia, especially in higher education.

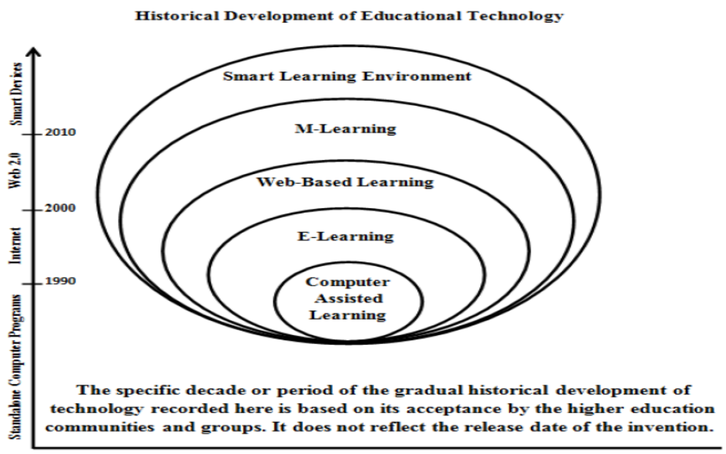

Figure 2.1. Historical stages of Educational Technology. (Alkraiji & Eidaroos, 2016).

The Attitudes of Higher Education Toward Technology in Saudi Arabia

Technology is a powerful tool that assists us in easily, effectively, and efficiently achieving our goals. Technology enhances and supports the educational process to make it more efficient and meaningful. Therefore, employing technology in teaching and learning supports and facilitates the transfer of content to the target audience through attractive methods and develops teaching strategies. Some educators think that technology increases the level education without taking into consideration other sides, such as content and teaching strategies; that is a misconception. Simonson et al. (2015) mentioned that integrating technology into the learning process creates a dynamic environment that produces high-quality education and prepares students for the labor market. Therefore, technology serves students to work together and helps them to understand the content.

Moreover, the percentage of acceptance of technology by students in higher education is increasing. Al-youbi (2017), maintained that students' acceptance of technology as a powerful tool in education rose increasingly from 1999 to 2012. This indicates the attitude of Saudi students towards technology is efficient. For instance, one of the first studies that discovered Saudi students' perspectives toward employing M-learning in the educational process was Al-Fahad (2009), who studied undergraduate and master's students at King Saud University to determine the effectiveness of mobile learning in the academic environment. The researcher concluded that mobile learning contributed positively to students' points in their learning process and improved their skills. This type of learning also enhances students' communication and involvement in their learning and improves knowledge in open and distance learning.

Additionally, based on the Saudi faculty members toward using technology, Bajabaa (2017) researched the College of Education at Taibah University to predict faculty members' perspectives on merging technology based on their experiences by utilizing ISTE standards to prepare pre-service teachers. The responses of faculty members on the survey items were (n=170, response rate =66%). This study revealed that faculty members' practices linked to ISTE standards (M= 4.25, SD= .64) at the College of Education favor using technology in the educational process. Therefore, faculty members believe in the importance of the educational processes; however, they responded that they need professional development [β=.05, p=.54], and support by providing training programs to effectively develop their skills in using modern technology in the educational process. Also, they lack leadership support toward using technology [β=-.23, p=.00]. Based on the results of this study, Bajabaa (2017) emphasized that leaders at the College of Education should set a plan that serves the educational process by supporting and facilitating faculty members to integrate the technology to efficiently develop their students' skills and make the educational environment more dynamic.

Similarly, Al-qahtani et al. (2022) argued that faculty members and students in educational institutions in the Kingdom of Saudi Arabia are ready to understand and develop their digital skills and to successfully integrate and accept technology into the educational process. Therefore, Al-qahtani et al. (2022) conducted a study that aimed to discover the students' attitudes and satisfaction toward using E-learning in their education by combining the Technology Adaption Model (TAM Model) with other factors--Social Influences (SI), Education Quality (EDQ), and Perceived Enjoyment (PE) on two public Saudi Universities. This study followed a quantitative research approach with 446 graduate and undergraduate student participants. A questionnaire tool that was designed to determine students' satisfaction and acceptance of e-learning in their education process was used. The results of this study showed that all the factors of SI, EDQ, PE, and the TAM model positively affect students' acceptance and satisfaction with E-learning in their learning process. At the end of this research, the researchers also stressed that students must evaluate these programs before adopting any e-learning program to determine whether the program meets their educational goals.

Therefore, the Kingdom of Saudi Arabia greatly supports the public and higher education sector to enhance the quality of education, including projects to integrate technology into education. Additionally, technology has played an essential role in higher education in Saudi Arabia. For example, during 2016-2017, several Saudi universities appeared in the international academic rankings for their quality of education, such as Shanghai and Times Higher Education (Al-youbi, 2017; Shankghai Ranking, 2023; Times Higher Education; 2023). However, higher education in the Kingdom of Saudi Arabia still needs more studies and research to comprehensively apply technology in education (Abouelnaga et al., 2019). Based on that, the Kingdom of Saudi Arabia seeks, with Vision 2030, to effectively integrate technology in all fields, including the education sector.

Saudi Computer Science Females and Technology

Overview of Female Education in Saudi Arabia

In Saudi Arabia, education is free for both genders. The government pays monthly incentives to students in higher education to encourage them to complete their education and develop their scientific and practical skills to serve society and the country. Female education received attention and care from the government to spread knowledge among society. As stated by the education policy in Saudi Arabia, the aim of female education is to train them to be well-mannered, good housewives, and successful mothers according to Islamic teachings (Aleissa, 2017). Also, the education system in Saudi Arabia aims to prepare female students to be ready to serve the community by engaging in various jobs that suit their identities and the nature of their culture, such as nursing, teaching, banking, and so on. Based on the objectives of the education policy in the Kingdom and society's desire to educate women and some young Saudis who received their education abroad, they need educated wives who are scientifically compatible with them (AlMunajjed, 1997). The Kingdom of Saudi Arabia began establishing the General Administration for Female Education in 1959, where there were only 16 primary schools and an intermediate institute for the preparation of female teachers (Ministry of Education, 2023). The curricula for girls were different from the curricula for boys, as their curricula focused more on religious practices than on the scientific side (Alhareth, 2014). Furthermore, in 2002, the General Administration for Girls and the Ministry of Knowledge for Boys' Education were merged into one ministry and called the Ministry of Education. In 2005, King Abdullah launched a project aimed at developing education in the Kingdom of Saudi Arabia by unifying the curricula for both genders while keeping the two genders separate in education. (Alsuwaida, 2016).

The 1970 beginning of the launch of female education in higher education was under the Jurisdiction of the Directorate of Girls' Education through institutes training female teachers and appropriately qualifying them to achieve the desired educational goals because of the urgent need for female teachers to teach female students at all academic levels. After a while, the number of female schools increased, and there was a need to fill the gap in the number of female teachers. These institutes were converted into teachers' colleges to train the future female teachers. The number of these female colleges increased in the late eighties due to social pressures in that women could not travel long distances alone and they could not drive (Alesa, 2011). After the issuance of the royal order in 2003, the Ministry of Education merged with the General Presidency for Girls' Education (mentioned above and in Chapter 1), and all female colleges in the Riyadh region were merged and converted into an independent university called at that time, "Riyadh University for Girls" (Alomar, 2018, p.13). Four years later, a royal decree was issued to rename the university Princess Noura University, considered the largest women's university in the world. It was established with the aim of accommodating women only (Profanter, 2014). Each female college was merged with the nearest university (Alomar, 2018).

Another approach of female higher education, coinciding with the beginning of higher education for women in Saudi Arabia, King Saud University in 1960 allowed female students to join the university through an Entesab system. This allowed them to complete their programs without having to attend the university except during final exams when they are required to attend the university headquarters under the supervision of several female employees appointed by the university (Alaulamie, 2014). Female students who joined this program reached 24 in

1960-1961 (Alomar, 2018). Recently, with the availability of technology, several universities have implemented this system due to the increase in female students in several specializations, such as health and social sciences. Thus, this system was canceled and converted into a high-quality distance education structure by effectively employing technology under the supervision of the Saudi Electronic University and transferring male and female students to it (Alaulamie, 2014). Consequently, the Kingdom of Saudi Arabia was keen on higher education for females, as it established separate campuses for women in every Saudi university. According to Al-youbi (2017), the number of Saudi female students at universities increased from 1999 to 2012, with roughly a total of 161,875 Saudi female students in 2012.

Moreover, the role of the government was not limited at this stage, but instead opened the fields and paved the way for Saudi females to complete their higher education outside the Kingdom in distinguished universities in some countries such as the United States, Australia, Britain, China, Japan, and other countries that include prominent universities in all disciplines. Thus, in 2005, the Ministry of Higher Education launched the biggest program in the history of Saudi education for studying abroad under the name of the King Abdullah Scholarship Program (KASP) to prepare male and female students for the needs of the labor market (Alamri, 2011). According to Alsharif (2019) stated that

> Over 40% of the KASP female graduates over the thirteen-year period pursued one of the STEM subjects, and 28% graduated with a degree in business, administration, or law. This is remarkable considering the concentration of women in education and humanities as women's fields of choice at the domestic institutions. It is no surprise that the latest Global Innovation Index (GII) ranks the Kingdom very high in terms of the number of STEM graduates. The most remarkable difference is in the academic level of study: 40%

of all KASP awards to women over the thirteen-year period were for studies at the graduate level, versus 22% for their male peers (p. 28).

Figure 2.2 shows the average number of females receiving the KASP rewards compared to males at the undergraduate and graduate levels from 2005–2017.

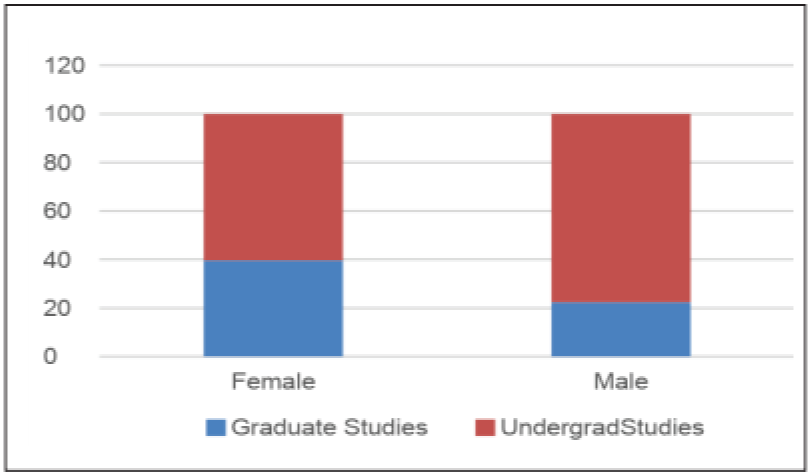

Figure 2.2. Shows the average for both genders receiving the KASP rewards from 2005 to 2017. (Alsharif and Abdul Ghaffar Mughal, 2018).

In 2022, the Ministry of Education developed the scholarship program for both genders in a standardized manner from what it was previously by identifying new distinguished universities in several disciplines; such as computer science, engineering, arts, business administration, and other scientific disciplines that serve the vision of the Kingdom of Saudi Arabia (2030) (Ministry of Education, 2023).

Computer Science

Computer Science is one of the most popular majors for Saudi female students. In contrast, in Western countries, such as the United States and Britain, the number of females majoring in computer science is much fewer than the number of males (National Center for Science and Engineering Statistics (NCSES), 2014; Universities UK (UUK), 2015). In 2014, the number of Saudi female students enrolled as computer science majors reached 45.8%. The enrollment rate of Saudi female students for all computer science majors is still increasing (Alghamdi, 2017). The Computer Science major is considered one of the most important disciplines, which resulted in a technical information revolution, as the Kingdom of Saudi Arabia focused on improving computer science education for both genders, to keep pace with the goals of the Kingdom of Saudi Arabia's Vision (2030) in the technical field.

Additionally, Alghamdi (2017) conducted a qualitative study on ten female students from three universities - Princess Nourah Bint Abdulrahman University, PNBAU; Al-Imam Muhammad Ibn Saud Islamic University, AMISIU; and Al-Baha University, ABU. The author applied the structured interview method to collect data. He conducted the interviews by email and phone rather than face-to-face because of Saudi tradition, and the content analysis approach was employed in the study. The study aimed to discover why female students study Computer Science (CS) as a major in Saudi Arabia. The researcher divided the data collected into two categories—motivation and expectation—to investigate why female students prefer to study Computer Science. The results showed three main reasons that helped women students in Saudi Arabia become Computer Science majors: "government support, family influence, and a stable workplace" (Algamedi, 2016, p. 53). The researcher recommended enhancing the Computer Sciences curriculum in education. This study suggests that the importance of this major is significant for female students, which means they have a positive vision toward technology.

The College of Computer Science and Engineering (CCSE) at Taibah University

Based on the issuance of the Royal Decree establishing Taibah University in 2003, the College of Computer Science and Engineering has been one of the core programs of Taibah University. In 2006, a royal directive was issued to restructure the university. Thus, the College of Computer Science and Engineering received outstanding and distinguished support from the university's director and vice presidents due to the importance of this college in establishing distinguished programs that compete globally (Taibah, 2024c). The College of Computer Science and Engineering includes five central departments for both genders: Computer Science, Information Systems, Computer Engineering, and two recently introduced majors in the world of technology and computers: Artificial Intelligence and Data Science, and Cybersecurity. The College of Computer Science and Engineering is keen to have a regional and global classification through the distinguished educational and research programs it provides and the unique community services that benefit the community in Madinah through learning and creativity (Taibah, 2024c). It was also noted that the percentage of female students enrolled in computer specializations at Taibah University is higher than that of their male peers, which distinguishes Saudi female students with orientation and excellence in technology. According to the website of the College of Computer Science and Engineering, the percentage of male and female students enrolled and graduated from the Bachelor's degree program in the Computer Science Department is as follows:

Table 2.1. Statistics of male and female students who enrolled and graduated in the Computer Science Department with Bachelor's degree (Taibah University, 2024c).

Year	**Enrolled**		**Continuing Studying**		**Graduated**	
	Male	Female	Male	Female	Male	Female
2019-2020	70	103	174	247	18	68
2020-2021	64	85	215	331	32	68
2021-2022	63	133	293	333	23	84
2022-2023	69	105	304	350	71	96
2023-2024	75	131	NA	NA	NA	NA

Also, in the same section the Information Systems Department recorded the percentage of female students higher than male students in the Bachelor's degree program as follows:

Table 2.2. Statistics of male and female students who enrolled and graduated int the Information Systems Department with Bachelor's degree (Taibah University, 2024c).

Year	**Enrolled**		**Graduated**	
	Male	Female	Male	Female
2016-2017	45	76	40	67
2017-2018	69	79	57	70
2018-2019	73	78	49	67
2019-2020	84	99	24	54
2020-2021	85	91	48	98
2021-2022	49	60	46	61
2022-2023	72	125	80	78
2023-2024	118	174	17	13

Therefore, the current study is interested in understanding the behavioral intentions of Saudi female students toward using laptops in their learning stages.

Saudi Female Position Toward Technology in Education

Technology enhances the educational process where teachers can employ it correctly to efficiently transfer content to students. Information and communication technology (ICT) is designed to assist people in developing their skills and knowledge while using technology; these include communication apps and search tools. Digital literacy also means understanding how to use technology, including hardware and software, in all fields to accomplish goals and to evaluate online resources to know the accuracy of information (Connor et al., 2014). From these definitions, the user experience is essential to knowing his/her skills towards technology and how to use it correctly. To illustrate, in the educational process, we cannot use any type of media or digital tools without knowing the students' skills with technology because of the digital divide and the quality of resources to transfer the content or how to employ and use the technology to serve them effectively to achieve their learning goals. This aligns with Bajabaa (2017) who stated that "… this divide is not only about those who have access to technology and those who don't, but instead it is about the effective use of technology" (pp. 101-102). Therefore, the ICT competency framework focuses on the attitude and digital skills of learners as well as teachers, digital media and information literacy, and how to correctly use technology in the educational process based on the educational environment and goals. Therefore, stakeholders and decision-makers in education rethought the importance of teachers' and students' digital skills. They should have skills and knowledge, relating to cloud storage, social media, web editing, image editing, videos using multimedia programs, and presentation software. If teachers have digital skills already, they can use 21st-century teaching strategies effectively, such as flipped classroom models, gamification, cooperative learning, and so on. Also, students can positively employ these technologies in their learning. Therefore, the evaluation of ICT users is essential in education to make the educational process meaningful and without gaps to accomplish the desired goals in the learning process.

Saudi women have a positive attitude toward using technology in their education and lives. For example, according to a report issued by the Communication, Space & Technology Commission in 2023, the percentage of females using the Internet in Saudi Arabia in 2022 reached 55.2%, while the percentage of males was 45%, with an average of more than seven hours per day (Communication, Space & Technology Commission in Saudi Arabia, 2022). Saudi women have a passion for developing their knowledge and seeking information from different places via the Internet to contribute to improving and building the community. Moreover, the Internet allows Saudi women to view other cultures in Western and other places in the world (Aleissa, 2017). Also, believing in the importance of the voice of Saudi women, they prefer to use the Internet to share their voice over social media. Robinson (2014) stated that social media gives Muslim women space to share their experiences, issues, and voices with the world. Therefore, according to the study of Al-Saggaf and Simmons (2015), the voices of Saudi women were prominent and influential in discussions and public forums via the Internet. They were characterized by confidence and courage in expressing their opinions and sharing their experiences and skills in scientific discussions.

For example, in Jeddah City, Saudi Arabia, Kamal (2012) discussed the factors that enabled implementing technology-assisted project-based learning (PBL) based on the teachers' practices in Tatweer Jeddah schools. The researcher used a mixed method to collect data from teachers (male and female), and out of 710 responses, there were 640 valid responses. This study discovered that teachers have positive perspectives toward using technology in the education process; however, the findings of this study showed that gender is one of the main factors toward their role in PBL practices. Males have a distinct learning environment and better opportunities than females to develop their roles to improve teaching methods by integrating technology. Females expressed their need for professional development towards integrating technology effectively, and also because of the increased teaching load faced by female teachers, which has caused an increase in the gap towards their roles toward PBL compared to males. Kamal (2012) suggested that all teacher development programs should be re-evaluated to align with their needs rather than setting programs that fit the general goals. Thus, these programs will have intrinsic values that positively benefit learning environments. He also suggested allowing these courses to be held inside schools, especially for females, which makes the application of these courses directly within the learning environment.

Another study by Masmali (2020) in middle and secondary schools in Saudi Arabia followed a mixed-method approach that focused on exploring teachers' concerns about adopting the Future Gate Learning Management System. Future Gate (LMS) is one of the programs under Tatweer Educational Technologies (TETCO) to develop the quality of education in Saudi Arabia and serve the new vision (2030). The results found that rates of the mean of female concerns were (*M*=4.40, *SD*=1.01) higher than males in the adoption of this Future Gate (LMS) project in their schools. There were three main points:

- Internet access in school. The percentage concern of females was 12.5% and for males was 7.8%,
- Availability of technology and equipment in schools. The percentage concern of females was 9.8% and for males was 8.4%, and
- Student's experience toward using Future Gate (LMS). The percentage of concern of females was 6.19% and for males was 7.8% (Masmali, 2020, p. 149). Based on these results, females still need to implement technology effectively in the educational environment.

Moreover, in the qualitative study, Alhamadi (2017) conducted a case study of six graduate Saudi students of both genders in different United States universities who have high follower numbers on their social media accounts to examine the extent of social media's influence on their lives, especially in education. Alhamadi (2017) utilized Vygotsky-based social constructivism as the theoretical frame to analyze the data and frame the findings into the main themes based on the participants' experiences with using social media. In this study, female participants expressed that social media is one of the best channels to share their voices and knowledge about the culture and educational content, and it allows them to contact others effectively through social platforms. For instance, one of the female participants shared her experience of using social media in her learning process, where she used "Instagram's live video feature" to efficiently transfer content to her students when she was away from the university because of a conference (Alhamadi, 2017, pp.104-105). Additionally, this study revealed that females preferred using social media in their daily practices, because "social media allows both men and women in the KSA to express their problems and rights” (p. 116), and the researcher continues that the effectiveness of social media "... brought opportunities to the KSA in terms of communication, freedom, knowledge, and entertainment" (Alhamadi, 2017. p. 118). Alhamadi (2017) recommended that the KSA Ministry of Education benefit from social media in the educational process by setting comprehensible and transparent regulations and goals to serve its vision of adapting and merging technology usefully.

Additionally, in the same year, Alsharidah (2018) conducted a 2017 study focusing on Saudi female Islamic teachers' attitudes toward employing Information and Communication Technology (ICT) in their teaching practices. The electronic questionnaire was distributed to 84 female teachers in intermediate and high schools in Wadi Aldawasir; 74 participants responded. The results of this study revealed female teachers' willingness to use the technology. To illustrate, the results of this study indicated that 88% of female teachers emphasized the importance of utilizing technology in the educational process to enhance teaching and to efficiently engage students in the activities during lesson time. Moreover, the results of this research showed that 81% of participants, expressed the need for training programs that focus on how to effectively integrate technology into the educational process. Alsharidah (2018) emphasized that the Ministry of Education must provide programs focusing on using electronic devices and software to prepare teachers for anticipated challenges and technical developments they will face. Also, the school administration must provide all technical tools, such as smart boards, laptops, iPads, etc., and ensure they are used effectively, facilitating the educational process. Although this study is limited in the number of participants, it adds value by sharing the expression of Saudi female teachers' experiences toward using ICT in the educational process and encouraging researchers to find appropriate solutions to make the academic environment more dynamic to achieve the 2030 vision.

Furthermore, the Saudi government has sought to reduce the gap many women face in completing their learning by launching the E-learning project to make the educational process very flexible and to make it unnecessary for them to travel to university campuses (Alkhattabi, 2016). However, there is still a need for Saudi females to effectively employ technology in higher education. Two reasons for the dilemma that women face in the educational environment are the shortage of female Saudi faculty members and the dependence on closed-circuit television (CCTV) as a solution to the style of communication. (Alasmari, 2020). According to Saudi customs and traditions, two-way audio and video communication is the most appropriate way for Saudi female students and male instructors to communicate and to engage with them in the field of education (Alahmari & Amirault, 2017). Moreover, another study by Naaj et al. (2012) showed that the channels were effective tools, as female students taught by male professors using CCTV achieved better scores compared to their peers who were taught by women professors. Additionally, Alomar (2018) contacted the study to examine how effectively technology was utilized to transfer educational content in gender-separated classes in Saudi Arabia. The researcher followed a mixed-methods study approach at two different Saudi universities in the Qassim region, Qassim University and Alfisal University, where male faculty members teach female students. Female Saudi students from various classes participated. The findings of this study showed that closed-circuit television (CCTV) and ethernet based videoconferencing (VCR) configurations were less effective modes in gender-separated classes at Qassim University. However, the Internet based videoconferencing (VC) configuration observed did not have more technical problems, and it is more efficient in their classes for transferring content. At Alfaisal, it found that partitioned face-to-face classrooms in small-sized classes contributed to enhancing the educational process. In contrast, double-deck classes were less efficient during the learning process, because female students felt remote and detached from their professors. Therefore, the researcher determined that we need professional development, especially in designing female classrooms, by employing the latest technologies to make the educational process dynamic. Also, female students' technical skills should be developed to maintain the quality of the educational process as planned in case of technical failures during the educational process (Alomar, 2018, p.171). Alomar (2018) concluded with this recommendation that "Efforts should be made to keep up with the latest innovations in educational technology to provide female students and male professors with an optimized educational experience" (p.172).

Another dilemma is that men have more authority than women in higher education, which gives male faculty more access than women to new technologies in their training and educational process. (Al-Sarrani, 2010; Kamal, 2013; Omar, 2016). For example, Al-Sarrani (2010) conducted a study titled *Concerns and Professional Development Needs of Sciences Faculty at Taibah University in Adopting Blended Learning*. The researcher used mixed methods (quantitative and qualitative) to examine the faculty members' attitudes and concerns toward blended learning (BL) in the educational process in the biology, physics, and chemistry science departments at Taibah University (n=148; the percentage of response rate was 58.8%). Al-Sarrani (2010) employed the theoretical framework, which is the "Concerns-Based Adoption Model" (CBAM), to discover the relationship between faculty concerns and attitudes toward BL according to some contextual factors—age, gender, country of graduation, content area, academic rank, and experience of faculty in the teaching process. Also, he selected technographic features in his study, which included the faculty's perspectives on employing technology in the teaching process in the science curriculum, and professional development related to using technology (pp. 31- 38). The results of this study were positive, with roughly 90% of the responses of faculty members at Taibah University supporting the use and merging of technology resources in the teaching process. However, Al-Sarrani (2010) found that female faculty had more concerns than male faculty about integrating BL into the educational process, because they still need professional development to effectively use the technology resources in their courses. Also, Al-Sarrani (2010) mentioned another concern for female professors, based on their comments in the open-ended questions, is that there is no equality in access to basic technological facilities compared to male college professors. Therefore, we need more applications with the latest technology in female higher education. The gender gap in higher education in Saudi Arabia is still a significant issue. To illustrate, Kamal (2013) and Omar (2016) conducted similar studies in two different universities in Saudi Arabia that focused on discovering the apprehension of the faculty to accepting online learning in the educational process. The essence of their findings was that female faculty members in two universities (King Abdulaziz University and King Saud University) experience challenges accessing technology and training, unlike male faculty members in Saudi universities. Kamal (2013) emphasized that the university stakeholders need to hear the female teachers' voices and open the doors to carefully listen to their requirements, opinions, and backgrounds toward adopting and applying technology in education.

Moreover, Omar (2016) stated that women participating in the study expressed a more serious concern than the male participants, because female faculty members are less involved in the adoption or launch of technology and online education at King Saud University. Female faculty members are more interactive and focused on the online teaching process using the best information and resources. To reduce the gender gap in the adoption of technology in the educational process, Omar (2016) stressed encouraging the participation of Saudi women in higher education decision-making in the launch of technology and training.

Similarly, Alsuelmi (2021) conducted a survey of 122 faculty members at Princess Nourah University (PNU) and Qassim University (QU) in the Kingdom of Saudi Arabia to explore their opinions on the importance of distance learning. The results of this study were positive; 78.9% of the faculty members prefer to deliver the content online. Also, 62.6% of the faculty members were interested in discussing the importance of distance learning. Moreover, this study revealed concerns about employing distance learning by gender, especially females, by "one-way MANOVA on Lamabda" (7, 59) = .742, $p > .05$) (Alsuelmi, 2021, p. 50). Based on that, Alsuelmi (2021) stated that "...studies conducted in Saudi Arabia and in Arabian Gulf countries found that gender does have a significant relationship. This might be due to cultural differences or the amount of support provided to male and female faculty members" (pp. 68-69).

This is what is being done in the Kingdom of Saudi Arabia to empower Saudi women in all government sectors, including education. For instance, a royal decree was issued in November 2023, appointing Dr. Nawal Mohammed Alrasheed as president of Taibah University (Taibah, 2023). She is the first Saudi woman to hold this position, which reflects the goals of the Kingdom's vision of empowering women in decision-making in the field of education. Moreover, this issue makes us realize that previous studies are deficient in discussing the use of technology in higher education, especially in the section of female employees and female students. Thus, the current study seeks to predict female students' desire toward using mobile computer devices in their education. This study will contribute to the framework of technology legislation in an advanced and equal manner in higher education. This is one of the goals of the vision of the Kingdom of Saudi Arabia 2030.

Mobile Computer Devices in Higher Education

Overview of Mobile Computer Devices

Interest in and publication of research on integrating mobile learning into the educational process began in 2000. For example, Sharples (2000) published an article in the April 2000 issue of *Computer and Education* where he discussed the possibility of utilizing technical designs in mobile devices to enhance learning programs and increase opportunities for adults to continue their educational process. Based on Sharples's article, between 2002 and the present, the term mobile learning "M-learning" has become increasingly popular and familiar (Badwelan et al., 2016). Therefore, researchers in educational technologies began to focus on studying all aspects of mobile learning and how to correctly employ it in the educational process. It is still in development in mobile computer devices and integrated into the learning process to raise the comprehensive understanding of how to correctly employ these devices in the educational environment by training teachers, faculties, and students in the implementation of mobile learning in education. (Pedro et al., 2018). Thus, mobile computer devices are used in several ways in modern teaching technologies that serve the goals of educational institutions in improving the quality of learning (Behera, 2013).

Over time, many scientists in different fields have highly recommended that mobile technology be employed in educational programs. Several studies discussed (Montreux et al.,2015; Ismail et al., 2013) merging mobile computer devices into classrooms and found that mobile technology helps students be active and creative in the learning environment. This indicates mobile computer devices' play a significant role, especially in their lives and academic progress. From the perspective of students, learning via laptop devices enables flexibility as they learn and develop their skills at anytime and anywhere taking advantage of all the capabilities and privileges these devices offer to effectively achieve their educational goals (Jaradat, 2014).

Many studies emphasize that mobile phones and applications, including social media, support and benefit students in practicing their learning. In other words, mobile apps enable students to effectively and efficiently access digital resources, such as educational images, videos, and texts at anytime and anywhere to enhance their learning (Alwaely, 2018). Similarly, research confirms that mobile learning is vital for education. This makes it easy to integrate mobile learning, and socialization is very adequate at using alternative ways to increase motivation and keep students' attention. Mobile learning is better and more effective in an educational environment. "M-learning can be summed up in one phrase: providing learning aids through mobile devices" (Badwelan et al., 2016, p. 13).

Based on the overview of mobile learning and the advantages of mobile computer devices in the educational process, mobile computer devices can be defined as portable devices that contain memory, a wireless connection, and a processor, which helps learners to communicate with others and access information sources easily at any time and any place. Mobile computer devices take many formats based on shape and style, such as iPads, iPods, smartphones, and tablet PCs (Hu & Garimella, 2014).

Mobile Computer Devices' Importance for Higher Education

Mobile technologies (tablets, laptops, and mobile phones) are quick sources for information and communication, offering easier handling and easy access to anywhere at any time. Networks lead to eliminating temporal and spatial dimensions relevant to time and space, respectively. Moreover, these technological advancements are prompting various educationalists to make radical changes between teachers and students and, therefore, to the nature and status of schools or schooling rather than social norms or expectations. The use of this hand-to-hand mobile technology in the classroom is recently evolving, having much potential. This technology can transform the educational field by focusing on specific designs and implementations relevant to society and cultural learnings. However, the design, application, and implementation of this technology poses significant challenges to the socio-cultural technological context of educational learning and teaching. It is equally popular in all areas of the world, from lower to higher levels of education. Domingo and Garganté (2016) suggested two major impacts of using mobile technology in the classroom: improved levels of knowledge and increased levels of interaction during activities inside the classroom. Also, selecting specific apps related to learning activities has greatly enhanced teachers' perceptions and learning processes. The coupling of teacher cognition with these technological advancements will further improve teaching/learning practices in the classroom.

Mobile learning has several advantages which have led to its spread and increased number of users in education worldwide. One of the advantages that laptops enjoy is the ease of use and portability in any place compared to desktop computers. Moreover, one of the essential advantages of mobile computer devices in the educational process is enriching the academic context (MacCallum & Jeffrey, 2009), such as using educational applications/platforms that aim to develop and enhance students' skills in all fields. For example, at Western State University in Indiana, Bose and Lowenthal (2016) conducted a qualitative study to integrate mobile devices into the classroom with 8 teachers in different disciplines: Mathematics, Educational Techniques, German Language, Elementary Education, History, and Literacy. The goal of this research was to develop instruction methods by enabling faculty members to use innovative mobile computer devices, such as tablets and mobile devices in the educational process. The results of the study stated that faculties used these devices to enrich the educational content by creating and communicating dynamic content in compelling ways commensurate with students' abilities. This approach increased digital fluency, interaction, "active learning," and communication among students. Also, the level of students preparing assignments was more positive than before. The study recommended enabling and supporting faculty members in universities to effectively use laptops, whether in face-to-face teaching or distance education, by providing training programs on how to efficiency employ these devices in serving the educational process and benefiting from all applications to achieve educational goals.

Mobile technology divides teaching into two categories: Innovative teaching and Instrumental teaching. Innovative teaching attempts to revolutionize the teacher-centered approach to the learning-centered approach by modifying the teaching plan or strategies. They can revolutionize their lesson plans according to mobile device technology. However, Instrumental teaching can use technology as a "book behind a glass." The prominent distinction between these two groups will have a great influence on the learning process of students. The shift of the old teaching practices with this mobile technology can bring a new, exciting environment and create interactive learning with a heavy media-rich approach. Montrieux et al. (2015) have elaborated on this aspect of learning and teaching practices by bringing innovations to the educational field. The policymaker further facilitates innovative technical or pedagogical efforts to enhance the teaching/learning practices to their full potential.

A paper titled *Integration of Mobile Computing into Computer Sciences and Engineering Curriculum* by Minaie et al. (2011) discussed the importance of the role of mobile computers in the educational process to enhance the excitement of learning in higher education. It dealt with three aspects of mobile computing devices, namely smart devices, tablets, and applications available on mobile devices. First of these aspects is communication issues in infrastructure networks, communication properties, protocols, and data formats. The second aspect is the components of mobile devices. The third aspect discussed the characteristics of innovative device applications in the educational process. This study concluded that these devices have advantages and are the opportunity to be integrated into the curricula of computer science and engineering programs to enhance distinctive ways of teaching and learning.

Mobile technology provides flexibility and ease to everyone in any learning environment, especially in higher education. Due to its relatively low cost and easy access, it is affordable, even for those who cannot afford desktops, computers, or laptops. On the other hand, students can be more innovative and motivated using mobile technology according to their interests and career. Therefore, the participation of students and teachers will be more proactive and reactive by using mobile devices in and outside the classrooms, based on their specific curriculum. They can also easily share their learning experiences at local, national, or global levels. For instance, Gikas & Grant (2013) did a qualitative study on the students' perspectives on mobile computing devices and the role of social media on their learning. This study was conducted with nine students from three different universities and disciplines in the United States -Costal College (North Carolina), Lakeshore University (South Carolina), and The University of Northbrook (Great Lakes). In this study, they allowed teachers to use portable computing devices such as smartphones and tablets, in their courses for two semesters. The researchers used focus interviews to collect data from students. They found that the students' attitude towards these devices was distinct and positive, as it enhanced their skills in creating scientific content that serves their specializations using Web 2.0 tools. Also, social media contributed to raising the rate and efficiency of communication between students for the purpose of learning to effectively complete their projects and assignments.

Similarly, Liu & Tasi (2013) conducted a study on how augmented reality (AR) mobile learning materials can help learners improve academic research at the University of Taiwan. They used mixed methods to collect data from five undergraduate English major students registered in a college English Composition course in 2011. Data collection in this paper is based on student essays and reflection with the combined assistance of open-ended questionnaires on their mobile learning. In a short time, students were able to use the most descriptive words in their academic essays in the English language.

Additionally, Sophonhiranrak (2021) used a systematic review to examine studies (quantitative methods, qualitative methods, and mixed methods) published from 2006 to 2018 that discussed mobile learning in higher education. This study focused on analyzing the advantages, disadvantages, and challenges of mobile learning that may negatively impact the learning process based on previous studies. The review of this study revealed that mobile computer devices can be used as the primary tool in academic tasks, such as submitting assignments and developing students' skills by platforms or apps that make the learning process more active and effectively portion their experiences and ideas with their peers. At the end of this study, the author discusses three aspects that should be attended to while utilizing mobile learning as the primary approach in the educational process: educators, students, and learning management readiness to accept the m-learning approach and provide the necessary support at any time. Although this study was limited to focusing on studies published in English, it proves the vital role that mobile computer devices play in learning.

Self-efficacy of technological leadership should foster an efficient manner at various stages. Administrators and faculty members should work and promote technology to improve workflow and teaching/learning practices. For example, the initiative of providing iPads or tablets can further enhance the teaching/learning process and evaluations in addition to facilitating administrative tools such as memos and calendars, etc. The use of these devices can further impact the professional image and motivation among students and teachers in an attractive, enjoyable manner. Mobile learning also provides a video or photographic-based colorful approach to learners as instructional technology. Combining a portable DVD player and other technologies can be used to teach some skills to learners as well. The shift of technology from optical media towards a smaller mobile device technology has revolutionized the whole concept of the learning process rather than just sitting in front of a TV or computer. Educators can use a single material to demonstrate all the steps needed for their teaching tasks by increasing the fidelity and skills (Ayres et al., 2013). Mobile computer devices can be appropriate for all learners. They may have limited access to technology at home; however, they can use their smartphones to access these lessons and follow their teachers using educational platforms or some apps. Overall, mobile learning opens up horizons for students and expands their awareness developing their knowledge and skills because mobile learning is flexible and appropriate.

The Importance of Mobile Computer Devices for Higher Education in Saudi Arabia

According to previous studies on the importance of integrating technology, especially laptops, into the educational process and the positive results it provided at the level of academic programs in terms of student interaction and improving their scientific and practical skills in all disciplines, this is an indication of the investment of universities around the world to reconsider and think about how to efficiently integrate these devices into academic programs. Therefore, several current studies examine the acceptability of students and faculty members with a mobile learning approach (Badwelan et al., 2016, Alasmari, 2020, Alturise et al., 2021).

The Kingdom of Saudi Arabia has sought to finance and encourage e-learning and to dynamically launch it in Saudi universities. The National Centre for E-Learning and Distance Learning (NCELDE) project launched by the Ministry of Higher Education in 2010 focuses on effectively activating e-learning in all Saudi universities (Alasmari, 2017), Distance Learning Management System (LMS) in all Saudi universities, the College of Medicine at Qassim University, and is considered the first Saudi university to launch learning with mobile devices (Adkins, 2011). Interest in learning via laptops has grown in Saudi Arabia recently, especially during COVID-19 (Alturise et al., 2021). This reflects the rapid development that the government is witnessing in prompt wireless communication and technical progress.

Additionally, many universities and government institutions in Saudi Arabia invest in learning via mobile devices, including King Saud University, King Abdulaziz University, Electronic University, and Taibah University, etc. (Badwelan et al., 2016), which is in line with the goals of Vision 2030. To illustrate, Saudi Arabia has a vision (Vision 2030) to develop all programs in all fields, including education. In conjunction with the vision of the Kingdom of Saudi Arabia to integrate technology in education, especially mobile devices, there is still a limited number of studies and research on the acceptance and application of mobile devices in the educational process. In short, "the tablets and smart phone devices became more convenient for higher education students because of to provide many of fundamental requirements to deal with these devices in the universities" (Badwelan et al., 2016, p. 14).

In the next section, some previous studies will be shown regarding using mobile computing devices in higher education in Saudi Arabia.

Previous Studies on Mobile Computer Devices in Saudi Arabia

Mobile computing devices have gained much attention in Saudi universities by integrating mobile learning into the curricula. There are still some challenges and further improvements for integrating knowledge using mobile computing devices to be an effective educational process (Yusuf, 2013). The study of mobile technology in contemporary literature focuses on the importance and role of technology in education. To date, there is still a shortcoming in Saudi studies that focuses on knowing the acceptance of these devices by teachers and students in the learning process and the extent to which they benefit. One of the first studies that focused on discussing the general context of learning through mobile devices in the Kingdom of Saudi Arabia was by Chanchary and Islam (2011). The goal of this study was to explore the perspectives of 131 students about their acceptance of the integration of these devices in their work process and the effectiveness of teaching guidance on students' level. Students' responses and interactions were positive towards integrating technology into the educational process, as it contributed to changing the climatic atmosphere of the education process, which contributed to improving their scientific level and developing their skills.

In contrast, some limitations (factors) were identified by researchers to measure students' acceptance of these mobile computer devices in the learning process, including battery life, memory size, processor performance level, and the different operating systems of these devices. Many students emphasized that there are some obstacles or limitations while using these devices, such as small screen sizes (which were not appropriate and comfortable for the learning process) and the incompatibility of the operating systems for these devices in downloading and following the curricula. This contributes to a decrease in the quality of learning and thus to the lack of accreditation—learning with mobile computing devices from a learning perspective.

However, mobile computing devices' applications play an essential role in the learning process in higher education in Saudi Arabia, especially during the COVID-19 pandemic. For example, Almaiah et al. (2022) conducted a study to examine the factors to adapting M-learning by using the TAM Model. They surveyed 520 undergraduate and post-graduate students from four universities in Saudi Arabia: King Faisal University, King Saud University, King Khalid University, and Dammam University. They found that students accepted the adaption of M-learning in their education. Students' acceptance of these devices in this study was affected by several factors, namely the support of senior management, awareness, and infrastructure of information technology.

Similarly, another study by Jaradat (2014) did a mixed study (quantitative and qualitative) on 39 French language students at Princess Noura University in Saudi Arabia to understand the students' positions toward mobile computer devices in practicing reading skills within the course. The analysis in this study focused on understanding the attitudes and opinions of female students towards learning via mobile devices through a pre- and post-test. The results indicated that learning by means of mobile computer devices contributed to enhancing the level of students' performance in the reading skill of the French language and dynamically practicing it in the classroom. The researcher concluded that the learning system could be adopted via mobile devices, because it enhances the cause of student interaction and improves their educational experiences by permanent practice and review of information at any place and at any time; flexibility is the main advantage that characterizes these devices.

Another similar study was carried out in 2020 by Almogheerah, titled *Exploring the Effect of Using WhatsApp on Saudi Female EFL Students' Idiom-Learning*, using the Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT) to discover their behavioral intentions toward using WhatsApp in their learning. This study followed the experimental design of nonequivalent groups. The researcher divided 70 female Saudi students at level seven in the Department of English Language and Literature at Imam Muhammad ibn Saud Islamic University into two different groups: a control group, which taught them English idioms by traditional methods, and an experimental group which taught them English idioms by WhatsApp based learning activities. Each group consisted of 35 students. A pre- and post-questionnaire was distributed to both the control group and the experimental group. The results showed that the achievement level of the experimental group far exceeded the achievement of the control group, as learning on the mobile device via WhatsApp was facilitated by students practicing the language inside and outside the lecture. Also, the views of the female students in the experimental group were positive and effective in learning common phrases in English via WhatsApp.

According to previous studies, Saudi female students in Saudi universities demonstrated a positive attitude towards learning via mobile devices, without regard to the level of their knowledge of mobile applications. (Almogheerah, 2020; Bin Mubayrik, 2017; Jaradat, 2014; Omer & Almasabi, 2017). On the other hand, Alsanosi (2013) discovered that it is necessary for Saudi female learners to have intensive training through courses held by Saudi universities in the optimal use of these devices in the learning process to benefit from them. In addition, another study by Alomran (2013) stated that there are social and religious factors that limit the use of mobile devices by female students in the educational process for fear of contact between the sexes within schools and universities.

However, with the current development of Saudi society, there is a greater use of mobile computer devices by Saudi female students in their learning stages, and they rely on these devices to complete their academic tasks. Thus, despite the effectiveness of the use of mobile learning (ML) by Saudi female students in higher education, there is still a lack of studies to find out the student's ability to use these devices and their adoption in higher education. For example, Alasmari (2020) conducted a descriptive study to investigate the gap in education between the genders in Saudi universities and the extent of the effectiveness of Mobile Learning Technology (MLT) in closing the gender gap. He collected data from 187 female learners who studied in 13 colleges in Jeddah through the online survey system. The study concluded that female students have a high desire to use mobile devices in their learning. They view the mobile learning system as a practical and constructive approach commensurate with the conditions of the education system in the Kingdom of Saudi Arabia.

With the separation between the sexes, female students communicate with male teachers through some platforms for discussion, obtain academic advice without the need to come to the university campus, and follow up on assignments and academic tasks at anytime and anywhere. Saudi female students also view mobile learning technology as a unique and effective tool for catching up on lectures when they are absent. Moreover, the researcher recommended conducting more studies and research to determine the extent to which Saudi female students accept the use of mobile computer devices and the extent of their implementation on female campuses of higher education in Saudi Arabia.

Alanazi et al. (2023) conducted empirical research on female learners, at level one in Java programming, at Aljouf University in the Computer Science and Information Technology Department, to discover their perspectives and experience toward using the mobile learning approach to learn programming by MoLeCop as a theoretical framework. This study's participants were 42 female students; the researcher divided them into two groups of 21 students each—one control group and one treatment group. The results of this study disclosed the percentage of students' responses who never brought their laptops to their classes in the traditional group reached 81%. The students' responses in the treatment group reached 71%, because the infrastructure was not properly equipped for them to use their devices. This study concluded that students accepted programming for this method and approach in integrating mobile technologies into their programming tasks, as it enhanced their learning. This reflects the positive role of adopting mobile learning in the classrooms as an essential tool in the education process. Finally, Alanazi et al. (2023) stressed in the last of this study that

> … female programming students in higher educational institutes of Saudi Arabia will suffer if m-learning is not formally adopted for them. Thus, it would be in the best interests of Saudi universities to find the right path through official authorization to foster the culture of mobile use for teaching and learning programming (p. 134).

Therefore, the current study focuses on Saudi female students at Taibah University to know their acceptance of mobile computer devices in their learning. Its goal is to make a substantial addition to the literature on integrating mobile devices into the educational process in higher education.

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

Background of the (UTAUT) Model

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a research model used for assessing individual acceptance. It is a combination of eight theories and models: Theory of Reasoned Action, Social Cognitive Theory, Technology Acceptance Model, Model of PC Utilization, Theory of Planned Behavior, Motivational Model, Combined TAM and TPB, and Innovation Diffusion Theory (Venkatesh, 2003). The first type of theory is the theory of reasoned action (TRA). It was established in 1975 by Ajzen and Fishbein, and developed later in 1980 (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). This theory focuses on factors/reasons that contribute to shaping the person's behavioral intention toward a given situation, which in turn affects the behavior and decisions of the individual. This theory is the basis for technology acceptance models in different fields, especially education (Davis et al., 1989). The theory links the individual's attitudes and perceptions to his/her intentions in making decisions, and it thus predicts behavior, either negative or positive, that results in intention.

The second type of theory is social cognitive theory (SCT), established by Albert Bandura in 1986. The theory states learning occurs within a social context by interacting with several dynamic factors, namely, environmental factors, personal factors, and individual behaviors (Bandura, 1986). Compeau et al. (1999) explain that individuals acquire and develop behavior due to their interaction with the social environment and maintain this accepted behavior through thinking about the social environment, which is known as self-efficacy. The third type of theory and model is the technology acceptance model. The purpose of this model was developed to predict the behavior of individuals toward the use of technology. In his doctoral study in 1986, Fred Davis improved the technology acceptance model (TAM) by identifying a couple of factors: a) observed usefulness and b) observed ease of use that led to the individual's acceptance or rejection of using technology in his tasks by merging technology with organizational behavior constructs (Davis et al., 1989; Davis, 1989).

The fourth type of theory and model is the Model of Personal Computer Utilization (MPCU). Thompson et al. developed this model in 1991 to predict the person's behavior toward personal computer (PC) utilization. Thompson et al., (1991) explain that behavior is usually defined by four factors: people's attitudes, their beliefs toward social norms, their habits, and the consequences based of their behavior. Based on their definitions of this model, Thompson et al. identify six principles of technology acceptance in this model: "job fit, complexity, long-term consequences, affect toward use, social factor, and the facilitating conditions" (Alomary & Woolard, 2015, p. 2). The fifth of these theories and models is the Theory of Planned Behavior (TPB). The aim of the design of this model was to expand upon some of the flaws of TRA, developed by Ajzen in 1991. He added a limiter to control the perceived behavior of intent. This theory examined several factors—subjective standards, attitudes faced by the individual, perceived behavioral control, and intentions over actual behavior. This theory has the ability to predict the behavior of the individual more than the TRA, because it focuses on the obligatory situations (Alomary & Woolard, 2015).

Sixth of these theories and models is the Motivation Model (MM) that was established and applied by Davis et al., in 1992, to know the extent of adoption and application of information and communication technology (ICT) in several areas, especially in education. This model focuses on the fact that people's behavior depends on internal and external motives. Internal motive arises in the person represented by satisfaction and pleasure when performing a task. Otherwise, extrinsic motivation arises as a result of external factors or reasons that motivate a person to do the task. In this model, the use and enjoyment of technology of all kinds are internal motivation factors, whereas the ability to easily use these devices and subjective criteria are external motivators (Davis et al., 1992; Venkatesh, 2000). Therefore, we can say that this model depends on the psychological aspects of a person to accept technology.

Seventh of these theories and models is the combined TAM – TPB model. In 1995, Taylor and Todd developed it. It is "also known as the 'decomposed' theory of planned behavior, because the belief structure is decomposed in this model" (Alomary & Woolard, 2015, pp. 2-3). Eighth of these theories and models is the innovation diffusion theory (IDT) that seeks to thoroughly understand individuals' positions towards innovation and to implement these innovations in their fields. This theory is extended to other fields such as education, marketing, and health. If we want to employ technology in our schools, we can consider this theory. Rogers' innovation diffusion theory (1995) is one of the oldest social science theories. Halton (2023) explained the innovation diffusion theory as "…the pattern and speed at which new ideas, practices, or products spread through a population."

Rogers (1995) explains the concept of the five main stages of the diffusion of innovation theory. When a person is exposed to the presence of innovation in his life, such as smart phones, and learns how to use it; *knowledge* happens. When a person has a positive or negative attitude towards innovation, *persuasion* happens. When a person participates in activities that result in either choosing or rejecting an innovation, *decision* happens. When a person puts an invention into use, *implementation* happens. When a person pursues fortification or encouragement of an innovation-decision and affirms or changes their decision based upon their life's practices, *confirmation* happens (p. 164). The following table summarizes the factors for the eight theories. It was adapted from Venkateshet al., (2003).

Table 2.3. This Table is Modified from Venkatesh et al., 2003, pp. 428 – 432.

Individual Acceptance Theories and Models	Factors
Theory of Reasoned Action (TRA)	○ Attitude toward Behavior ○ Subjective Norm
Social Cognitive Theory (SCT)	○ Outcome Expectations Performance ○ Outcome Expectations Personal ○ Affect ○ Self- efficacy ○ Anxiety
Technology Acceptance Model (TAM)	○ Perceived Usefulness ○ Subjective Norm ○ Perceived Ease of Use
Model of PC Utilization (MPCU)	○ Job-fit ○ Long-term Consequences ○ Complexity ○ Affect toward Use ○ Social Factors ○ Facilitating Conditions
Theory of Planned Behavior (TPB)	○ Subjective Norm ○ Attitude toward Behavior ○ Perceived Behavioral Control
Motivational Model (MM)	○ Intrinsic Motivation ○ Extrinsic Motivation
Combined (TAM and TPB)	○ Attitude toward Behavior ○ Subjective Norm ○ Perceived Behavioral Control ○ Perceived Usefulness
Innovation Diffusion Theory (IDT)	○ Relative Advantage ○ Ease of Use ○ Image ○ Compatibility ○ Visibility ○ Results Demonstrability ○ Voluntariness of Use

Based on the theories and models, in 2003 Venkatesh began to construct the theory of UTAUT to be a reliable measurement tool. The integration of UTAUT in research was to consider the fragmented theory applicable to the personal acceptance of IT solutions. The unified theoretical result takes into consideration these eight specific models as determinants of IT dependency and intent to use. The UTAUT model used enabled the comparison of empirical and conceptual similarities of the integrated models (Venkatesh et al, 2003). This theoretical framework includes four constructs—performance expectancy, effort expectancy, social influence, and facilitating conditions—to discover the learners' behavioral intentions toward mobile computer devices. However, facilitating conditions are not included in the study. Venkatesh et al., (2003) emphasized that the UTAUT model has four constructs (mentioned in chapter one) to contribute predictors of users' acceptance toward using technology.

Previous Studies that Investigated Factors and Constructs of the (UTAUT) Model

The objective of the UTAUT model is to assess users' behavioral intentions toward using technology, especially in higher education. That is, the UTAUT model was developed by merging eight theories to gain a deeper understanding of the users' insights and intentions toward correctly employing the technology in all fields of health care, business, and education by determining acceptance of information technology (IT) and its moderators (Venkatesh et al., 2012). For instance, Pullen et al. (2015) employed the UTAUT theory to discover pre-service teachers' acceptance of the use of mobile computer devices in their teaching in Malaysia. The results were positive in pre-service teachers' acceptance of the use of these devices in the educational process, and they can have an effective impact on the educational environment. This study used three determinants—performance expectancy, effort expectant, and social influence—to predict the behavioral intentions of using laptops in learning. The researchers stated that the mediator variables, such as gender and age, did not cause statistically significant differences in the acceptance of mobile computer devices. The authors also recommended that more research be conducted on different samples.

Additionally, Hsieh and Tsai (2017) used a qualitative approach to investigate the extent of teachers' behavioral intentions to use mobile computer devices in the teaching practice. The authors used structured interviews to collect data from 15 Taiwanese high school teachers. In the analysis data, this study used a themes-coded approach: a) meeting students' desires, b) conducting classes in a dynamic and effective way, c) promoting and stimulating the learning process, d) moving away from the traditional approach in teaching, e) enhancing students' ownership, and f) expanding the scope of learning and its continuity outside the school. The study found that the UTAUT model contributed to the understanding and explanation of the determinants of teachers' intention to use mobile computing devices in teaching. Therefore, teachers believed in the effectiveness of these devices and their integration into the teaching process to increase the level of efficiency and productivity in the educational process.

In contrast, there are a few studies in Saudi Arabia to thoroughly understand the behavioral intentions of students in higher education toward using mobile computing devices in their learning. One of these studies was conducted in higher education in Saudi Arabia by Alasmari (2017). The author used mixed methods to examine the students' behavioral intentions to accept mobile computer devices in their journey of learning using the UTAUT model. The findings indicated that the three determinants—performance expectancy, effort expectancy, and social influence—played a role in motivating the students' behavioral intentions to use mobile computer devices.

Performance Expectancy (PE):

The first primary construct in the UTAUT model is performance expectancy (Venkatesh et al., 2003). This construct has several definitions. Venkatesh et al. (2003) defined performance expectancy as "...the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p. 447). On the other hand, Khlaif (2018) stated that performance expectancy is defined as "the degree to which an individual believes that using mobile technology in classroom instruction is beneficial for teachers and students and assists the teacher to achieve the goals of the lesson and improve his/her performance" (p. 51). The current study uses this definition, which explains the theories of the UTAUT model in terms of mobile computing devices. Venkatesh et al. (2003) emphasized that performance expectancy is the main moderator of behavioral intention to utilize the technological devices.

Several different studies (Alasmari, 2017; Al- Hujran et al., 2014; Al-Hunaiyyan et al., 2018; Alshahrani, 2016; Alturise et al., 2022; Badwelan et al., 2016; Nassoura, 2012; Venkatesh et al., 2003; Wang et al., 2009) used various approaches with various samples and proved that performance expectations played a role in revealing the behavioral intentions of users towards using technology. For instance, Badwelan et al. (2016) employed the quantitative approach to examine students' acceptance of the mobile learning approach in higher education in Saudi Arabia using the UTAUT model. Questionnaires were distributed to 400 students from King Abdulaziz University, King Saud University, and King Fahad University. The results revealed that the performance expectancy determinant was significant in discovering students' intention toward the mobile device-based learning approach, reaching 74.09%, opposed other determinants where effort expectancy reached 53.3% and social influence, 60.6%.

Effort Expectancy (EE):

Effort expectancy (EE) is "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). Based on this definition, effort expectancy is an essential determination that effectively identifies users' behavioral intentions. Moreover, Khlaif (2018) stated that "… effort expectancy can be thought of as the degree to which an individual believes that it is easy to use a device and learn how it works" (p. 51). This definition aligns with the aims of the current research. Effort expectancy is one of the significant determinants in the UTAUT model to understand the users' perspectives toward adopting and accepting the technology (Venkatesh et al., 2003).

Numerous studies have demonstrated the importance of the role of effort expectation and its impact on knowledge of behavioral intentions toward the use of technology (Alasmari & Zhang, 2019; Al-Hunaiyyan et al., 2018; Alasmari, 2017; Al-Hujran et al., 2014; Al-Shahrani, 2016; Badwelan et al., 2016; Alturise et al., 2022; Iqbal & Qureshi, 2012; Pullen et al., 2015). Alasmari & Zhang (2019), for example, followed the mixed-method approach in higher education in Saudi Arabia to examine learners' readiness to use mobile computer devices by utilizing the UTAUT model. In this study, 1,203 qualified undergraduate learners, 591 males and 612 females, took part in an online questionnaire; and 15 students took part in personal interviews. The result of multiple regression for behavioral intentions variance was 52%. Also, the results proved that the expectation of effort was one of the determinants that contributed to predicting and detecting the behavioral intentions of students and their behavior towards the use of mobile computer devices in their learning process. The results were satisfactory and proved effective with the importance of integrating these devices in the educational process, especially, in higher education. (Alasmari & Zhang, 2019).

Social Influence (SI):

Venkatesh et al. (2003) stated that social influence is “the degree to which an individual perceives the importance of others believing he or she should use the new system” (p. 451). Khlaif (2018) also defined social influence as the level to which a person considers their peers when they encourage them to use technology (p. 51). Despite the difficulty and complexity of social influence on the individual, the role of this determinant is vital in revealing the behavioral intentions of users to use and accept technology. Venkatesh et al. (2003) indicate that the determinant of social influence greatly affects the formation of the behavioral intentions of individuals to adopt new technology, especially with women. They are directly affected by the opinions of others, especially when making the decision to accept the new system of technology. Thus, this determinant is considered one of the three important determining factors in this study that will contribute to knowing Saudi female students' behavioral intentions toward using mobile devices at Taibah University.

Further research has validated the significance of social influence on users' behavioral intentions. Findings imply social influence adds to the overall achievement of incorporating technology in the classroom (Al-Hujran et al., 2014; Lee, 2013; Padumadasa, 2012; Pullen et al., 2015). Some research has proven the importance of social influence as a determinant related to users' behavioral intentions. The results of these studies have demonstrated that social influence has contributed significantly to the possibility of adopting and applying new technology in classrooms (Alasmari & Zhang, 2019; Alasmari, 2017; Al-Hunaiyyan et al., 2018; Al-shahrani, 2016; Badwelan et al., 2016; Pullen et al., 2015). However, other studies have proven that social influence did not directly link to users' behavioral intention toward using new technology (Alsulami, 2021; Iqbal & Qureshi, 2012; Alturise et al., 2022). For example, Alturise et al.

(2022) conducted a quantitative study on 272 students at different levels of education in Alrass City, in Al-Qassim Province in Saudi Arabia, where 139 males and 133 females participated in the study to determine the students' acceptance toward the mobile learning approach in education. The study discovered that social influence was not related to the students' behavioral intentions, in contrast to the expectation of effort and performance, self-management, and hedonic motivation, which directly and positively impacted students' acceptance of the mobile learning approach in their education.

Behavioral Intention (BI):

There are unique, comparable definitions of behavioral intention. Venkatesh et al. (2012) explained that behavioral intention is a person's express desire to use mobile learning technology practically in his/her future behavior. Warshaw and Davis (1985) stated that the definition of behavioral intention is “the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior” (p. 214), and this study employed this definition. As Alasmari (2017) defined, behavioral intention is a thoughtful decision that an individual makes to conduct a particular behavior or not.

In the Saudi context, Nassoura's study (2012) is the first study to use the UTAUT model to explore students' intentions toward using laptops in higher education. Nassoura (2012) did quantitative research on 80 students at Al Faisal University, a private university in Saudi Arabia. The study adapted the Unified Theory of Acceptance and Use of Technology (UTAUT) model to examine the students' readiness to use laptops by determining the factors and constructs that impact the behavioral intentions of learners to employ mobile computer devices in learning. The statistical results showed high student acceptance of mobile computer devices and behavioral intentions to use them during their learning. The researcher stressed that there is an urgent need to conduct more research to find out the behavioral intentions of students at several different universities in the Kingdom of Saudi Arabia to promote the projects of the Kingdom of Saudi Arabia in integrating mobile learning into higher education.

Similarly, 623 students and 132 teachers in Kuwait were surveyed by Al-Hunaiyyan et al. (2018) to discover their views on the extent of the effectiveness of mobile computing devices in teaching and learning. The results showed that both teachers and students were aware of the importance of mobile computer devices in the educational process. They had positive views towards these devices. (Al-Hunaiyyan et al., 2018). The variance of acceptance to adopting social media in learning is roughly 71.80% of the teachers and 67.90% of the learners. Also, students believe social media is essential in their learning process, as it enhances their communication skills with their teachers and peers. The teachers expressed their regret that external barriers made it harder to use these mobile devices for educational purposes in the classrooms, such as cultural and social barriers. However, they had a positive impression of integrating technology into the educational process.

The studies in the literature review discussed some challenges that female employees, including teachers, faculty members, staff, and students, face in enabling the use of technology in educational institutions, such as universities and schools. The studies also presented the general views of Saudi women regarding the importance of technology in their education and lives, which have been largely positive. Therefore, faculty members and teachers are among the pillars that directly influence learners' willingness to use technology. Previous studies showed a need for more studies to reveal the acceptance of mobile devices by Saudi female students in higher education in the Kingdom of Saudi Arabia, which is the first step in applying technology in the educational environment to make it more efficient. There was a gap in previous studies that did not focus particularly on Saudi female students. Therefore, this study could add literary value in the educational technology field to know the behavioral intentions of these Saudi female students at Taibah University towards using these devices in their learning.

Chapter Summary

The literature review for this study discussed the history of educational technology in Saudi Arabia, including the emergence of the Internet in higher education, the integration of E-learning in higher education, and the attitudes toward using technology in higher education in Saudi Arabia. Also, it dealt with Saudi computer science females and technology. Using current related studies, the literature review covered mobile computer devices in higher education, especially in Saudi Arabia. In addition, the literature review provided an overview of the constructs of the UTAUT. Finally, this chapter included a review of the literature covering the variables of the UTAUT model (performance expectancy, effort expectancy, and social influence) to predict users' behavioral intentions toward using technology. Chapter three will discuss the methodology that the study will follow, such as the research design, variables, research setting and participants, the data collection procedure, ethical procedures to protect the participants, the survey instrument, procedures for ensuring the reliability and validity of data, and the data analysis.

Chapter 3 - Methodology

In this chapter, the researcher describes in detail the methodology used to conduct this quantitative research. The purpose of this study is to predict the behavioral intention by Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to use mobile computer devices for learning purposes, based on selected constructs of the UTAUT model (performance expectancy, effort expectancy, and social influence). The researcher will discuss the following methodology: research questions, research design, variables, research setting and participants, data collection procedure, ethical procedures to protect the participants, survey instrument, procedures for ensuring reliability and validity of data, and data analysis.

Research Questions

1. To what extent does performance expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?
2. To what extent does effort expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?
3. To what extent does social influence predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

Based on the research questions, the researcher developed three hypotheses to test in this study:

H_0 1: There is no relationship between performance expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 2: There is no relationship between effort expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 3: There is no relationship between social influence and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

Research Design

Quantitative research is a theoretical deductive method for collecting numeric data. Therefore, researchers utilize quantitative research methodologies to predict the specific connection and effect between independent variables and a dependent variable, which is the procedure to be followed in this study (Creswell & Guetterman, 2019). Consequently, the research design suitable for this study is a survey research design. The researcher selected a survey research design to conduct this study based on some insights provided by Creswell (2014): (1) The survey research design is an empirical research method that allows researchers to measure an individual's beliefs, opinions, and actions on a trend or problem. (2) If the research design is applied, the transversal analysis of the shared correlations between the variables is possible to statistically analyze the data to answer research questions or to test hypotheses. (3) These tools often generate useful data in a short period of time with a reasonable level of personnel and material investment. To use a large target audience in the study, the quantitative approach contributes to generalizing the results based on the sample results of the population through statistical indications. Therefore, according to the cultural context, especially dealing with Saudi female students, the quantitative approach is appropriate for this study and feasible to implement rather than qualitative research by conducting interviews or using a qualitative survey (Al-Sarrani, 2010; Alghamdi, 2017; Bajabaa, 2017). This study intends to examine behavioral intention and how it relates to the independent variables (performance expectancy, effort expectancy, and social influence). Therefore, in the present study, the survey design used to investigate how the constructs (performance expectancy, effort expectancy and social influence chosen from the UTAUT model) predict the behavioral intentions of Saudi female students in Saudi Arabia to use mobile computer devices in their learning.

Variables

The proposed research study focused on predicting the behavioral intention of Saudi female to learn with mobile computer devices based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT). Venkatesh et al. (2003) developed the UTAUT model and introduced four critical elements of the UTAUT conceptual framework: effort expectancy, facilitating conditions, performance expectancy, and social influence. However, the element of facilitating conditions was not considered in the research at hand, as it does not have a direct relation to the students' behavioral intentions. Using mobile computers is still in its preliminary stages in the education system in Saudi Arabia; therefore, the current study used behavioral intention as a dependent variable and exclude usage behavior. Venkatesh et al. (2003) also encompassed specific moderators, including experience, age, gender, and volunteerism. In Saudi Arabia, students in higher education are roughly the same age, and their experiences with technology have no significant variances (Alshahrani, 2017; Mtebe & Raisamo, 2014).

Therefore, the study at hand excluded four moderators (gender, involuntariness, age, and experience) from the analysis of behavioral intention.

Figure 5 explains the model built for this study to theoretically demonstrate the behavioral intention of female Saudi students to utilize mobile computing devices in their learning journey.

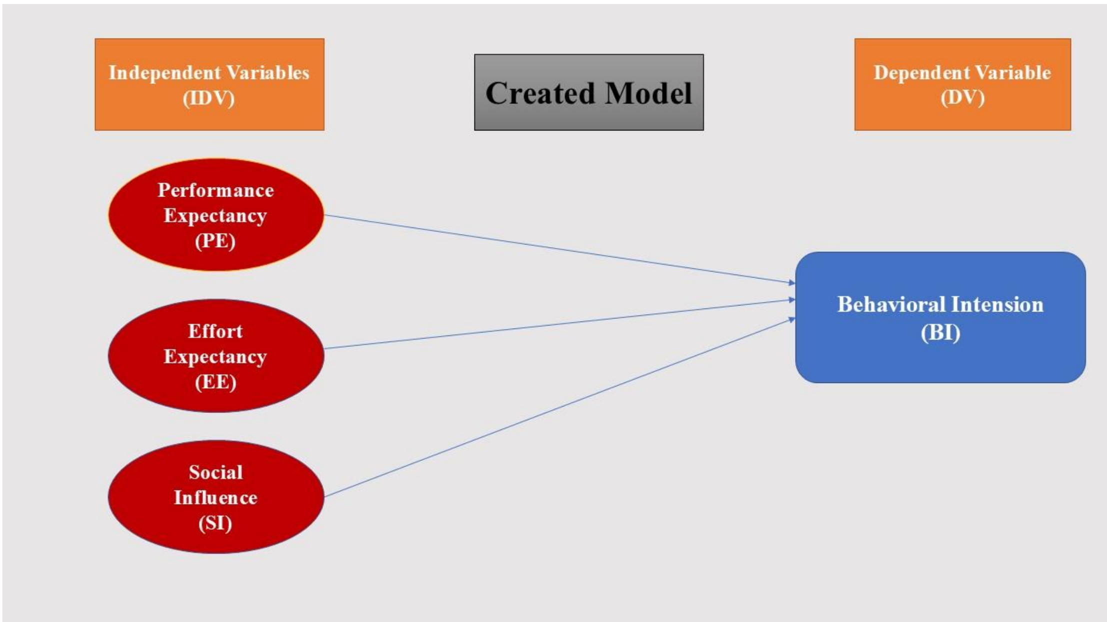

Figure 3.1. The researcher modified this model from Venkatesh et al., 2003, p. 447.

Research Setting and Participants

The research conducted at Taibah University, which is located in the west of Saudi Arabia. The study focused on female students in the College of Computer Science and Engineering at the university. Taibah University was established in 2003 and is a Saudi public university located in Medina, western Saudi Arabia. Taibah University merges two branches—Imam Muhammad bin Saud Islamic University and King Abdulaziz University after the royal decree in 2003. These branches were merged to be an independent public university, named after one of the names given to Medina, which is Taibah. At Taibah University, male and female students are educated in separate classrooms.

This study aims to target female students in all fields at the College of Computer Science and Engineering. As mentioned in Chapter Two, the College of Computer Science and Engineering was one of the core colleges of Taibah University after the Royal Decree establishing Taibah University in 2003. In 2016, it received continuous support from university officials based on the royal order to restore and restructure the university. Therefore, the College of Computer Science and Engineering is one of the essential colleges with the best of luck, with support from university officials aimed at achieving high-quality goals by launching competitive global programs to prepare graduates of this college for all technical challenges in the labor market (Taibah, 2024c). This is one of the most important goals to be achieved by the College of Computer Science and Engineering, which aligns with the vision of the Kingdom of Saudi Arabia (Vision 2030). The College of Computer Science and Engineering consists of four majors for females: Computer Science, Information Systems, Artificial Intelligence and Data Science, and Cybersecurity (Taibah, 2024c). The College of Computer Science and Engineering at Taibah University roughly has an average of 400 to 500 female students.

Sampling Strategy

The sample design of choice is convenience sampling. Convenience sampling enables the selection of respondents based on their availability and voluntariness to participate in the research (Creswell & Guetterman., 2019). The research strategy seeks female respondents at Taibah University and who are available to participate in the study.

Sampling Size

The perceived sample size was determined with the use of G*Power software. The sample size ideal for the calculation of multiple linear regression analysis, with α= 0.05, and an assumption moderate effect size of 80%, shows there should be at least 77 participants to ensure that the research is reliable (See Appendix A). As a means of optimizing the potential sample power and size, the instrument was distributed to all female students at Taibah University. To conduct multiple regression analysis, 134 female Saudi students participated in this study, more than the sample size specified by statistical G * power analysis. The number valid responses were 127.

Data Collection Procedures

The researcher followed four main steps to collect data. First, an online survey created using Qualtrics®. Qualtrics® is a web application server that allows researchers to make their surveys available and accessible online. The researcher obtained permission from the Institutional Review Board (IRB) to ethically conduct this study (See Appendix B). Second, the online survey conducted as an exploratory study. It sent to a select group of female individuals, roughly 45 participants, to share their feedback about the content clarity of the survey items to ensure validity and reliability before being sent to the actual sample of this study (See Appendix C). This section will be discussed in "Procedures for Ensuring Reliability and Validity of Data" later in this chapter.

Third, after IRB approval and conducting the pilot study, the researcher sent an introductory email to the participants explaining the purpose of the study, the questions, the strategies to be used during data collection, and obtain their official approval. That is, during the initial email, the researcher shared the consent form to get their approval to explain all the parts of the research and request that they sign and return the form via email. Additionally, the email explained that there will be no risk to them for their participation in this research. The email shared my procedures for protecting their information; this will contribute to reducing their nervousness and give them the confidence to engage with me during the completion of the questionnaire. The researcher also informed volunteers that they can withdraw from the study anytime. At the end of the email, the researcher informed them that another email followed with the link to the questionnaire (See Appendix D). The researcher gave the subjects four weeks to complete the survey; a first reminder email sent two weeks after sending the survey encouraging them to complete the survey.

Finally, after reaching the required number of participants, the researcher closed the survey, and the data exported from Qualtrics to an SPSS file for analysis to answer the research questions. The researcher used the SPSS software to compute the descriptive and inferential statistics for data analysis. Additionally, the SPSS software presented the results of the data in figures and in tabular from for easy analysis, interpretation, and understanding. The technique of multiple linear regression used further to test the variables and their relationship.

Ethical Procedures to Protect the Participants

Ethics is one of the main concerns that the researcher should consider in quantitative research. Creswell and Guetterman (2019) emphasize the importance of being aware of ethical procedures while conducting the study: "... all educational researchers need to be aware of and anticipate ethical issues in their research" (p. 22). This study evaluated the ethical concerns at the beginning, during, and at the end of working with participants:

1. The research submitted to the Institutional Review Board (IRB) to ensure the study follows ethical principles and federal regulations to protect participants' information and privacy.

Also, the researcher completed the training courses offered by the IRB at Kansas State University to prepare, which enhanced the researcher's awareness while dealing with participants, such as their rights and how to deal with the data after collecting and analyzing it (Creswell & Guetterman, 2019). Moreover, Tracy (2010) states that procedural ethics includes approval from the IRB to ensure the protection of participants' privacy and to avoid deception and not harm them. After receiving approval from the IRB, the researcher sent a consent form, which is "a statement that participants sign before they participate in research" (Creswell & Guetterman, 2019, p. 146). An email sent to the participants with the information needed about all aspects of the study so they can make an informed decision about whether or not to participate in this study.

2. Participants in this study are volunteers; they can refuse to answer any survey question or withdraw anytime. According to Creswell and Guetterman (2019), "You need to respect the wishes of individuals who choose not to participate in your study" (p.168).

3. This study anticipates minimum risk the participants may face before conducting this study. Some participants may be nervous about sharing their personal information and opinions about using mobile computer devices in their learning. Therefore, before the beginning of the study, the researcher sent an introductory email to the participants to present the research's goals and procedures. The researcher clarified the importance of their roles in this study to get quality results based on the participants' opinions. Their responses kept confidential. Also, to guarantee their privacy, the investigator does not be directly engaged in meeting the participants and collecting data. Moreover, all information collected kept confidential and protected, as the information encoded so that it is not transmitted directly to the participant. Data collected over a month. All collected data saved in private files with password protections that cannot be easily

accessed. Therefore, all data that collected from the participants used for the purposes of the study as authorized by Kansas State University and kept until the completion of the study and the approval for publication of the results.

Survey Instrument

This study used the survey as a primary method to collect data. Creswell (2014) explains that questionnaires in quantitative research are the primary tool for collecting data from participants, including some basic personal questions and other questions related to research objectives, to discover their opinions. Moreover, Fink (2009) discusses that surveys are dynamic and efficient methods of directly collecting information from participants to understand, explain, or compare the practitioners' feelings, behavior, and preferences (p. 1). Also, this study followed the approach of an online questionnaire using Qualtrics because of the extensive data collection and ease of use of the Internet by individuals to answer the questionnaire (Creswell & Guetterman., 2019).

Venkatesh et al. (2003) provides surveys that can be used by the researcher in the analysis of the viability of a new technology, how to deploy it, and the likelihood of success or failure in comparison to older solutions. In this survey, the researcher will develop a survey with two sections similar to those applied by Venkatesh et al. (2003) to align the research questions and objectives. Creswell and Guetterman (2019) define modifying the tool as "locating an existing instrument, obtaining permission to change it, and making changes in it to fit your requirements" (p. 156). The researcher sent an email to authors to obtain their permission (Venkatesh et al., 2003) to modify the survey (See Appendix F). The first section of the survey focuses on demographic data that includes age, academic year, major, number of years of experience using mobile computer devices in their learning, their knowledge of using mobile computer devices, and challenges that may be faced while using these devices.

- Age will be coded as (1 = 18-20 years, 2 = 21-23 years, 3 = more than 23 years).
- Academic year will be coded as (1= First year (Freshmen),2 = Second year (Sophomore), 3 = Third year (Junior), and 4 = Fourth year (Senior)).
- Major in the College of Computer Science and Engineering (CCSE) will be coded as (1= Computer Science, 2 = Information Systems, 3 = Cyber Security, 4 = Artificial Intelligence and Data Science).
- Number of years of experience will be coded as (1 = less than two years, 2 = 2-4 years, 3 = 5-7 years, 4 = more than 7 years).
- Describe the learners' knowledge of mobile computer devices in their learning task will be coded as (1 = Limited, 2 = Average, 3 = Very good, 4 = Advanced).
- Finally, challenges that students face while using mobile computer devices will be coded as (1= Classroom infrastructure, 2 = Inability to complete tasks efficiently because of the quality of these devices, 3 = Technical issues of these devices, 4 = Other specific challenge(s)).

The second section of the survey is a modification of the UTAUT instrument and encompasses four parts related to the four selected UTAUT constructs. These are performance expectancy (measured using four items), effort expectancy (measured using four items), social influence (measured using four items), and behavioral intention (measured using three items). The purpose of using this questionnaire is to measure female Saudi students' intentions toward using mobile computer devices in their learning journey. The survey questions designed based on standards such as ease, clarity, and brevity. The questionnaire took roughly 15 minutes for participants to complete the questions. It used an interval scale with six response rate options for each question (strongly agree, agree, somewhat agree, somewhat disagree, disagree, and strongly disagree). Creswell and Guetterman (2019) state that the Likert scale (strongly agree to strongly disagree) "is treated as both ordinal and interval data in educational research" (p. 165). Some previous studies used the original and developed a survey from Venkatesh et al. (2003) with a 6-point Likert scale (Alsulami, 2021; Choi et al., 2018; and Roestenburg, 2021) to predict the intentions of participants toward using new technological devices such as mobile computer devices or related to accepting and employing Information Technology (IT) systems in social services organizations., such as the study by Roestenburg (2021). Chomeya (2010) mentions that the advantage of the 6-point Likert scale contributes to making the tool more rigorous to ensure an answer for each question. (See Appendix G).

Table 3.1. Summary of Questionary Items Based on The Independent and Dependent Variables

Section	Name of Section	Questionary Items	Scale	Type of Data Analysis
Section 1	Demographic Information	6		Descriptive
Section 2		UTAUT Constructs		
RQ 1	Performance Expectancy (IDV)	4	Interval	Descriptive and Multiple Linear regression
RQ 2	Effort Expectancy (IDV)	4	Interval	Descriptive and Multiple Linear Regression
RQ 3	Social Influence (IDV)	4	Interval	Descriptive and Multiple Linear Regression

Behavioral Intention (DV)	3	Interval	Descriptive and Multiple Linear Regression

Procedures for Ensuring Reliability and Validity of Data

Creswell and Guetterman (2019) state that "Reliability and validity are bound together in a complex way" (p. 158). The instrument used in the study must be valid and reliable, because this reflects the accuracy of the study's conclusion. Reliability is the first factor that should be available in the instrument. Creswell and Guetterman (2019) define reliability as "scores from an instrument that are stable and consistent" (p. 158). They continued explaining the importance of reliability in the study: "A goal of good research is to have reliable measures or observations" (p. 158). Creswell and Guetterman (2019) identify some factors that may cause the instrument to be unreliable, such as some items (questions) of the instrument being unclear for participants and confusing to them, because the structure of sentences and procedures of the survey is not standardized. Based on that, as mentioned in the survey instrument section (p. 84), this study applied the instrument from research by Venkatesh et al. (2003). The evidence of measuring the extent of the instrument's reliability shows that replicating it gives the same results (Taber, 2018). Cronbach’s alpha reliability coefficient is popularly used in educational research to ensure the instrument's reliability and internal consistency (Creswell & Guetterman, 2019; Taber, 2018). Therefore, alpha values of 0.70 or higher indicate the extent of an instrument's consistency and adequate reliability. To illustrate, Venkatesh et al. (2003) have conducted UTAUT longitudinal field experiments on 45 enterprises that contributed a sample size of 645 to gain technical experience in applying the model. The research group focused on the heterogeneity of technologies, enterprises, industrial specializations, business functions, and nature of use. They also compared these results to a different research program that had a 399-pool sample sourced from two organizations. The UTAUT model was able to account for 70% of the variance in behavioral intent to use technology. The original Internal Consistency Reliability (Alpha) Indices of UTAUT Model Constructs were: Performance Expectancy, .91; Effort Expectancy, .90; Social Influence, .94; and Behavioral Intention, .90. (Venkatesh et al., 2003).

UTAUT surveys have also been revised with other communities around the world and in other languages and has demonstrated versatility in being translated and used in various cultures (Oshlyansky, Cairns, & Thimbleby, 2007). To ensure the reliability of the instrument, the researcher conducted a pilot study on (n= 45) participants from the target population of female Saudi students at Taibah University to ensure the internal consistency of the survey and their understanding of the questionnaire questions. The participants took 10 minutes or less to complete the survey and were asked for feedback and comments after the instrument was completed. Based on the pilot study, the survey did not receive participant feedback or comments. However, the researcher calculated the modified UTAUT survey's reliability test with Cronbach α coefficients for each predictor variable and the whole survey using SPSS to ensure the reliability scores. The result of the reliability test of the entire survey was 0.94>0.70, and the Cronbach Alpha for each UTAUT Model construct was: performance expectancy =,0.78>0.70 effort expectancy= 0.84>0.70, social influence= 0.77>0.70, and behavioral intentions = 0.89>0.70, which means survey results above .70 are considered high internal consistency.

Table 3.2. The Reliability Scores of the Pilot Study

UTUA Model Construct	Items	Cronbach's alpha Value
Performance Expectancy	4	0.78
Effort Expectancy	4	0.84
Social Influence	4	0.77

Behavioral Intentions	3	0.89
Total	15	0.94

Content validity is the second factor that refers to the instrument's ability to accurately measure what you want to measure (Field, 2013). Therefore, content validity is one of the main factors that should be present in the instrument before it is used in the study (Creswell and Guetterman, 2019). The researcher reviewed the survey with panel experts to ensure the instrument's content validity before distributing it to the participants, and this is one of the strategies Tashakkori and Teddlie (1998) encouraged. Therefore, by reviewing the instrument by experts in the field, this strategy ensures the survey questions are straightforward and solid, leading the researcher to answer the research questions perfectly (Fink, 2009; Bajabaa, 2017). The survey was modified and developed in English and Arabic to ensure the quality of the instrument. Experts reviewed the instrument to ensure respondents could answer the survey questions, with no difficulties in language barriers. Then, to ensure the validity of the content, the English version of the instrument was modified and reviewed by a significant advisor, Dr. Todd Goodson, who specializes in the area of English/Language Arts Teacher Education. After translating the instrument from English to Arabic, it was reviewed by two Saudi professors: Dr. Mohammad Althobaiti, Assistant Professor in the Foreign Language Department at Taif University with a doctoral degree in Literary Studies and Linguistics from Drew University, USA. The second reviewer, Dr. Rashed Alsulami, Assistant Professor in the College of Education at Taibah University, has a doctoral degree in Instructional Technology from Northern Illinois University, USA. The instrument was reviewed to ensure the integrity of the language in the questionnaire, the instructions and logic for using the scales were clear, and the type and size of the font of the Likert scale is easy to read (Fraenkel et al., 2015). The structure of some of the sentences was corrected to make them clear to the participants without confusion.

Data Analysis

The purpose of this quantitative correlational study is to predict the behavioral intention of female students at Taibah University in Saudi Arabia to use mobile computers for learning purposes, based on selected constructs of the UTAUT model (performance expectancy, effort expectancy, and social influence). The Statistical Package for Social Science (SPSS®) used to analyze the data. The researcher utilized two main statistical approaches: descriptive statistics and inferential statistics. Descriptive statistics assists the researcher in describing and summarizing trends in the data, providing comprehension of the variance in the scores, and giving a complete picture of "where one score stands in comparison with others" (Creswell & Guetterman, 2019, p. 181). The researcher applied inferential statistics to answer the research questions and draw conclusions about the population from which the sample obtained (Creswell & Guetterman, 2019). The following describes the study's research procedures used with the related data analysis methods.

First, non-numeric data must be systematically encoded before being entered into SPSS (Fraenkel et al., 2015). After checking the data bias and clearing the missing values, the researcher started the analysis process using Cronbach's alpha coefficient. Alpha coefficients a = 0.70 or more indicate adequate evidence of reliability in terms of internal consistency (Fraenkel et al., 2015).

Second, the researcher checked the data to determine the rate of return on the response. The rate of return shows the number of sample members who completed and returned the survey. This reported using a table that includes the number and percentage of participants who completed the survey and the percentage of participants who did not complete the survey (Field, 2013). A low percentage of returned surveys means that some participants did not complete the survey or missed a question. To avoid bias when the data collected contains errors that can affect the statistical values of the analysis (Field, 2013), the data for missing values filtered and excluded to deal with the missing cases by listwise or pairwise. Excluding by listwise means that cases with missing values are excluded from the entire data set, while exclusion by pairwise means that only data excluded with missing values relevant to a specific analysis or test is analyzed (Field, 2013). Next, the researcher computed descriptive statistics for the respondents' age, academic year, major, years of experience in using mobile computer devices, and challenges that may be faced while using these devices. The researcher calculated the inference statistics to obtain the equations, histograms, dispersion diagrams, tables, and assumptions necessary to make inferences related to the importance and relationship of the variables and effects for each selected construct of the UTAUT model.

Afterwards, the researcher also attempted to answer the research questions for this study using the Multiple Linear Regression option in SPSS Statistics. Multiple linear regression is a model for discovering the relationship between variables in a study, either positive or negative, between independent variables (predictors) and dependent variables (outcomes) (Field, 2013). Therefore, multiple linear regression was used to study the relationship between multiple predictors or independent variables and outcome variables (Creswell & Guetterman, 2019). The researcher also was checked regression assumptions, such as before interpreting the multiple linear regression output for research questions 1, 2, and 3. This was done through various regression outputs, such as scatterplots, histograms, Durbin-Watson statistics, and multicollinearity to ensure that data is distributed normally and ready for regression analysis.

Chapter Summary

This chapter details the methodology procedures the researcher followed. The quantitative research conducted to collect data to predict the behavioral intention of female Saudi students at Taibah University toward using mobile computer devices in their learning. Also, this study measured three variables (performance expectancy, effort expectancy, and social influence) that directly correlate with behavioral intentions based on research by Venkatesh et al. (2003). Then, the researcher used SPSS software to analyze the data. In Chapter 4, the researcher will present the study's findings.

Chapter 4 - Data Analysis and Research Findings

This study conducted the quantitative research to discover the behavioral intentions of Saudi female students toward using mobile computer devices in their learning by employing the unified theory of acceptance and use of technology (UTAUT) model to address the stated research questions:

1. To what extent does performance expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?
2. To what extent does effort expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?
3. To what extent does social influence predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

Based on the research questions, the researcher developed three hypotheses to test in this study:

H_0 1: There is no relationship between performance expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 2: There is no relationship between effort expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 3: There is no relationship between social influence and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

This chapter presents the results of the data analysis collected using quantitative methods to address the three research questions, RQ1, RQ2, and RQ3, analyzed by SPSS through descriptive and inferential statistics. This study also shows results in figures and tabular form obtained from the SPSS findings regarding how the research questions were answered for easy analysis and interpretation.

Data Screening

Before analyzing the data, it is necessary to examine the data and remove missing data to ensure the accuracy of the results. This examination provides accurate results and avoids errors during analysis (Field, 2013). Therefore, after obtaining approval from the Institutional Review Board (IRB) at Kansas State University, the researcher distributed the questionnaire to approximately 300 female undergraduate students at the College of Computer Science and Engineering at Taibah University. One hundred thirty-four students from all College of Computer Science and Engineering majors responded. After that, the researcher verified and examined the data to remove missing data. Seven cases were removed due to the absence of data on the items in the questionnaire and left blank. This approach is consistent with the opinion of Tabachnick and Fidel (2007), who clarified that removing some cases is acceptable when there are a small number of missing cases to avoid any randomness in the results. Therefore, this study employed the listwise approach to exclude the missing value. Thus, the number of responses received was 134; 127 were valid, representing more than 90%.

Reliability Evidence of the Modified UTAUT Survey Items (Cronbach's Alpha)

To ensure the reliability and internal consistency of the modified questionnaire, Cronbach's alpha (α) coefficient was calculated for the whole instrument. Nunnally and Bernstein (1994) confirmed that the higher the questionnaire's reliability score (Cronbach's alpha coefficient) the more internally consistent it is. The results showed that the tool has high reliability, as the Cronbach's alpha coefficient value reached (0.89> 0.70) (See Table 4.1).

Table 4.1. Reliability of The Modified UTAUT Survey Items

Cronbach's alpha Value	Items
0.89	15

Descriptive Statistics Analysis

Demographic Information of Participants

As mentioned,127 valid responses were obtained from female students in the College of Computer Science and Engineering at Taibah University. This section presents the characteristics of the participants based on their responses, including age, academic year, major, number of years of experience using mobile computer devices, description of their knowledge of mobile computer devices in their learning, and challenges that they face while using mobile computer devices, using statistical frequency and percentage which are described in tables and in figures.

Age of Participants

This question consists of three age categories, and based on the participants' responses, the largest percentage was those aged 21 to 23 (46.2%), followed by those aged 18 to 20 (37.3%), and the lowest percentage was those aged older than 23 years (16.5%) (See Table 4.2, Figure 4.1).

Table 4.2. Age Distribution of Participants

Age's Categories	Frequency	Percentage
18- 20 years	48	37.3%
21-23 years	58	46.2%
Older than 23 years	21	16.5%

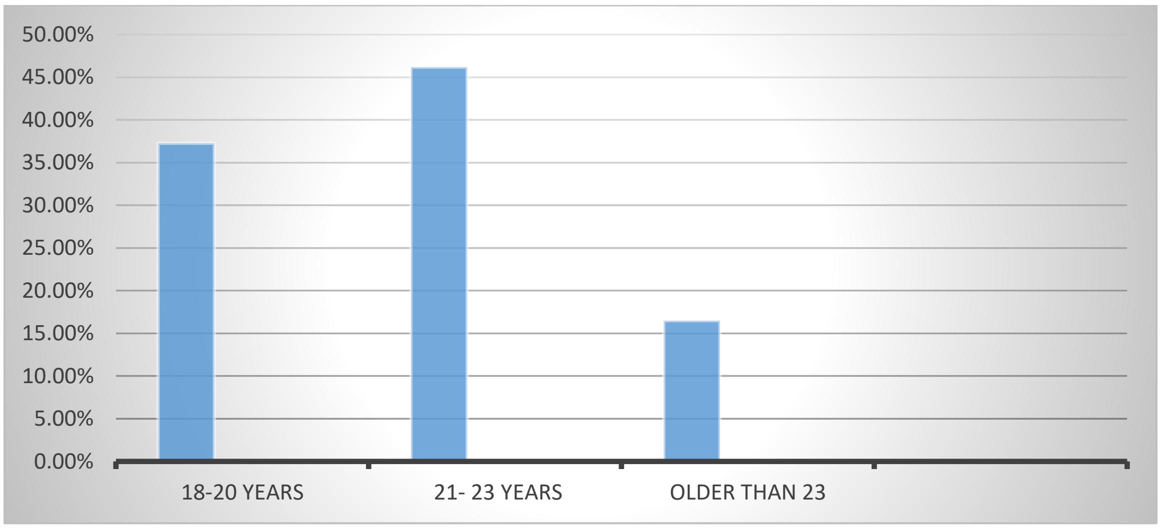

Figure 4.1. The Range of Participants

Academic Year

The academic year contains four categories based on the responses. The third academic year (Junior) had the largest percentage (n= 44, 34.7%), followed by the second academic year (Sophomore) (n= 37, 28.2%) and the first academic year (Freshmen) (n= 25, 19.3%). The lowest percentage within the fourth category was the fourth academic year (Senior) (n= 21, 17.8%) (See Table 4.3 and Figure 4.2).

Table 4.3. Academic Years' Distribution of Participants

Academic Year Categories	Frequency	Percentage
First year (Freshmen)	25	19.3%
Second year (Sophomore)	37	28.2%

Third year (Junior)	44	34.7%
Fourth year (Senior)	21	17.8%

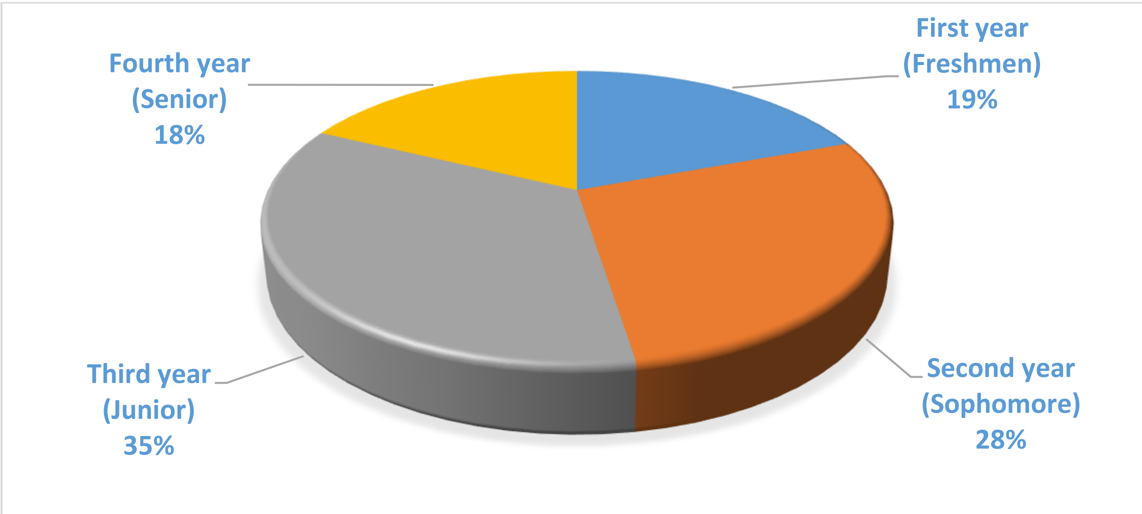

Figure 4.2. Respondents' Academic Years

Major in the College of Computer Science and Engineering

Table 4.4 and Figure 4.3 show that the highest number of participants' responses were from those who majored in Computer Science (n=, 37, 28.6%). The second major with the highest percentage of responses was Artificial Intelligence and Data Science (n= 36, 28.3%), followed by Information Systems with percentage of responses (n= 28, 22.7%). The lowest percentage of the responses was from Cyber Security (n= 26, 20.4%).

Table 4.4. Academic Major

Academic Major Categories	Frequency	Percentage
Computer Sciences	37	28.6%
Information Systems	28	22.7%
Cyber Security	26	20.4%
Artificial Intelligence and Data Science	36	28.3%

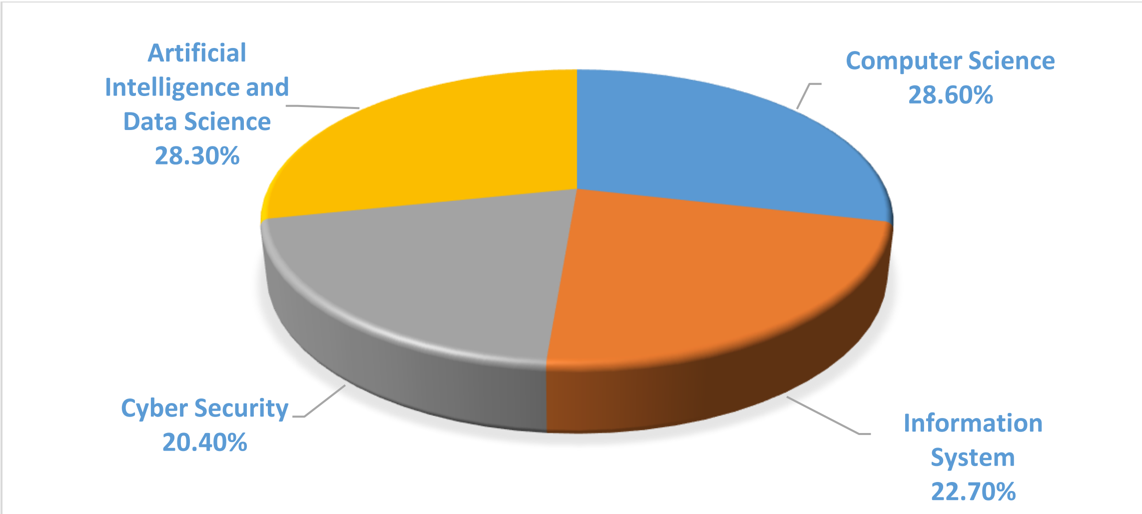

Figure 4.3. Participants' Majors

Number of Years of Experience Using Mobile Computer Devices

Table 4.5 and Figure 4.4 show that the vast majority of the participants' responses indicated 2-4 years of experience using mobile computer devices in their learning (34.7%). The second highest rate shown based on their responses was 5-7 years' experience using mobile computer devices (24.6%), and less than two years of the participants' experiences using mobile computer devices was 23.4%. The lowest rate of participants' responses was more than 7 years of experience using mobile computer devices in their learning (17.3%).

Table 4.5. Experience Years Categories

Years of Experience Using Mobile Computer Devices Categories	Frequences	Percentage
Less than two years	30	23.4%
2-4 years	43	34.7%
5-7 years	32	24.6%
More than 7 years	22	17.3%

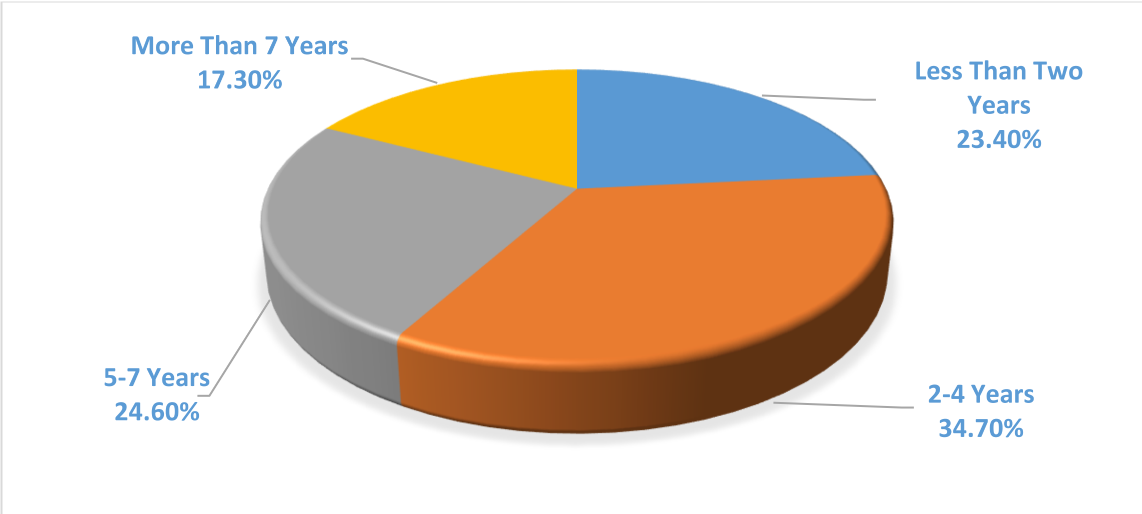

Figure 4.4. Experience Years of Participants

Participants' Knowledge of Mobile Computer Devices in Their Learning

Table 4.6 and Figure 4.5 indicate that the majority of respondents, 51 (40.4%) had very good knowledge of mobile computer devices, followed by 50 responses (38.6%) with average knowledge. Other responses indicated that 15 participants (12%) had advanced knowledge. The lowest rate of the participants' knowledge, 11, was limited (9.0%).

Table 4.6. Participants' Knowledge of Mobile Computer Devices

Participants' Knowledge of Mobile Computer Devices	Frequency	Percentage
Limited	11	9.0%
Average	50	38.6%
Very good	51	40.4%
Advanced	15	12%

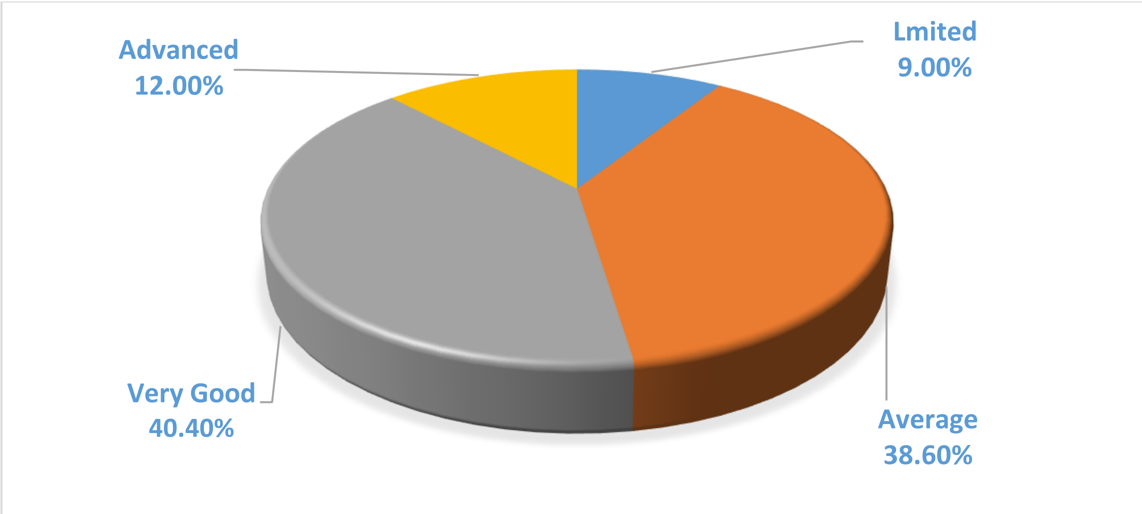

Figure 4.5. Participants' Knowledge of Mobile Computer Devices

Challenges that Participants Face While Using Mobile Computer Devices

As indicated in Table 4.6 and Figure 4.5, the percentage of reasons that limit the students' use of mobile computer devices in their learning was 81 responses (63.8%) who reported a classroom infrastructure that limits the use of mobile computer devices (e.g., Internet access). In contrast, 54% of their responses reported technical issues with these devices, (e.g., quality of the battery and the device while downloading (i.e., files, programs or apps, Internet speed), 43.6% reported inability to complete tasks efficiently and effectively because of the limited quality and specifications of these devices (e.g., screen size, memory capacity). However, 8.6% of their responses reported other reasons that limit use of their devices inside and outside the classroom.

Table 4.7. Challenges Categories to limit to Use Mobile Computer Devices

Challenges limit to use Mobile Computer Devices	Frequency	Percentage
Classroom infrastructure that limits the use of mobile computer devices.	81	63.8%

Inability to complete tasks efficiently and effectively because the limited quality and specifications of these devices.	56	43.6%
Technical issues of these devices.	69	54%
Others	10	8.6%

**Note:* Participants could choose as many answers as apply.

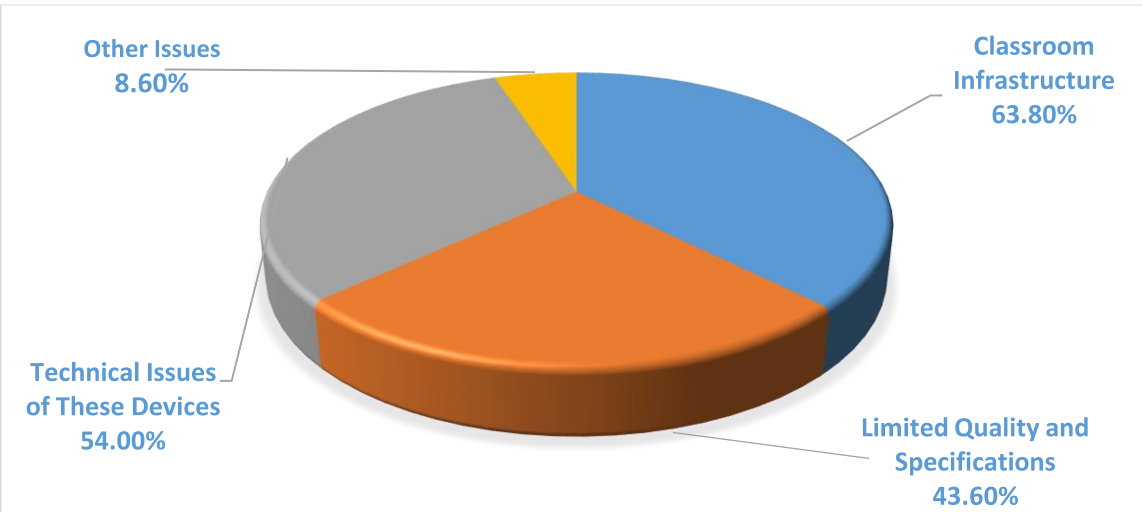

Figure 4.6. Limit Use of Mobile Computer Devices

Descriptive Statistics for The Unified Theory of Acceptance and Use of Technology (UTAUT) Constructs

This section shows descriptive statistics of the UTAUT constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI) (Independent Variables), and behavioral intentions (BI) (Dependent Variable). As mentioned in Chapter 3, the UTAUT modified instrument used an interval scale with six response rate options for each question, with scores strongly agree=6, agree=5, somewhat agree=4, somewhat agree=3, disagree=2, and strongly disagree=1. The mean and standard deviation for each of the UTAUT constructs across the survey items were processed—table 4.8. social influence (SI) gained the highest score (*M= 2.35, SD= .871*), and then came after it was effort expectancy (EE) (*M= 1.80, SD= .781*), followed by performance expectancy (PE) (*M= 1.69, SD= .728*). However, behavioral intention (BI) reported the lowest score of the UTAUT construct (*M= 1.54, SD= .718*).

Table 4.8. Descriptive Statistics of the UTAUT Constructs

Predictor Variables	**Number**	**Sample Size**	**Mean**	**Standard Deviation (SD)**
Performance expectancy (IV)*	132	127	1.69	.728
Effort expectancy (IV)*	131	127	1.80	.781
Social Influence (IV)*	128	127	2.35	.871
Behavioral Intention (DV)**	127	127	1.54	.718
Valid N (Listwise)	**127**			

Note: Independent Variable*= (IV), Dependent Variable** = (DV).

Assumptions of Multiple Linear Regression Checking

After cleaning the data and before data analysis and interpreting the multiple linear regression output for research questions 1, 2, and 3; we begin to ensure and present the assumptions information in this study for three research questions, including multicollinearity, linearity, normality, Durbin-Watson statistic, histograms, and outliers.

Multicollinearity Test

In this study, multicollinearity among variables was checked to avoid any problems in the accuracy of multiple regression analysis. Alkan and Atakan (2013) confirmed that one of the most important statistical problems that may occur in the accuracy of multiple regression analysis is multicollinearity violation due to the strong correlation between the independent variables. Therefore, multicollinearity was checked using the variance inflation factor (VIF) and tolerance. Table 4.9. shows that the value of each of the three independent variables was below 10, and the tolerance value for each was above 0.10. Based on these results, there is no issue with multicollinearity.

Table 4.9. Collinearity Statistics for each Predictor Variable

Predictor Variables (IVs)*	Tolerance	Variance Inflation Factor (VIF)
Performance expectancy (PE)	.617	1.621
Effort expectancy (EE)	.566	1.765
Social Influence (IS)	.761	1.313

Note: IVs*= Independent Variables

Normality and Linearity Analysis

The current study checked the residuals' normality assumption to ensure they are close to the normally distributed ones. Therefore, the researcher examined normality distribution by employing the Normal P-P Plot and Histogram Standardized Residuals. The Histogram Standardized Residuals (bell-shaped histogram) figure shows that the residuals were normally distributed (See Figure 4.6), which aligns with Figure 4.7. of the Normal P-P Plot, a straight diagonal. Most of the dots lie on the line, meaning the residuals are normally distributed.

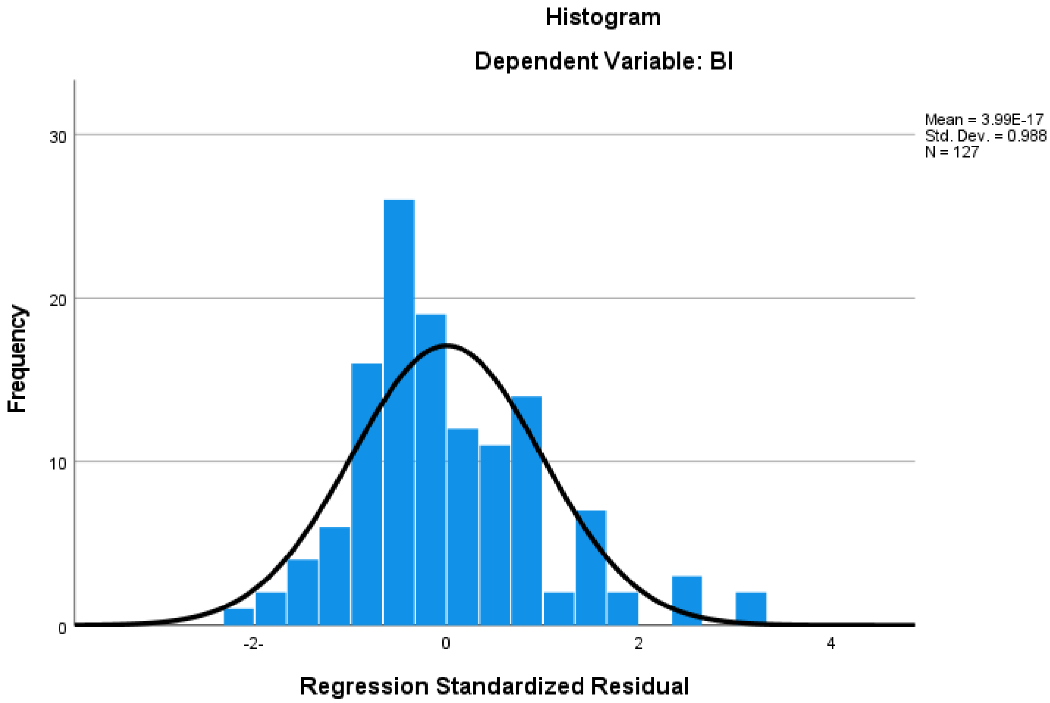

Figure 4.7. Histogram of Regression Standardized Residual

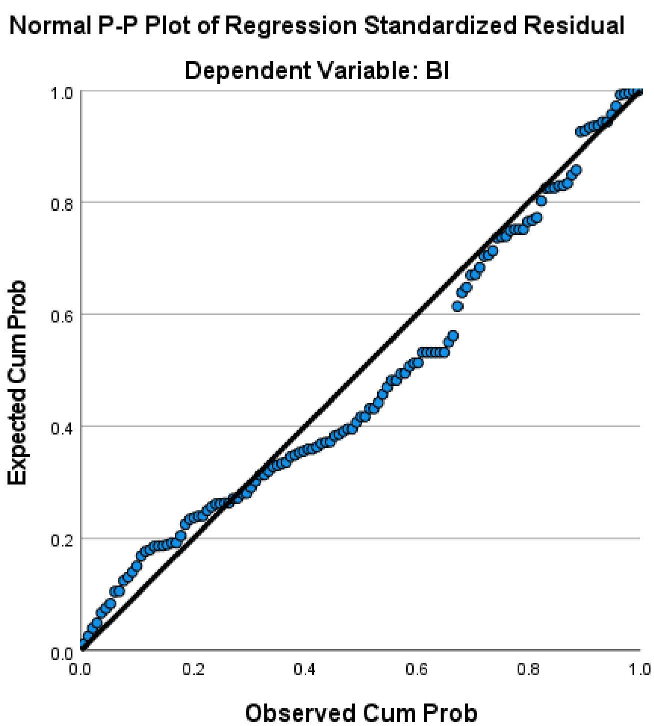

Figure 4.8. Normal P-P Plot of Regression Standardized Residual

Moreover, the linearity and homoscedasticity between variables (independent and dependent variables) assumptions were conducted using a scatterplot of standardized residuals against the predicted values in SPSS (Field, 2013). Therefore, Figure 4.8. shows that the regression plots are homoscedastic and scattered normally. No patterns are noticed in the model, which means there are no problems with the assumptions of linearity and homoscedasticity.

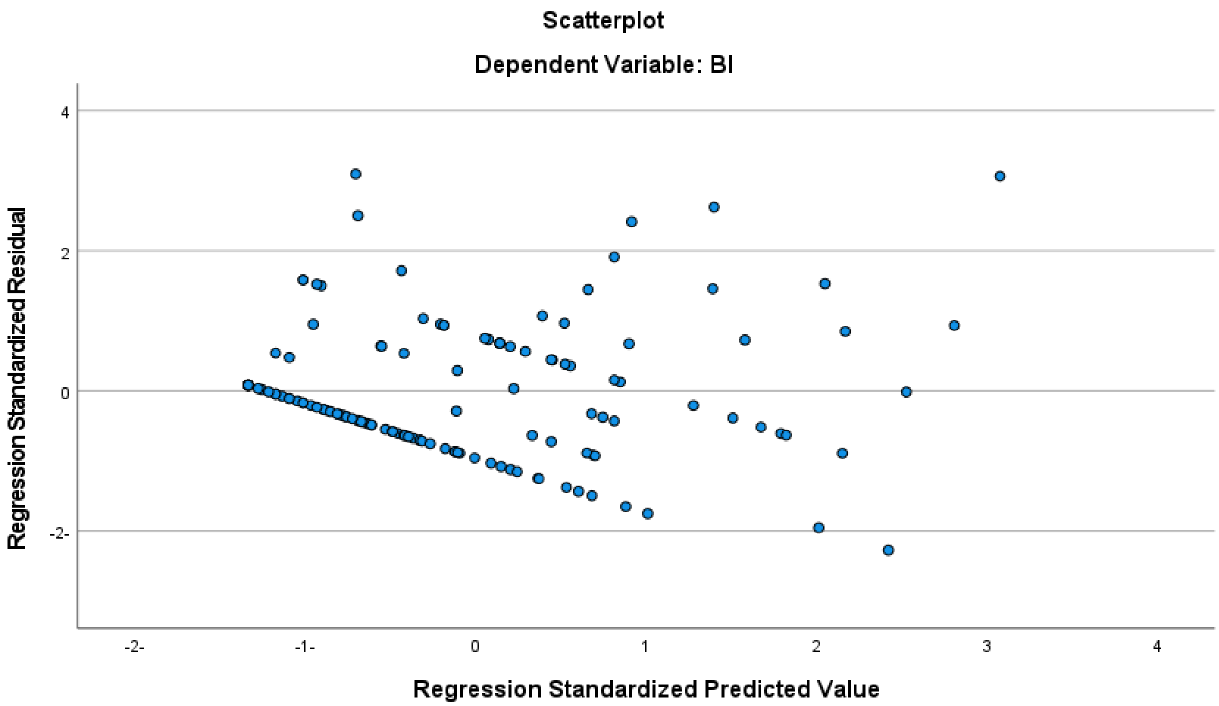

Figure 4.9. Scatterplot of Regression Standardized Residuals Against the Predicted Values

The Durbin-Watson Statistic

The Durbin-Watson statistic was conducted to ensure a sequential correlation among residuals and that they are independent error-free. Alshahrani (2017) mentioned that "The value of the Durbin-Watson statistic ranges from 0 to 4" (p. 81). Whenever the Durbin-Watson statistic value range is close to 4, there is a strong negative correlation, whereas if the value is close to 0, there is a strong positive correlation (Field, 2013). Table 4.10 indicates that the value of the

Durbin-Watson statistic is 1.838, which means that there are no independent errors in the data, and they are uncorrelated; therefore, there are no problems with this assumption.

Table 4.10. The Durbin-Waston Statistics

	R Square Change	F Change	Sg. F Change	Durbin-Watson
Model Summary	.386	25.724	<.001	1.838

Cook's Distance and Standardized Residuals Statistics

This section used Cook's distance and the standardized residuals to test the outliers and influential values. Whenever the overall values of the extreme values are equal to or above 1.0, this indicates that there are extreme values according to Cook's distance. Therefore, the mean Cook's distance is 00.1, below 1, and the regression model has no influential outlier values.

Multiple Linear Regression Results

This section discussed the multiple linear regression results by testing whether the three UTAUT constructs (performance expectancy, effort expectancy, and social influence) predict the behavioral intention toward using mobile computer devices in learning. Therefore, the multiple linear regression results indicated that these three UTAUT model predictors were significant predictors of the behavioral intentions of Saudi female students toward using mobile computer devices in their learning by F (3, 123) = 25.724, $p < .001$, which means they accepted using these mobile devices in their learning (See Table 4.11).

Also, Table 4.12 shows that the variance of the regression model, 39% of the behavioral intentions of female Saudi students toward using mobile computer devices in their learning, can be interpreted by the three UTAUT model predictors: performance expectancy, effort expectancy, and the social influence (R^2 = .386, R^2adj = .371). This means that the percentage of variance is perfect in practice, and the remaining variance percentage of behavioral intentions is 61% and can be explained by other predictors that are excluded in this study.

Table 4.11. ANOVA Results

Model	Sum of Square	df	Mean Square	F	Sig.
Regression	25.061	3	8.354	25.724	<.001
Residual	39.945	123	.325		
Total	65.006	126			

Table 4.12. Summary of Multiple Linear Regression Model

R	R Square	Adjusted R Square	Std. Error of the Estimate
.621	.386	.371	.569

Regression Coefficients

To answer for three research questions, Table 4.13 indicates that the Standardized Coefficients (Beta) of the UTAUT predictors model, effort expectancy, and social influence have a positive relationship with the dependent variable, behavioral intentions of Saudi female students toward using mobile computer devices in learning (effort expectancy (EE): $\beta = .444$, $p = <.001$; and social influence (SI): $\beta = .174$, $p =.033$). However, performance expectancy (PE) predictor was not statically significant of Saudi female students toward using mobile computer devices in learning ($\beta = .108$, $p = .232$). The two null hypotheses (H_0 *2* and H_0 *3*) were rejected based on that. Thus, effort expectancy was the most potent construct of the UTAUT model of the behavioral intention of using mobile computer devices in learning, followed by social influence (see Table 4.13; Figure 4. 9).

Table 4.13. Regression Coefficients

UTAUT Predictors	B	SE	Beta (β)	t	Sig.	Partial	Part
Constant	.295	.164		1.798	.075		
PE*	.107	.089	.108	1.201	.232	.108	.085
EE**	.408	.086	.444	4.732	<.001	.392	.334
SI***	.144	.067	.174	2.153	.033	.191	.152

Note: PE*= Performance Expectancy, EE**= Effort Expectancy, SI***= Social Influence.

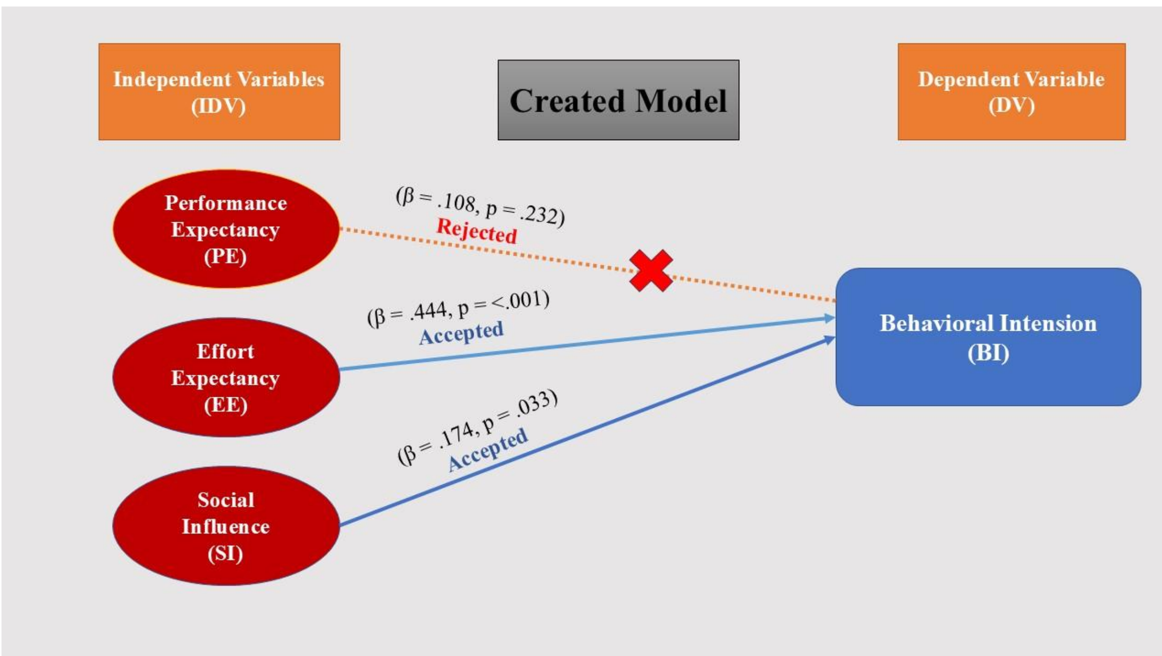

Figure 4.10. Standardized Coefficients (Beta) of the UTAUT Predictors Model

Semi Partial (Part) Correlations:

Table 4.13 reveals the part (Semi partial index); the percentage of variance between the particular predictor and the dependent variable. Moreover, the decrease in the R^2 correlation can be explained if one of the specific predictors is removed from the model (Alshahrani, 2017). Thus, effort expectancy achieved the highest proportion of variance in the R^2 model, 11%

($.334^2$), then social influence 2% ($.152^2$), and performance expectancy recorded the lowest percentage 0.72% ($.085^2$).

The Relative Importance of the UTAUT Model

The rank of the relative importance predictors of the statistically significant predictors of the UTAUT Model (Independent Variables) of the behavioral intentions (Dependent Variable) by partial correlations. Therefore, the results reveal that effort expectancy EE (.392) was the most relative important predictor, followed by social influence SI (.191) sequentially (See Table 4.13).

Summary of the Three Main Null Hypotheses Acceptance Results

Table 4.14. Summary of the Null Hypothesis Test

Hypotheses	Acceptance Results
H_0 1: There is no relationship between performance expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning **(β = .108, *p* = .232).**	ACCEPTED **P = .232**
H_0 2: There is no relationship between effort expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning **(β = .444, *p* = <.001).**	REJECTED **P <.001**
H_0 3: There is no relationship between social influence and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning **(β = .174, *p* = .033).**	REJECTED **P = .033**

Conclusion

This chapter answered the research questions and hypotheses through the findings analysis. The first section showed data screening and how it dealt with the missing data. Then, the researcher analyzed and presented the descriptive data of the survey items, including demographics and the UTAUT constructs model questions by tables and figures. After that, multiple linear regression assumptions, including multicollinearity, normality, linearity, and the Durbin-Watson Statistic tests were analyzed, and the results revealed there were no issues with assumptions. Next, the outliers were examined to ensure there were no influential outlier values. In addition, multiple linear regression results were presented where the percentage of variance of the model was 39% in the behavioral intentions of Saudi female students toward using mobile computer devices in their learning. The standardized coefficients (Beta) of the UTAUT predictors model, effort expectancy, and social influence were significant in using mobile computer devices in learning. However, performance expectancy was not significant of Saudi female students toward using mobile computer devices in their learning. Thus, two null hypotheses (*H_0 2 and H_0 3*) in the current study were rejected. Chapter 5 discusses the findings and highlights the recommendations and conclusion.

Chapter 5 - Discussion and Recommendations

Introduction

The purpose of this study is to predict the behavioral intention by Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to use mobile computer devices for learning purposes, based on selected constructs of the UTAUT model (performance expectancy, effort expectancy, and social influence). Therefore, the study followed a quantitative, non-experimental survey design to collect data from 127 Saudi female students at Taibah University to predict the behavioral intentions of Saudi female students toward using mobile computer devices in their learning by employing the unified theory of acceptance and use of technology (UTAUT) model to address the stated research questions:

1. To what extent does performance expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

2. To what extent does effort expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

3. To what extent does social influence predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

Based on the research questions, the researcher developed three hypotheses to test in this study:

H_0 1: There is no relationship between performance expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 2: There is no relationship between effort expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

H_0 3: There is no relationship between social influence and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

The survey, which was distributed to the participants, had two main sections. The first section consisted of characteristics questions for participants, including age, academic year, major in the College of Computer Science and Engineering, number of years of experience using mobile computer devices, description of their knowledge of mobile computer devices in their learning, and challenges that they face while using mobile computer devices. The second main section was based on the UTAUT construct model, which consisted of 15 items covering four constructs: performance expectancy (4 items), effort expectancy (4 items), social influence (4 items), and behavioral intention (3 items).

After collecting the data, the researcher addressed the problem of missing data by using the listwise deletion method, which deletes all cases with missing data. Then, the reliability of the survey was tested by calculating Cronbach's alpha (α) coefficient for the instrument. After that, demographic data were analyzed using statistical frequency and percentage, which were described in tables and figures. Before answering the three research questions, the researcher addressed the assumptions of multiple linear regression, including multicollinearity, linearity, normality, the Durbin-Watson statistic, histograms, and outliers. To answer these research questions, a multiple linear regression was conducted to determine the significant relationship between the three UTAUT constructs (performance expectancy, effort expectancy, and social influence) with the dependent variable, behavioral intentions of Saudi female students toward using mobile computer devices in their learning. This chapter discusses the consistent or inconsistent findings with previous studies, comparing them to those addressed in the literature review chapter. The researcher also addresses the study's limitations and provides recommendations and concluding remarks based on the results.

Discussion

According to the descriptive analysis, the results showed that the majority of participants were aged 21-23 years (46.5%), followed by those aged 18-20 years (37.3%), and the lowest number of participants was older than 23 years (16.5%). Also, the descriptive analysis revealed that the years of experience of the Saudi female students ranged from 2 to 4 years (34.7%), followed by 5 to 7 years (24.6%) and less than 2 years (23.4%). Participants with more than 7 years of experience using mobile computer devices in their learning was 17.3%. Additionally, the highest proportion of Saudi female students' knowledge of using mobile computer devices was very good, at 40.4%, and their average knowledge level was 38.6%. The knowledge level was advanced in 12% of cases and limited in 9% of cases.

Moreover, the data analysis revealed that the challenges that Saudi female students face while using mobile computer devices in their learning are due to a classroom infrastructure that limits the use of mobile computer devices (e.g., Internet access) by 63.8%—followed by reported technical issues of these devices, (e.g., quality of the battery and the device while downloading files, programs or apps, and Internet speed) by 54%. The inability to complete tasks efficiently and effectively because of the limited quality and specifications of these devices was 43.6%; other reasons to limit them from using mobile computer devices inside and outside of campus was only 8.6%. These descriptive results indicate that Saudi female students desire and believe in the importance of using mobile computer devices in their learning. However, they still face some challenges that limit them from using these devices effectively inside and outside the classes; these results align with the previous studies (Alanazi et al., 2023; Alsamari, 2020; Alshahrani, 2017; Almaiah et al., 2022; Almogheerah, 2020; Alomran, 2013; Chanchary & Islam, 2011; Jaradat, 2014).

Based on the results of the descriptive analysis for the elements of the UTAUT Model, which yielded low mean and standard deviation scores due to the small population sample size and the use of a six-Likert scale instrument, these factors contributed to influencing the descriptive scores of these constructs in the model. To illustrate, the social influence had the highest mean score and standard deviation against other constructs ($M= 2.35, SD= .871$), effort expectancy had the second highest mean score and standard deviation ($M= 1.80, SD= .781$), followed by performance expectance ($M= 1.69, SD= .728$). However, behavioral intentions gained a lower score in the UTAUT construct ($M= 1.54, SD= .718$). That means the female Saudi students had low expectations for using mobile computer devices in their academic journey. Additionally, these results revealed that Saudi female students have struggled with a willingness toward using mobile computer devices because of their limited vision to use these devices. They also had a limited understanding of the benefits of these devices, and lacked the viewpoints and influence of faculty members, peers, and family members to encourage them to use mobile computer devices. Thus, there is a need for training to efficiently use these devices in their learning. Therefore, these reasons influence their interest in employing mobile computer devices in learning to achieve their academic goals. These results align with previous studies, which stressed that female students need training programs and other efforts to extend their experience to know how to effectively deal with these devices in their learning through cooperation from the faculty members, family, stakeholders, and decision makers (Alasmari, 2020; Alanazi et al., 2023; Alshahrani, 2017; Jaradat, 2014).

Next is a discussion the findings of the research questions and hypotheses, and a comparison with the previous studies:

First Research Question

RQ1: To what extent does performance expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

H_0 *1:* <u>There is no relationship between performance expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.</u>

Performance expectancy indicates the extent to which a person believes using technology is vital in achieving their educational and academic goals. To illustrate, the stronger the students' belief in using a particular type of technology in their learning, such as mobile computer devices, the more effectively they will adopt them. The results of this study showed that the performance expectancy predictor was not significantly related to the behavioral intention of female Saudi students to use mobile computer devices in their academic projects; the null hypothesis of this question was accepted. Thus, the result of this study is not in agreement with the numerous previous studies, which indicated that the performance expectancy played a role in the participants' acceptance of the technology, such as (Alasmari, 2017; Al- Hujran et al., 2014; Al-

Hunaiyyan et al., 2018; Al-shahrani, 2016; Alturise et al., 2022; Badwelan et al., 2016; Nassoura, 2012; Venkatesh et al., 2003; Wang et al., 2009). However, Wang et al., 2009, and Venkatesh et al., 2003, studies indicated that performance expectancy was not the strongest predictor compared with effort expectancy, which was the strongest predictor.

Based on the results of this study, one explanation for the limited vision of female students in the College of Computer Science and Engineering at Taibah University is their lack of understanding of the benefits and importance of using mobile computer devices and how to utilize them in their learning journey. Several studies have also emphasized that mobile computer devices enable students to use them flexibly to access information, easily participate in educational activities, and retrieve materials as needed (Alasmari, 2020; Alasmari, 2017; Alanazi et al., 2023; Alsanosi, 2013; Al-shahrani, 2016; Almogheerah, 2020). Also, a study conducted by Alasmari (2017) used mixed methods to explore students' acceptance of mobile learning (M-learning) in their education. The qualitative results revealed that graduate students in Saudi Arabia rely on M-learning to help them complete their academic tasks efficiently.

The current study recommends that faculty members encourage the use of mobile computer devices when presenting content to female students, especially for exams, rather than using traditional methods. Also, resources within the college should be prepared to help students use mobile computer devices, working in cooperation with the college's IT office to provide facilities for female students and to make the educational environment more dynamic. Finally, this study recommends that further studies be conducted to investigate how the performance expectancy predictor associates female students' behavioral intentions toward mobile computer devices, using multiple research methods, such as mixed methods, and examining other moderators, including age and experience, by expanding the participants to include undergraduate and graduate students, because there will be variance in the ages and experiences toward using mobile computer devices.

Second Research Question

RQ2: To what extent does effort expectancy predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

H_0 2: <u>There is no relationship between effort expectancy and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.</u>

Effort expectancy is a critical predictor influencing behavioral intentions toward using mobile computer devices. Based on the current results, effort expectancy was statistically significantly high among the Saudi female students' behavioral intentions to use mobile computer devices, as indicated by the standardized coefficient (Beta value) ($\beta = 0.444$, $p < 0.001$), and the null hypothesis of this question was rejected. This result is consistent with the previous existing studies (Alasmari & Zhang, 2019; Al-Hunaiyyan et al., 2018; Alasmari, 2017; Al-Hujran et al., 2014; Al-Shahrani, 2016; Badwelan et al., 2016; Alturise et al., 2022; Iqbal & Qureshi, 2012; Pullen et al., 2015). These studies indicated that the effort expectancy had a positive relationship on the users' behavioral intentions toward using technology.

This finding suggests that Saudi female students in the College of Computer Science and Engineering at Taibah University believe mobile devices are easy to use in their learning. Also, they have fundamental skills in using and employing these devices in their academic projects, requiring minimal effort and allowing for easy, understandable, and flexible interaction.

Another reason for the common use of these mobile computer devices among female students is the ease of accessing the internet at home and on campus, even though some classrooms lack internet connectivity. Furthermore, female students often depend on free and open learning resources such as YouTube, educational apps, and AI-based applications. Moreover, they find it easy to communicate with their peers in group work on projects using apps like WhatsApp and Telegram. The investigator recommends that all departments, both within the College of Computer Science and Engineering and across Taibah University, represented by the E-Learning Department and the Deanship of Information and Digital Transformation, provide all services that support the use of mobile computer devices in learning, including educational website design and content that are compatible with these devices, making them easier to use and more flexible. This can be achieved by employing distinguished specialists in this field.

Third Research Question

RQ3: To what extent does social influence predict the behavioral intention of a Saudi female student in the College of Computer Science and Engineering to learn with mobile computer devices?

H_0 3: There is no relationship between social influence and behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University regarding using mobile computer devices in their learning.

Social influence predictor (SI) indicates how society affects an individual's intention to use and accept a particular type of technology. Also, Venkatesh et al. (2003) stated that the social influence predictor from the UTUAT Model was the strongest predictor related to females, especially those with limited experience using the system. Thus, the current findings revealed that social influence is significantly associated with the behavioral intentions of Saudi female students in the College of Computer Science and Engineering at Taibah University toward using mobile computer devices, as measured by the standardized coefficient (Beta value) ($\beta = 0.174$, $p = 0.033$). The null hypothesis of this question was rejected. Also, social influence (SI) recorded that the rank relative importance predictor of the behavioral intention was (.191) less than effort expectancy. These results align with numerous previous studies that indicated social influence had a positive relationship on the behavioral intentions of participants to adopt new technology (Alasmari & Zhang, 2019; Alasmari, 2017; Al-Hunaiyyan et al., 2018; Alshahrani, 2016; Badwelan et al., 2016; Pullen et al., 2015).

On the other hand, other studies found that social influence did not have a significant correlation on users' behavioral intentions to accept the technology, such as Iqbal & Qureshi (2012), Alsulami (2021), and Alturise et al. (2022). Based on the result of the current study, the community, including professors at Taibah University, parents, and friends, plays a vital role in encouraging female Saudi students to accept mobile computer devices in their learning. Another indication based on the current findings is that society values the importance of integrating technology into the educational process. Thus, this study recommends that by holding enriching courses and workshops to introduce university faculty members to the latest trends in technology in education and providing training on how to employ them correctly in education will contribute to influencing female students' acceptance of technology in their learning; especially mobile computer devices, because the process of influence between teachers and students is reciprocal. Additionally, involving female students in these workshops and hearing their opinions on technology will help create a rich educational environment with effective academic momentum.

The Study Limitations

This study, like any other, has the potential of limitations related to several research aspects, such as the research tool used, the sample, and the approach used to collect data, and others, which can be addressed in future research. Therefore, in this section, the researcher will address the most critical limitations of this study:

1. This study focused on a specific group: female undergraduate students at Taibah University in the College of Computer Science and Engineering. This makes it difficult to generalize the results to all universities in the same field in the Kingdom of Saudi Arabia or any other country which calls geographical limitations.

2. This study was limited to a specific technology, mobile computer devices and their impact on learning, without focusing on the importance of some applications and programs on these devices, which have become dependent on artificial intelligence technology.

3. The current study adopted a convenience sampling, which may create bias in the results, because some students did not want to engage and participate.

4. This study used the modified UTAUT tool after it was translated and reviewed by specialists. However, the translating process from the English Language to the Arabic Language may result in poor quality and strength, unlike in its native language, English. The survey used in this study needs to be applied in future studies to ensure it is suitable for female students' educational environment, or some survey items can be changed to align with the natural Saudi females' educational process.

Recommendations for Future Study

This section discusses some recommendations that should be considered in future studies to provide valuable results that serve the field of educational technology and the educational process in general. First, the current study was limited to a specific scope: Saudi female undergraduate students at the College of Computer Science and Engineering at Taibah University. As several previous studies have indicated, there is still an urgent need for future studies to examine Saudi female students' behavioral intentions toward adopting modern technology (e.g. mobile computer devices as main tools) in the educational process in different contexts. Therefore, this study recommends expanding the scope to include female graduate students and university faculty members to understand their role and acceptance of these modern technologies during the teaching and learning process by designing lectures and educational courses using the UTAUT model.

Moreover, the results of this study revealed that the performance expectancy was not statistically significant in relation to the behavioral intentions of Saudi female students toward using mobile computer devices; it was also limited to using a quantitative method to collect participant data. It is recommended to use mixed methods because this approach will assist the investigator in understanding the participants' views toward using mobile computer devices in the learning process. To illustrate, qualitative research seeks to verify the determinants that discover Saudi female students' intentions towards using mobile computer devices in their academic lives. For example, the qualitative methods, including interview sessions, field notes, etc., contribute to gathering as much as possible the participants' opinions and experiences towards using mobile computer devices in the educational process. I think the more experiences there are for female students, the more profound the results will be, which will help frame the results and legislate the use of mobile computer devices in the future in all female section in the universities of the Kingdom of Saudi Arabia. Qualitative methods add value to the educational technology field because they focus on understanding the female students' positions regarding mobile computer devices at Taibah University. According to Creswell (2014), qualitative research seeks to understand human behaviors and determine the reasons that control their behavior. Therefore, the main goal of this study is to address and innovate learning-focused instructional design theories that help educators and trainers foster the development of mobile learning for female students. Also, qualitative research methods help verify participants' responses to the questionnaire and better understand their perspectives and concerns.

In addition, this study focused on female Saudi students' behavioral intentions toward a particular technology: mobile computer devices for learning. So, technology has evolved significantly in recent years, encompassing several sectors, including education, especially with the investment and use of AI technologies in education. There is still a pressing need to understand students' behavioral intentions toward using AI-powered applications on mobile computer devices, such as ChatGPT and other AI-enabled programs. Therefore, it would be beneficial to include items in the survey, particularly in the demographic section, that focus on inquiring about the use of the most critical AI applications or other applications that rely on this technology and the extent of their impact on the learning process.

The original UTAUT model was employed and designed to examine the behavioral intentions of Saudi female students toward using mobile learning in their academic journey by using three constructs of the UTAUT model—performance expectancy (PE), effort expectancy (EE), and social influence (SI)—to know their behavioral intentions. Facilitate conditions (FC) were excluded from this study. Future research is recommended to test this construct (FC), including technical support and infrastructure for the classes and labs, with other previous constructs of the UTAUT model to investigate if that plays a role and positively associates their behavioral intentions to use mobile computer devices. Also, it is recommended that the three moderator variables be examined: age, experience, and voluntariness. This study excluded these moderators because there were no variances between participants in terms of their ages and experience with technology. However, as mentioned previously, extending the scope to include graduate students and faculty members is recommended. There will be variance between their ages and experiences toward using mobile computer devices and may they affect their behavioral intentions. Also, this study focused on discovering the female students' behavioral intentions toward using mobile computer devices rather than actually using them in their learning. Thus, it is recommended to examine to what extent they are actually using these devices in their learning by adopting items from Venkatesh et al. (2003) and other items in previous studies. In conclusion, this study encourages and recommends establishing new instruments by using different Arabic terms and meanings to examine the participants' behavioral intentions toward using the latest technology rather than translating it from other languages to be consistent with the educational context and environment in Saudi Arabia.

Implications for Applying Mobile Computer Devices

Embedding technology, including mobile computer devices, in the educational and learning process is vital to enhancing the average engagement level of students in their learning and the level of faculty members in the teaching process. Based on the findings of this study, some implications should be considered in developing the adoption of mobile computer devices in the educational process. College of Computer Science and Engineering leaders, faculty members, and instructional designers should be included in the development process.

Recommendations for the decision makers and the College of Computer Science and Engineering leaders at Taibah University

Based on the new Saudi vision (Vision 2030), the government supports and encourages the use of technology trends in all sectors to serve the community, especially in Saudi education, including schools and universities. Taibah University has a mission to align with the vision's goals in all science fields and to develop the educational environment and process by employing technology, such as mobile computer devices. The results of this study discovered that participants have behavioral intentions toward using mobile computer devices. However, performance expectancy was not statistically significant toward using mobile computer devices against the effort expectancy construct, which had a highly significant association with their behavioral intentions. This means participants have a vague vision of correctly using mobile computer devices in their learning.

Therefore, the decision-makers at Taibah University, representing the president of the university and the College of Computer Science and Engineering Department leaders, should investigate the quality of mobile computer devices to determine how to serve the educational goals and take into consideration female Saudi students before adoption. Therefore, decision-makers, stakeholders, and leaders in educational institutions should consider intrinsic factors, such as students' beliefs and attitudes toward mobile computer devices, if positive or negative, before adopting them in their educational environments (Bajabaa, 2017; Ertmer et al., 2006). Additionally, the findings of the current study found that the participants are still facing struggles with technical issues while using mobile computer devices in their learning on campus and distance education. These include the instructional infrastructure of the labs and classes, the speed of access to the Internet, the lack of the facilities and technologies inside and outside the classrooms, and updated programs and apps that align with students' needs.

To overcome these issues, with cooperation from the Deanship of Information Technology and Digital Transformation and E-Learning Department, facilities and assistance to students will be provided to overcome any technical issues they may encounter while using mobile computer devices in their learning. Desktops will be available in all colleges, including the College of Computer Science and Engineering at Taibah University. This approach will enhance the effective integration of mobile computer technologies into teaching and learning, helping students achieve their educational goals. Moreover, providing further support by establishing and developing educational policies that support the use of mobile computer devices in the educational process, in cooperation with the university's e-learning department, will help clarify how these devices can be used efficiently in classrooms by professors and students, and can simultaneously be leveraged in the teaching and learning process. Alanazi et al. (2023) also stressed that female students struggle to use laptops in classrooms unless there is a clear educational vision and policy to raise awareness and culture among professors and students about using mobile computer devices in learning and teaching.

Faculty members in the College of Computer Science and Engineering at Taibah University

Faculty members are considered one of the fundamental pillars of the educational process in higher education. Therefore, they are responsible for integrating technology into lecture preparation and during the teaching process, both inside and outside the classroom. Furthermore, the results showed that female students struggle with using mobile computer devices in the educational environment to effectively achieve the desired results. Therefore, this study recommends an active role among faculty members, in collaboration with the E-Learning Department and the Quality and Development Deputyship at the College of Computer Science and Engineering, to provide courses and programs to train female students on how to effectively use these devices academically and personally.

Also, faculty members should implement and employ more flexible strategies within the college to merge technology into the teaching and learning process, which is pivotal. To illustrate, female students should be allowed to use mobile computer devices in the classrooms, because they express their desire to employ these devices in their academic journey. Moreover, among these strategies is the effective use of these devices in the educational environment, which involves converting traditional exams to electronic, which requires enabling female students to use mobile computer devices during exams in a compatible manner.

Instructional Design at Taibah University

The instructional designers should be experts in educational design, or specialists such as faculty members in the Educational Technology Department at Taibah University (Bajabaa, 2017). The current study's findings showed that female students need support from instructional designers to design and develop content lessons to align with mobile computer devices because the educational content and websites of some assignments and projects is inconsistent. Therefore, effort expectancy was statistically significantly related to female students' behavioral intentions toward using mobile computer devices in their learning. Based on that finding, instructional designers should consider easily their designs and websites. Finally, instructional designers serve to open channels to listen from decision-makers, leaders, faculty members, and students. At the same time, educational content should be designed to meet their needs while using mobile computer devices.

Conclusion

Mobile computer devices play a vital role in developing the level of education and making the educational environment efficient. Accordingly, the Saudi government seeks to encourage and establish systems across all government sectors, including education, to integrate technology, a key objective of Vision 2030. Mobile computer devices remain one of the most important technologies; however, research is ongoing to determine their effectiveness in education. While adopting any type of technology, it is essential to determine whether students and teachers accept it before using it effectively.

In addition, the educational strategies used in the classroom must align with the type of technology to effectively achieve educational goals. Therefore, when students perceive that they do not need this technology for learning, there will be a proliferation of technology use, resulting in ineffective use and a waste of financial resources. Despite this, a limited number of studies focus on Saudi Arabia's female students' desire to use technology for learning. The purpose of this study was to predict the behavioral intention of Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to learn with mobile computer devices based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). Thus, the relationship between the three predictors (performance expectancy, effort expectancy, and social influence) with behavioral intention is determined. The results revealed that effort expectancy and social influence had a significant relationship to the behavioral intentions of Saudi female students toward using mobile computer devices ($\beta = 0.444$, $p < 0.001$; $\beta = 0.174$, $p = 0.033$); however, performance expectancy had no statistically significant association ($\beta = 0.108$, $p = 0.232$). In addition, multiple linear regression results were presented, showing that the model accounted for 39% of the variance in the behavioral intentions of Saudi female students toward using mobile computer devices in their learning. This chapter discussed the results linked to the previous studies covered in the literature review. It showed the limitations and recommendations that contribute to enhancing the development of mobile computer devices in the College of Computer Science and Engineering at Taibah University.

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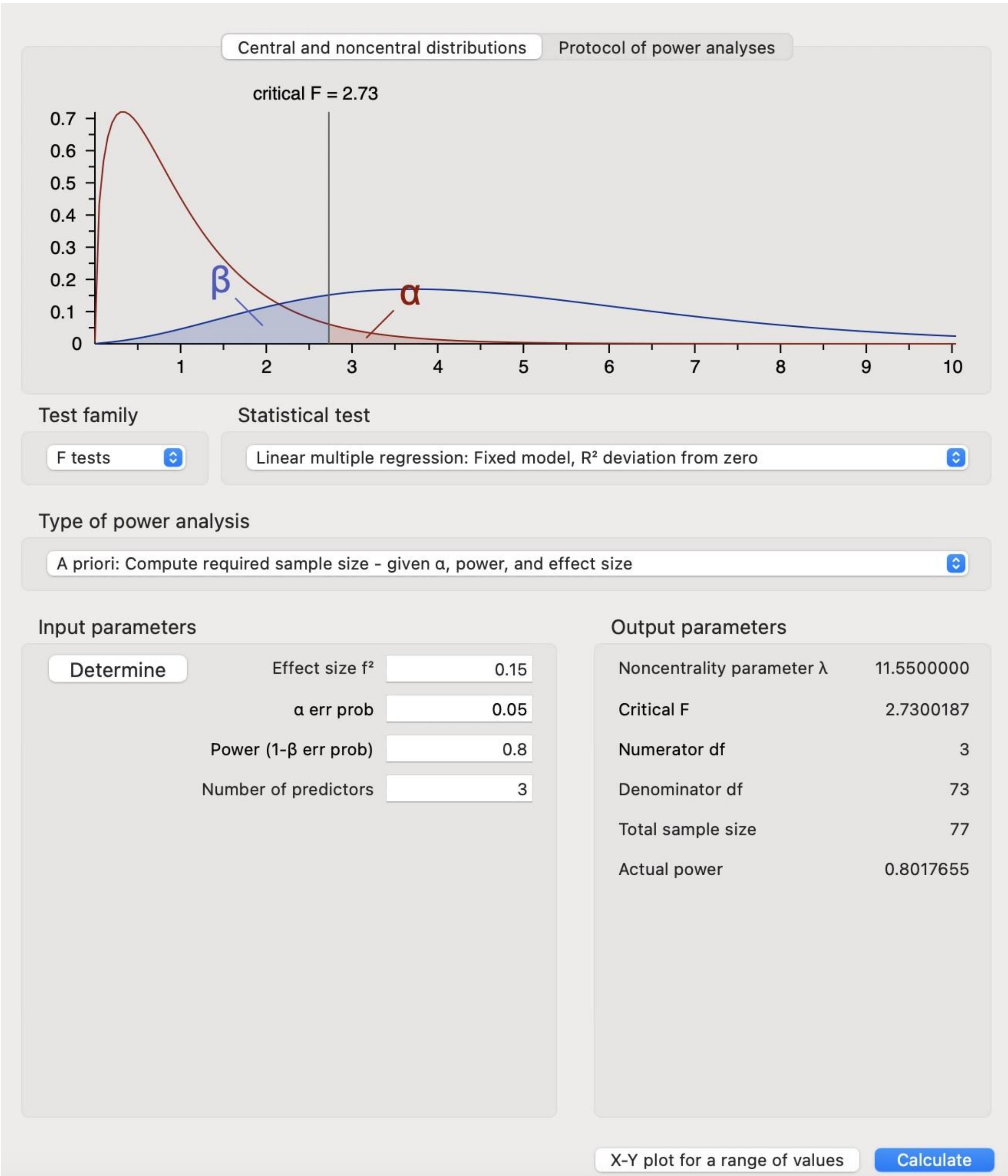
Appendix A - G* Power Software Analysis and the Minimum Sample Size



Appendix B - IRB Approval Form from Kansas State University

KANSAS STATE UNIVERSITY | Office of Research Integrity, Compliance and Security

TO: F Goodson
Curriculum and Instruction
Manhattan, KS 66506

Proposal Number: IRB-12567

FROM: Lisa Rubin, Chair
Committee on Research Involving Human Subjects

DATE: 01/30/2025

RE: Proposal Entitled, "Behavioral Intentions of Saudi Female Students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia Toward Using Mobile Computer Devices in Their Learning.."

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §104(d), category:Exempt Category 2 Subsection ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

Electronically signed by Lisa Rubin on 01/30/2025 2:13 PM ET

Appendix C - Request for Subjects to Participate in the Pilot Study

Dear female Saudi students pursuing a bachelor's degree at the College of Computer Science and Engineering at Taibah University,

I am conducting a study of your behavioral intentions regarding using mobile computer devices in learning. The results of this study will contribute to developing technological practices in the educational process.

I invite you to answer the survey questions, which consist of 21 closed-ended questions in two main sections: the demographic section and the questions of the main section, which focus on your behavioral intention toward using a mobile computer device in your learning journey. It will take roughly 15 minutes of your time to answer these questions. Your participation in this study will support the instrument's development, which is the central phase in completing my doctoral research and moving forward with my dissertation.

Thank you so much for your attention and participation. Please read these questions carefully and answer them based on your experiences and views.

Your responses will be kept confidential, which will help you respond in good faith. The link to the online survey is located here:
https://qualtricsxmz4mtq56lx.qualtrics.com/jfe/form/SV_9LHxZhDkx4SOv9Y

If you have any questions or concerns about the survey, feel free to contact the primary study supervisors,

Dr. Todd Goodson, tgoodson@ksu.edu.
Dr. Kay Ann Taylor, ktaylor@ksu.edu.
Or the researcher, Naif Alnehari, alnehari@ksu.edu. Phone Number: 785-592-0744.

Thank you in advance for your time and cooperation.

Appendix D - Request for Participation and Informed Consent Form- English Version

Kansas State University

Informed Consent Form

Dear Female Saudi Students in the Bachelor's Degree Program in the College of Computer Science and Engineering at Taibah University,

My name is Naif Alnehari, a PhD candidate in the Department of Curriculum and Instruction, College of Education, Kansas State University. I look forward to your help and cooperation to engage in this study by answering on the survey questions and it is a part of my journey of my doctoral dissertation titled:

Behavioral Intentions of Saudi Female Students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia Toward Using Mobile Computer Devices in Their Learning

RESEARCH PURPOSE

The purpose of this study is to predict the behavioral intention of Saudi female students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia to learn with mobile computer devices based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003).

CONFIDENTIALITY AND PARTICIPATION

This questionnaire is distributed to female Saudi students at the College of Computer Sciences and Engineering at Taibah University to share their opinions and views toward using mobile computer devices in their learning. All participants who engage in this study to answer on the survey questions are volunteers. Therefore, participant can refuse to answer any survey questions or withdraw anytime if you choose not to answer. There will be no penalty and you will not lose any benefits to which you are entitled. By agreeing and engaging to be part of the study, you are anonymous and only answer on your responses will be used for the research purposes because the confidentiality of participants' responses is an ethical issue that is followed in this study.

PROCEDURES OF SURVEY

The questionnaire includes closed-ended questions, which are six questions in the demographic section, and fifteen main questions related to your behavioral intentions toward using mobile computer devices. The link to the survey will be sent to the Dean's Office at the College of Computer Sciences and Engineering, and they will distribute it to the four main departments in the college. The requirement to answer the survey questions will take roughly 15 minutes. I appreciate your complete cooperation in response and sharing your opinion on this study.

RISKS ANTICIPATED:

There is no risk anticipated in participation in responding to the survey. Your responses will be kept confidential, which will help you respond in good faith.

BENEFITS:

The focus of this research study is to predict the female students' experience and desires toward using mobile computer devices in their learning. Therefore, this research study adds value to the educational technology field, because it focuses on understanding the female students' positions in using mobile computer devices at Taibah University. This study also aligns with the Saudi vision (Vision 2030) which encourages the merging of technology in the educational process, especially mobile computer devices by using them to help in the learning process. Additionally, the results of this study will provide the Ministry of Education in Saudi Arabia with a real vision of enabling the use of mobile computer devices in education. Finally, I hope this research will help female Saudi students better understand their position in using mobile computer devices in their academic lives in Saudi Arabia.

If you have any questions or concerns about the survey, feel free to contact the primary study supervisors,
Dr. Todd Goodson, tgoodson@ksu.edu.
Dr. Kay Ann Taylor, ktaylor@ksu.edu.
Or the researcher, Naif Alnehari, alnehari@ksu.edu.
Phone Number: [redacted].
If you have any questions about your rights as a research participant, please contact the IRB Chair at 785-532-3224 or rubin@ksu.edu.

Thank you for your time and cooperation.

Appendix E - Request for Participation and Informed Consent Form- Arabic Version

بسم الله الرحمن الرحيم

دعوة للمشاركة في الإجابة على أسئلة الاستبانة لنيل درجة الدكتوراه

عزيزتي الطالبة بكلية علوم و هندسة الحاسب الآلي لمرحلة البكالوريوس بجامعة طيبة بالمدينة المنورة

السلام عليكم و رحمة الله و بركاته أما بعد,,,

أنا الباحث نايف بن ناصر النهاري، مرشح للحصول لدرجة الدكتوراه بإذن الله، قسم المناهج و طرق التدريس - تخصص -التقنيات و التصاميم التعليمية- بجامعة ولاية كانساس الحكومية بالولايات المتحدة الأمريكية.

أرجوا مشاركتكم في الإجابة على أسئلة الاستبانة التي تخص هذه الدراسة و هي متطلب للحصول على درجة الدكتوراه، بعنوان (النوايا السلوكية للطالبات السعوديات بكلية علوم و هندسة الحاسب الآلي بجامعة طيبة تجاه استخدام الأجهزة الكمبيوتر المحمولة في تعليمهن).

Behavioral Intentions of Saudi Female Students in the College of Computer Science and Engineering at Taibah University in Saudi Arabia Toward Using Mobile Computer Devices in Their Learning

تهدف هذه الدراسة إلى التنبؤ بالنية السلوكية للطالبات السعوديات في كلية علوم وهندسة الحاسب الآلي بجامعة طيبة في المملكة العربية السعودية للتعلم باستخدام أجهزة الكمبيوتر المحمولة بناءً على مفاهيم النظرية الموحدة لقبول واستخدام التكنولوجيا (UTAUT).

تركز هذه الدراسة البحثية على التنبؤ بتجربة الطالبات ورغباتهن في استخدام أجهزة الكمبيوتر المحمولة في التعلم. لذلك، تضيف هذه الدراسة البحثية قيمة إلى مجال تكنولوجيا التعليم، لأنها تركز على فهم مواقف الطالبات في استخدام أجهزة الكمبيوتر المحمولة في جامعة طيبة. كما تتوافق هذه الدراسة مع رؤية المملكة العربية السعودية (رؤية 2030) التي تشجع على دمج التكنولوجيا في العملية التعليمية، وخاصة أجهزة الكمبيوتر المحمولة من خلال استخدامها للمساعدة في عملية التعلم.

بالإضافة إلى ذلك، ستوفر نتائج هذه الدراسة لوزارة التعليم في المملكة العربية السعودية رؤية حقيقية لتمكين استخدام أجهزة الكمبيوتر المحمولة في التعليم. أخيرًا، آمل أن يساعد هذا البحث الطالبات السعوديات على فهم موقفهن بشكل أفضل في استخدام أجهزة الكمبيوتر المحمولة في حياتهن الأكاديمية في المملكة العربية السعودية.

مشاركتكم و تعاونكم في هذه الدراسة مشكورة سلفاً، هي تطوعية، حيث يمكنكم رفض الإجابة على أي سؤال من أسئلة الاستبيان أو الانسحاب في أي وقت لا ترغبون في الإجابة دون أي عقوبة قد يترتب على ذلك. من خلال موافقتكم مشاركتكم

في هذه الدراسة، تكون الهوية المستجيب مجهولة (حيث لا يتطلب اسم المشارك)، وسيتم استخدام إجاباتكم فقط لأغراض البحث ، لأن سرية إجابات المشاركين هي قضية أخلاقية يتم اتباعها في هذه الدراسة. سوف يستغرق من وقتكم الثمين للإجابة على أسئلة الاستبانة لا تزيد عن (**خمسة عشر دقيقة**).

إذا كانت لديك أي أسئلة أو مخاوف بشأن الاستطلاع أو الدراسة، فلا تتردد في الاتصال بمشرفي الدراسة:

Dr. Todd Goodson, tgoodson@ksu.edu.

Dr. Kay Ann Taylor, ktaylor@ksu.edu.

أو التواصل مع الباحث بشكل مباشر من خلال معلومات التواصل أدناه.

جزاكم الله عني كل خير و جعل ما قدمتموه من وقتكم الثمين في الإجابة على الاستبانة في موازين حسناتكم.

لكم خالص التحية و التقدير,,,

الباحث: نايف بن ناصر النهاري

كلية التربية-قسم المناهج و طرق التدريس-جامعة ولاية كانساس الحكومية بالولايات المتحدة الأمريكية

الهاتف: [redacted]

الايميل:alnehari@ksu.edu

Appendix F - Permission to Use UTAUT Survey and Figure

Permission Granted

V

vvenkateshautoreply@gmail.com

To: Naif Alnehari

Mon 8/26/2024 9:10 PM

Flagged

This email originated from outside of K-State.

Dear Naif Alnehari,

Thank you for your interest. Your permission to use content from the paper is granted. Please cite the work appropriately. Note that this permission does not exempt you from seeking the necessary permission from the copyright owner (typically, the publisher of the journal) for any reproduction of any materials contained in this paper.

Sincerely,
Viswanath Venkatesh
Eminent Scholar and Verizon Chair of Business Information Technology
Director, Executive Ph.D., http://executivephd.pamplin.vt.edu/
Email: vvenkatesh@vvenkatesh.us
Website: http://vvenkatesh.com

Asking for Permission to use UTAUT Figure and Instrument in the Current Study

NA You
Hello Dr. Davis, I hope you are doing well! I am a cur... Mon 8/26/2024 8:46 PM

DF Davis, Fred <Fred.Davis@ttu.edu>
To: Naif Alnehari
Mon 8/26/2024 9:22 PM

Flagged

This email originated from outside of K-State.

You have my permission to use the UTAUT figure and instrument.
Best wishes
Fred Davis

From: Naif Alnehari <alnehari@ksu.edu>
Sent: Monday, August 26, 2024 12:46 PM
To: Davis, Fred <Fred.Davis@ttu.edu>
Subject: Asking for Permission to use UTAUT Figure and Instrument in the Current Study

This email originated outside TTU. Please exercise caution!

...

Appendix G - Survey Employed in this Study- English Version

Characteristics of Participants	
What is your age?	☐ 18-20 years ☐ 21-23 years ☐ Older than 23 years
Which year are you in at Taibah University?	☐ First year (Freshmen) ☐ Second year (Sophomore) ☐ Third year (Junior) ☐ Fourth year (Senior)
What is your major in the College of Computer Science and Engineering (CCSE)?	☐ Computer Science ☐ Information Systems ☐ Cyber Security ☐ Artificial Intelligence and Data Science
How many years of experience do you have using mobile computer devices?	☐ Less than two years ☐ 2-4 years ☐ 5-7 years ☐ More than 7 years
How would you describe your knowledge of using mobile computer devices in learning tasks?	☐ Limited ☐ Average ☐ Very good ☐ Advanced
What challenges do you usually face that limit your use of mobile computer devices (inside and outside of class)? Choose as many answers that apply	☐ Classroom infrastructure that limits the use of mobile computer devices (e.g., Internet access). ☐ Inability to complete tasks efficiently and effectively because the limited quality and specifications of these devices (e.g., screen size, memory capacity). ☐ Technical issues of these devices, (e.g., quality of the battery and the device while downloading (files, programs or apps, Internet speed). ☐ Other specific challenge(s): ……………………………………………………………

2. Modified Section							
Variable Measured	**Statement**	**Strongly Agree**	**Agree**	**Somewhat Agree**	**Somewhat Disagree**	**Disagree**	**Strongly Disagree**
Performance Expectancy	I would find mobile computer devices useful in my learning process.						
	Using mobile computer devices would enable me to accomplish learning tasks more quickly.						
	Using mobile computer devices would increase my productivity.						
	If I use mobile computer devices, I will increase my chance of getting a higher grade in my courses.						

Effort Expectancy	My interaction with mobile computer devices would be clear and understandable.						
	It would be easy for me to become skillful at using mobile computer devices.						
	I would find mobile computer devices easy to use in my learning process.						
	Operating mobile computer devices in learning is easy for me.						
	People who influence my behavior think that I should use mobile computer						

Social Influence	devices in my learning.						
	People who are important to me think that I should use mobile computer devices in my learning.						
	The professors of the College of Computer Science and Engineering at Taibah University have been helpful in the use mobile computer devices in my learning.						
	In general, the College of Computer Science and Engineering at Taibah University supports using						

	mobile computer devices in the learning process.						
Behavioral Intent to Use Mobile Computer Devices	I intend to use mobile computer devices in the future if they are available.						
	I predict I will use mobile computer devices in the future for my learning.						
	I plan to use mobile computer devices in the future if they are provided.						

Appendix H - Survey Employed in this Study- Arabic Version

قسم المعلومات الشخصية للمشاركين	
ما هو عمرك؟	( ) 18-20 سنة ( ) 21-23 سنة ( ) أكبر من 23 سنة
في أي سنة دراسية في المرحلة الجامعية بجامعة طيبة؟	( ) السنة الأولى من المرحلة الجامعية ( )السنة الثانية من المرحلة الجامعية ( ) السنة الثالثة من المرحلة الجامعية ( ) السنة الرابعة من المرحلة الجامعية
ما هو تخصصك في كلية علوم و هندسة الحاسب الآلي بجامعة طيبة؟	( ) علوم الحاسب الآلي ( ) نظم المعلومات ( ) أمن السيبراني ( ) الذكاء الاصطناعي و علم البيانات
كم عدد سنوات الخبرة لديك في استخدم أجهزة الكمبيوتر المحمولة؟	( ) أقل من سنتين ( ) من 2-4 سنوات ( ) من 5-7 سنوات ( ) أكثر من 7 سنوات
كيف تصف معرفتك تجاه استخدام أجهزة الكمبيوتر المحمولة في المهام التعليمية؟	( ) محدود ( ) متوسط ( ) أعلى من المتوسط ( ) متقدم
ما هي التحديات التي عادة تواجهك و تحد من استخدام أجهزة الكمبيوتر المحمولة (سواء داخل أو خارج الفصل الدراسي)؟ يمكنك اختيار أكبر عدد من الإجابات التي قد تنطبق عليك.	( ) البنية التحتية للفصول الدراسية تحد من استخدام أجهزة الكمبيوتر المحمولة (مثل الوصول إلى الانترنت). ( ) عدم القدرة على إنجاز المهام بكفاءة و فعالية بسبب الجودة و المواصفات المحدودة لهذه الأجهزة (مثل حجم الشاشة، و سعة الذاكرة). ( ) المشاكل الفنية لهذه الأجهزة (مثل جودة بطارية الجهاز، جودة عمل الجهاز أثناء تنزيل الملفات الكبيرة أو البرامج أو التطبيقات، و سرعة الانترنت).

( ) تحديات محددة أخرى التي تواجهك أثناء استخدام أجهزة الكمبيوتر المحمولة في مرحلة التعلم.	

الجزء الثاني من الاستبانة التي تتعلق بالدراسة

المتغير المراد قياسه	الفقرة	أوافق بشدة	أوافق	أوافق إلى حد ما	غير موافق إلى حد ما	غير موافق	غير موافق بشدة
توقع الأداء	أعتقد أن الأجهزة الكمبيوتر المحمولة ستكون مفيدة في عملية التعلم الخاصة بي.						
	إن استخدام أجهزة الكمبيوتر المحمولة تمكنني من إنجاز المهام التعلم بشكل أسرع.						
	إن استخدام أجهزة الكمبيوتر المحمولة تزيد من إنتاجيتي.						
	إذا كنت استخدم الأجهزة الكمبيوتر المحمولة، فسوف تزيد فرصتي في الحصول على درجات أعلى في المواد العلمية.						
توقع الجهد	سيكون تفاعلي مع أجهزة الكمبيوتر المحمولة واضحاً و مفهوماً.						
	سيكون من السهل لي أن أصبح ماهراً في استخدام أجهزة الكمبيوتر المحمولة.						
	أجد أن أجهزة الكمبيوتر المحمولة سهلة الاستخدام في عملية التعلم.						
	استخدام أجهزة الكمبيوتر المحمولة في التعلم أمر سهل بالنسبة لي.						
	يعنقد الأشخاص الذين يؤثرون على سلوكي أنني يجب أن استخدم أجهزة الكمبيوتر المحمولة في تعليمي.						

التأثير الاجتماعي	يعتقد الأشخاص الذين يهتمون بي بأنه يجب أن استخدم أجهزة الكمبيوتر المحمولة في تعليمي.							
	ساعدني أساتذة كلية العلوم و هندسة الحاسب الآلي في استخدام أجهزة الكمبيوتر المحمولة في تعليمي							
	بشكل عام، تدعم كلية علوم و هندسة الحاسب الآلي بجامعة طيبة باستخدام أجهزة الكمبيوتر المحمولة في عملية التعلم.							
النوايا السلوكية	أنوي استخدام أجهزة الكمبيوتر المحمولة في المستقبل إذا كانت متاحة.							
	أتوقع أنني سأستخدم أجهزة الكمبيوتر المحمولة في المستقبل لأغراض التعلم.							
	أخطط لاستخدام أجهزة الكمبيوتر المحمولة في المستقبل إذا تم توفيرها.							

Appendix I - Effat University, Dar Al- Hikmah University, and Princess Nourah Bint Abdulrahman University

Appendix Figure I.1. Effat University. Source: https://tinyurl.com/5h34nnbj.

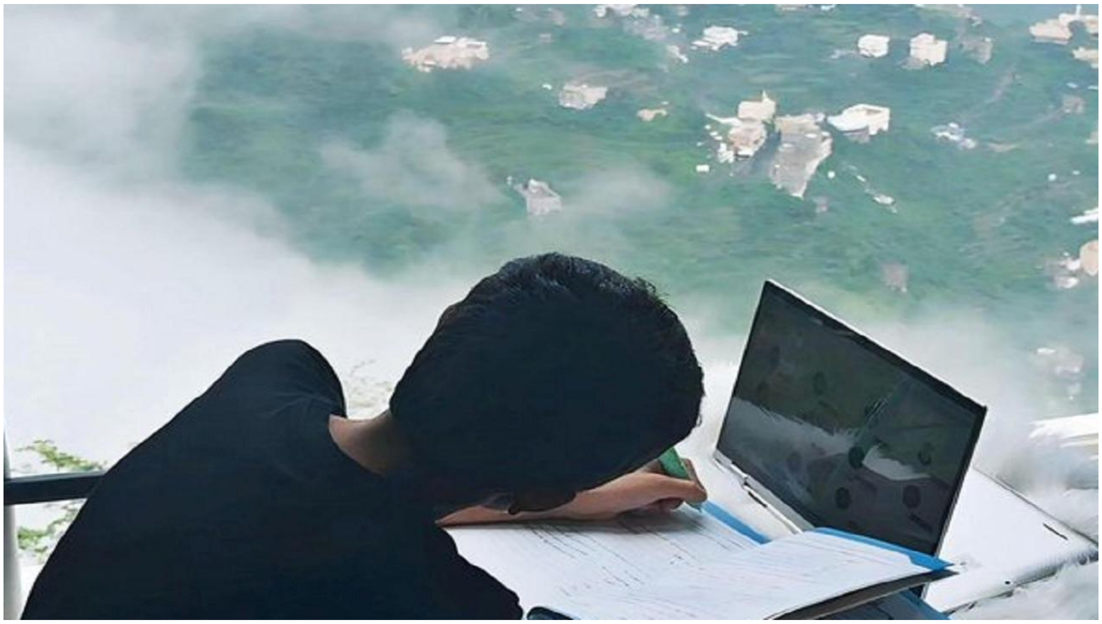
Appendix Figure I.2. Dar Al-Hikmah University. Source: https://tinyurl.com/bde7629b.

Appendix Figure I.3. Princess Nourah Bint Abdulrahman University.
Source: https://pnu.edu.sa/ar/Pages/Home.aspx.

Appendix J - Taibah Received Innovation Award from the National Learning Center in Saudi Arabia

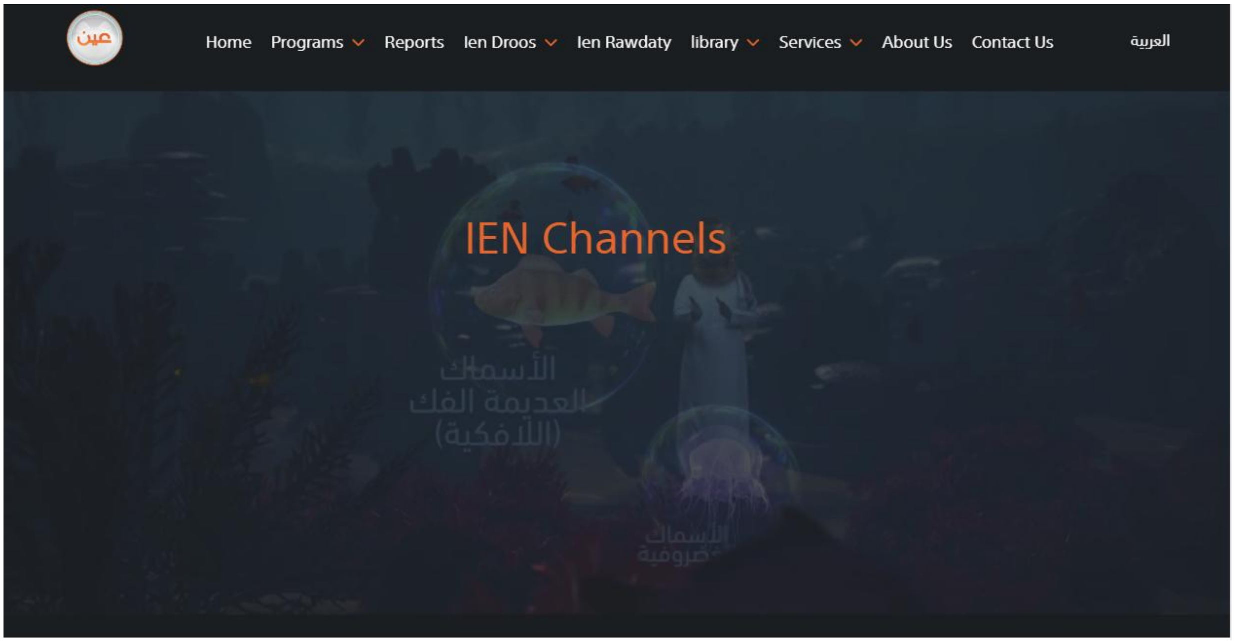
Appendix Figure J.1. The E-learning Department received the Reward for Learning Innovation Award in 2023 from the National Learning Center in Saudi Arabia.
Source: https://x.com/taibahu/status/1708463687202197904?lang=ar.

Appendix K - Future Gate Platform



Appendix Figure K.1. The student used the Future Gate Platform in the Jazan Province, Faifa Village, when school was closed due to weather conditions in August 2024.
Source: https://x.com/SaudiNews50/status/1828825243848458668?lang=en.

Appendix L - IEN Channel



Appendix Figure L.1. IEN Channel Home Page. Source: https://www.ientv.edu.sa/en/node.