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The IMPACT OF ONLINE SERVICE QUALITY ON STUDENTS' SATISFACTION

İŞLETME ANABİLİM DALI
DOKTORA TEZİ

RAMI ABDELLATIF
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TEZ SAVUNMA SINAVI, İÜ Lisansüstü Eğitim-Öğretim Yönetmeliği'nin **50. Maddesi** uyarınca yapılmış, sorulan sorulara alınan cevaplar sonunda adayın tezinin **KABULÜNE** OYBİRLİĞİ / OYÇOKLUĞUYLA karar verilmiştir.

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Özet

Geçmiş deneyimler: Üniversitelerin, öğrencilere daha kaliteli hizmet sunmak için kullanılabilecek çok sayıda teknoloji uygulaması vardır. Özellikle elektronik sınıflar dışındaki araştırmalarla ilgili olarak, öğrencilerin kalite algılarını ve yüksek öğretimde, teknolojilerin kullanımını inceleyen araştırmalarda bir eksiklik vardır. Bu araştırma, dijital nesil için şu anda mevcut olan teklifleri tanıtmak ve en uygun kalite modellerini ve teorilerini gözden geçirmek için bu alanı literatür taramasından geçirmiştir. **Yöntem:** Türkiye'deki 11 üniversiteden teknolojideki hizmet ve tekliflerle ilgili olarak, öğrencilerin kalite algılarının belirlenmesinde sosyal ilişkiler için dört model incelenmiştir. Literatürde belirtildiği gibi, toplam 318 öğrenciye ait, çok boyutlu sorular içeren anketler kullanılmıştır. Tüm sonuçları değerlendirmek için SPSS, AMOS ve Smart PLS kullanılmıştır. **Sonuçlar:** Katılımcıların çoğunluğu, üniversite hizmet tekliflerinden memnuniyet duyduklarını belirtmiştir. Kombine bir TAM/UTAUT ve HEdPERF/SERVQUAL model, SRMR ve NFI ile rapor edilmiştir. Son olarak, TechnoQual model tanıtılmıştır ve test edilmiştir. Performans beklentisi değişkenleri, algılanan kullanım kolaylığı, sosyal etkiler, güvence, empati, akademik olmayan yönler, kullanma niyeti ile sonuçlandırılmıştır. Bu bulgulara dayanarak nihai bir anket önerilmiştir.

Anahtar kelimeler: Çevrimiçi hizmetler, Kalite, Memnuniyet, Teknoloji Kabulü, Yüksek Öğrenim

Abstract

Background: Universities have numerous types of technology applications that can be used to provide higher quality service offerings to students. There is a lack of research examining student perceptions of quality and the use of technologies in higher education, specifically regarding research other than electronic classrooms. This research studied this area through literature to introduce the offerings currently available to the digital generation and to review types of quality models and theories that were most applicable. **Method:** Four models were examined for relationships in determining quality perceptions of students regarding services offerings in technology from 11 universities in Turkey. A total of 318 students' questionnaires were used, which included multi-dimensional questions as indicated in literature. SPSS, AMOS, and Smart PLS were used to assess all results. **Results:** The majority of respondents indicated satisfaction with their university service offerings. A combined TAM/UTAUT model and HEdPERF/SERVQUAL model were reported with SRMR and NFI. Lastly, the TechnoQual model is introduced and tested, resulting in the variables of performance expectancy, perceived ease of use, social influences, assurance, empathy, non-academic aspects, and intent to use. A final questionnaire was proposed based on these findings.

Keywords: Online services, Quality, Satisfaction, Technology Acceptance, Higher Education

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List of Symbols and Abbreviations Used

Abbreviated Terms in Paper:

360-degree videos or 360: Images taken to include the full surroundings of the area around.

A: Attitude

AMOS: Analysis of a Moment Structures

Blackboard: Learning Management System

DIT: Theory of Diffusion of Innovations

DTPB: Decomposed Theory of Planned Behaviour

E-Commerce: Electronic Commerce, shopping, purchases, and sales of products through information and communication technologies.

e-learning: Electronic learning – educational services provided using information and communication technologies.

E-Services: services provided using technologies for information and communication.

et al: And others

GBL : Game Based Learning

GmbH: Gesellschaft mit beschränkter Haftung – Company with limited liability

HE: Higher Education

HEdPERF: Higher Education Performance, applied as a concept model and scale to measure satisfaction with higher education offerings.

HESQUAL: Higher Education Service Quality, applied to a concept model and theory of service quality.

IBM: International Business Machines

IS: Information technology or information systems.

L2 Anxiety: Second Language context anxiety

LMS: Learning management systems

MBA: Master of Business Administration

Moodle : Modular Object-Oriented Dynamic Learning Environment

PBC: Perceived Behavioural Control

QMF: Quality Management Framework

SERVQUAL: Service Quality; applied to a concept model and theory of service quality.

SET: Self-efficacy Theory

Smart PLS: software to conduct variance-based structural equation modelling.

SN: Subjective Norms

SPSS: Statistical Package for Social Sciences

STEM: Science, Technology, Engineering, and Mathematics; referring to education.

TAM: Theory of Acceptance Model

TPB: Theory of Planned Behaviour

TRA: Theory of Reasonable Action

TTF: Theory of Task-technology Fit

U.S.: United States of America

UK: United Kingdom

UTAUT: Unified Theory of Acceptance and Use of Technology

YÖK: Council of Higher Education (Turkey)

Abbreviated Terms and Symbols in Data and Results

ACAD: Academic Aspects

ACCESS: Accessibility

AGFI: Adjusted Goodness-of-Fit Index

AIC: Akaike Information Criterion

ASSUR: Assurance

AVE: Average Variance Extracted

BCC: Browne-Cudek Criterion

B-ESEM: Bayesian Exploratory Structural Equation Modelling

BI: Behavioural Intention

BIC: Bayesian Information Criterion

BSEM: Bayesian Structural Equation Modelling

C.R.: Capability Ratio

CAIC: Consistent AIC

CFA: Confirmatory Factor Analysis

CFI: Comparative Fit Index

CMIN: Minimum value of C

df: degrees of freedom

ECVI: Expected Cross-Validation Index

EE: Effort Expectancy

EFA: Exploratory Factor Analysis

EMP: Empathy

ESEM: Exploratory Structural Equation Modelling

FC: Facilitating Conditions

FMIN: Minimum value of F

GFI: Goodness of Fit Index

HTMT: Heterotrait Monotrait

ICM: Independent Cluster Model

IFI: Incremental Fit Index

IntentUs: Intent to Use

IU: Intent to Use

KMO: Kaiser-Meyer-Olkin value

KURT: Kurtosis

M: Mean

N: Sample

NCP: Non-centrality Parameter

NFI: Normed Fit Index

NONA: Non-Academic Aspects

NPAR: Number of Distinct Parameters estimated

P or P Value: Probability Value

PCFI: Parsimonious fit index based on CFI

PE: Perceived Ease of Use

PerfE: Performance Expectancy

PerfEx: Performance Expectancy

PLS-SEM: Partial Least Squares Structural Equation Modelling

PNFI: Parsimonious fit index based on NFI

PRatio: Parsimony ratio

PROG: Program Issues

PU: Perceived Usefulness

REL: Reliability

REPU: Reputation

RESP: Responsiveness

RFI: Relative Fit Index

RMSEA: Root Mean Square Error Approximation

S.E.: Standard Error

SD: Standard Deviation

SEM: Structural Equation Modelling

SI: Social Influence

Sig: significance

SMEAN: Missing values replaced with mean variable set

SRMR: Standardized Root Mean Square Residual

STDEV: Standard Deviation

t or t-statistic: statistical measurement of ratio departure used for significance

TANG: Tangibles

TechnoQual: Technology Quality model proposed

TLI: Tucker-Lewis Index

UB: Use Behaviour

UNDER: Understanding

USE: Use of offering

VOL: Voluntariness

1. Introduction

Changes to technology have directly influenced education at a global level, creating new methods of completing education, accessing materials, and transforming textbooks and written assignments. In addition, increased mobility has improved the ability of students to attend universities in any location, regardless of how far away the school may be, which includes global access to classroom materials, communication with other students, instructor lectures, and submission of assignments (Taylor & Cantwell, 2015; 411). Today, students can attend online colleges, discuss assignments in virtual classrooms, and read textbooks on smartphones. Esteves., et al. (2018) argued that one of the greatest challenges for instructors is "to build a bridge between the technological world that students live in and the classrooms in which teachers expect them to learn" (116). Lai and Hong (2015) researched the use of technology by higher education students and found both the need for improvements on teaching the technology used in the classrooms and the acknowledgement that access to technology was uneven, but not based on age of students. Challenges were based across various levels of experience with use of technology, familiarity with technology, and knowledge of instructors in sharing tips and training tools with students to learn the technology. A variety of opportunities are available to colleges and universities for both engaging and teaching students, which can improve the learning experience and increase student use of available technologies.

New technologies, emerging since the late 1900s, have included websites, e-commerce, social media platforms, information technology systems, e-learning platforms, virtual reality, WEB 2.0, and mobile technologies (Carlos, Alejandro, & Francisco; Gautam & Husain, 2017; Peart, 2017). Use of the technologies vary based on colleges; for example, nursing education trends indicate the use of blended learning, using online and face-to-face interactions, and focusing on

use of online databases to gather learning materials and teach researching skills (Skiba, 2016). As part of Lai and Hong (2015)'s conclusions, recommendations included changes to higher education (HE) policies to improve upon student access to and success with the technology of their campuses. Increases in technology have also improved the ability for HE to grow, by creating a borderless environment and permitting students the ability to attend virtual classrooms for study.

Growth in higher education, globally, has expanded the strongest during the time since 1990 (Zapp, 2017; 38). A variety of different types of educational institutions have contributed to this growth, primarily identified as either public or private. The United States has had a large growth in private HE and Germany has had strong growth in public HE (Zapp, 2017; 39). Much of the growth has focused around sciences, or STEM, degree programs that increase the competitiveness of students upon graduation (Zapp, 2017). However, credit for the growth of HE, overall, has been given to the increased "mobility of resources, ideas, and cultural practices across national borders" (Taylor & Cantwell, 2015; 411). Although private education for HE has increased, much of the growth has been directly related to increased interest by governments for improvement in competitive employment opportunities, including attracting more students and attracting organizations to the country. Results of growth in HE has created competition due to increased options for potential students.

Competition in both employment and education has grown globally, for higher education, this is seen as a result of access through technology to schools far away from students and as a result of improved accountability in numerous countries. Due to increased competition in Canada, Ontario publicly funded HE institutions were forced to begin using market tools and corporate models to remain viable and appeal to larger number of students globally (Farhan, 2017). Fischer and Wigger (2016) suggested that Germany public education offers free HE to increase the number

of students attending their colleges, with less fear of huge debts that are unable to be repaid after graduation. The results of competition and growth include increases in regulations to improve upon the educational offerings and quality available to students, in numerous different countries and at a variety of government and private levels.

Quality management in UK HE has included increased regulation that focuses on the distinctions between colleges, methods of achieving professional certifications and quality of instructors (Francis & Taylor, 2016). A systematic literature review conducted by Manatos, Sarrico, and Rosa (2017) found increases in the use of quality management principles and practices by HEs, including process and organizational levels. The quality emphasized in the findings was based on holistic and comprehensive quality management approaches by HEs (Manatos, et al, 2017). However, little research is available on satisfaction of students regarding the types of technology used by HEs, or how they use those technologies to meet their individual learning needs.

Online services are present in many HEs around the globe. The use of technology has increased access to these types of services; however, few researchers have examined the relationship between student perceptions of quality, satisfaction, and the online service offerings of the universities and colleges. Literature was examined to understand if student satisfaction was studied in the areas of online services, as opposed or in addition to the studies examining e-learning and related offerings by HEs. Other areas examined in this chapter included the theoretical foundations and conceptual framework, which directly influences how the study was developed and the guiding concepts that framed the questions and results analysis. A further understanding of the topics and concepts of the online services was developed through the exploration of the growth and competition in higher education and technology in education. Online services available

required an understanding what was available and why the growth has been rapid. Additionally, the application of online services, including e-commerce, has been examined in literature for adoption of technology and customer satisfaction. Quality management is a critical area of the student satisfaction, because it could directly indicate the engagement with students to continuously develop in the direction of student needs. Further, adoption of technology has a direct influence on the ability of students to find the online services satisfaction. It was critical to this work to understand what type of adoption of technology was found to be directly related to customer satisfaction or to customer adoption of technology.

1.1 Relevance of the Topic

As HEs increase the use of technology and develop a focus of quality management, it is important to understand the perceptions of students that use or must use the technology. Technology offers a number of advantages in disseminating information and reaching students during their travels, during short breaks from other tasks, and while mobile. Correct application of technology can also improve student success and satisfaction with their experiences. However, numerous factors are involved in engaging students through technology, amongst these are the experience of students and faculty with tools available and the skills required to create satisfaction in the students' use of those tools. Universities and colleges benefit from the exploration of online services quality on student satisfaction by providing important feedback for improvements in the future.

Current literature explores the perceptions of quality and satisfaction from a variety of different theoretical options and focus around the use of SERVQUAL, HESQUAL, and HEdPERF. While widely accepted measurements and dimensions for understanding the needs of customers from areas of research, the current availability of dimensions focused around the online

offerings of colleges have not been identified and clarified for future researchers or for HEs to understand where improvements must occur. This research is relevant to a variety of different fields and HEs as part of the ongoing development for improving organizational understanding of individual satisfaction perceptions of online offerings. The purpose of this research is to identify the dimensions within quality perceptions and how they influence the satisfaction of the students in HEs and could be adapted in the future for other areas of consumer satisfaction in online offerings.

1.2 Problem Statement

Current literature on the application of technology in HE classrooms has been limited over the past five years. Mang and Wardley (2013) examined student perceptions of using tablets for classwork, finding that the majority of students were interested in the use of this type of mobile equipment to complete classwork, both before and after its use. While Abbad and Jaber (2014) explored the perceptions of students in the evaluation of e-learning systems, the problem did not examine perceived quality of the education. Abbad and Jaber (2014) did find that a critical area was technology acceptance. Research is lacking between student perceptions of quality and the use of technology in the HE. This research is designed to fill the gap in knowledge and provide universities and colleges with information necessary for improving both quality and perceptions of quality to remain competitive in the global HE markets.

1.3 Benefits of IS Technology in HE

Information technology or information systems (IS) is part of a numerous technology areas that are being used in various different industries globally. Emerging technologies are explored by researchers, such as Backhouse (2013), and use definitions with terms of innovations, virtual reality, text, and tools that are both innovative and change the way communication and information

transference occurs in a variety of ways (346). Demand for implementation of technology, such as learning management systems (LMS) are on the rise, particularly to reach larger populations of potential students (Mouakket & Bettayeb, 2015). Some examples of new technology in use are Blackboard and Moodle (Mouakket &Bettayeb, 2015; Unal & Unal, 2014).

IS technology is used in e-service, as offered by colleges through online applications, access to instructors and course materials, and correspondence with financial aid or other staff members. E-services are reported by Batagan, Pocovnicu, and Capisizu (2009), to have the benefits of:

- "Familiarizes individuals with electronic information and educates them about the benefits of using advanced technology.
- Enables telecommuting.
- Provides integrated informative systems with social, cultural and economic aspects of the individuals.
- Transparency of information
- Removes time and location barriers
- Enhances data acquisition, transformation and retrieval, unlike the data chaos in a traditional service provider
- Promotes reuse of information
- Reduces operation time
- Reduces costs
- Improves information access for decision-making
- Cultivates better relationships with customers
- Reduces overhead costs such as benefits administration

- Speeds process turnover such as expense reimbursement
- Allows searches of large volumes of heterogeneous data (documents, pages, database, messages, multimedia)
- Involves the citizens in governmental activities providing easy access to information using Internet." (376).

1.4 Consequences of IS Technology in HE

Technology can be difficult to implement in a well-organized environment, due to the need to learn new methods and equipment. Additionally, not all staff or students may be interested in learning new ways to manage information. Lai and Hong (2015) studied younger generations to determine if a "digital generation" was occurring and if education needed to change to appeal to the generation or to provide for needs not addressed by technology, finding that the claims were not based on empirical evidence (735). While the use of technology is growing, it may not be influencing learning or other aspects of education. In some cases, instructors are reluctant or lack interest in continued use of technology, sometimes resulting from perceived usefulness (PU) or from lack of satisfaction in the interfaces available (Mouakket & Bettayeb, 2015). Unal and Unal (2014) found that use of the technology also required some previous experience with software, or knowledgeable personnel that could assist when software and technology worked unexpectedly or incorrectly.

In addition to inconsistent reporting of use and interest in use, technology implementations can be costly to universities. Cost can be a leading indicator on implementation, as indicated by Akotoye (2017) in the research of sub-Saharan Africa's universities' use of conference calling as a collaboration tool (63). Universities in the U.S. have experienced rapid growth, since the late 1900s, in online degree program offerings, which are less costly after the initial purchasing of

software and assisting in funding students to receive access, including costly library databases (Deming, et al, 2015). With increases in costs per student, in higher education, researchers such as Johnes and Johnes (2016), and Lu and Chen (2013) have explored the issues of returns to scale, scope, cost efficiency, and cost inefficiency to understand the costs and effectiveness of universities in the HE sectors. Public versus private sector HE varies based on country, and funding supported by the government under various programs also varies. In this same way, accountability of costs can vary between HEs, including in meeting government or student requirements.

1.5 Objectives of the Research

The objectives of this research are to determine if quality of online services is related to student satisfaction. Objectives include the examination of numerous different dimensions and parameters indicated in various literature examining satisfaction in offerings. According to research for SERVQUAL, HESQUAL, and HEdPERF, dimensions may include tangibles, reliability, responsiveness, assurance, empathy, non-academic aspects, academic aspects, reputation, access, accessibility, program issues, study programs, and understanding, which are expected to influence the perceptions of quality and satisfaction of individuals. Organizations must determine when different opportunities exist to creating increased value to consumers, as a method of improving satisfaction and increasing customers. HEs are especially at risk of disappointing consumers due to rising access and awareness of potential technology uses. Along with understanding the relationship between quality and perceptions of satisfaction, this research aims to develop a further understanding of the influence of these various dimensions and which dimensions will most influence the perceptions of students.

1.6 Key Concepts

1.6.1 Information Systems (IS)

Is defined as being both a product and a discipline, referred to as information systems and technology (McDonagh, 2014; 441). IS products include any type of hardware, software, or types of data processing tools utilized by an organization in order to achieve a method of managing information and disseminating it to employees and stakeholders in an efficient manner (McDonagh, 2014; 441). The discipline of information systems and technology is the study and research of the use and management of information, particularly through systems and technology, and includes a number of different theories (McDonagh, 2014; 441). Some theories in IS are the technology acceptance model and the information systems success model (McDonagh, 2014; 441). The majority of IS research is conducted based on exploration of digital technologies and settings of applied use (McDonagh, 2014; 441).

1.6.2 Service Quality Dimensions

Service quality dimensions are identified in a variety of research to include reliability, competence, access, responsiveness, communication, courtesy, credibility, empathy, security, and tangibles (Lagrosen & Lagrosen; Kant & Jaiswal, 2016; Janita & Miranda, 2013). Some research eliminates some of the options for measurement, due to the number and previous findings; however, for the purpose of this research, dimensions were gathered from the available research in the areas of SERVQUAL, HESQUAL, and HEdPERF, and found to consist of tangibles, reliability, responsiveness, assurance, empathy, non-academic aspects, academic aspects, reputation, access, accessibility, program issues, study programs, and understanding. Although some research indicates that other aspects and dimensions may influence the perceptions of quality and satisfaction of consumers, these dimensions were most commonly indicated for the theoretical areas researched. Definitions of each of these dimensions is located in Chapter 3.

1.6.3 SERVQUAL

SERVQUAL is used as quality model, due to the multi-dimensional aspects that are able to measure the service quality dimensions previously indicated. The original five dimensions include “tangibility, reliability, responsiveness, assurance and empathy” (Chatterjee, et al., 2009; 1099). SERVQUAL can also be measured using other dimensions indicated in the service quality dimensions, which include competence, courtesy, security, credibility, access, understanding, and communication (Chatterjee, et al., 2009; 1100). Parameters used are not always consistent between researchers, for example, Đonlagić and Fazlić (2015) only used tangibles, responsiveness, reliability, assurance, and empathy (47). This was similar in Panni and Sarker’s (2013) model researching private universities. Parasuman developed the original concept and model and tested it in a number of studies (Parasuraman, Zeithaml, & Berry, 1985).

1.6.4 HESQUAL

HESQUAL is the higher education service quality model originally introduced in Teeroovengadum, Kamalanabhan, and Seebaluck (2016), and is designed to utilize 53 different service quality dimensions and is tested using a survey of 207 students. The purpose of the model is to provide a practical form of measurement that higher educational institutions can use to measure key aspects of the offering and improve upon meeting quality objectives for student satisfaction.

1.6.5 HEdPERF

HEdPERF is a model developed from the concepts of both SERVQUAL and HESQUAL, by Abdullah in 2005 and assessed again by Abdullah in 2006, and later explored for validation by Silva et al, in 2016 (Silva et al, 2017). In Abdullah (2006), a study was conducted using both public and private universities, along with three colleges, private, all from locations within Malaysia. The

total number of questionnaires that were collected and acceptable for use were 381, from a 68% response rate and a possible population of approximately 400,000 students (Abdullah, 2006; 31). This resulted in the use of a five-factor structure for the HEdPERF, which includes non-academic aspects, reputation, access, and program issues (Abdullah, 2006; 42). Since this publication, a number of comparisons have been developed in the literature and numerous authors have indicated that the HEdPERF is most reliable in the areas currently being studied with SERVQUAL and HESQUAL (Silva, et al., 2006; 416).

1.7 Structure of the Work

This research is structured into five sections, beginning with the introduction. The Introduction has been this chapter and introduced the topic and concepts in summary. Chapter 2 is the Literature Review, and data was gathered from a number of different databases to provide a wide range of current literature, within the past five years, that identify key concepts that are represented in this research. In the third chapter, Methodology, the methods are explored more completely, including the sample population and the instrumentation used to conduct the study. Further, the Methodology provided the hypotheses and questionnaires developed for respondents. Chapter 4 provides details from the data gathered, combining the statistical analysis to indicate all results as gathered. Finally, Chapter 5 is the conclusions and discussions as they are derived from the results of the both the literature review and the study conducted.

2. Literature Review

Literature is widely available regarding the continued application of technology and information technology in organizations, including in the case of HEs. This chapter evaluates the historical background of the use of technology and online services in HEs, globally, and as related to perceived quality or satisfaction by students. However, there is limited research in the past five-years, examining these relationships. This is a critical area of consideration as the technology continues to grow and improve. For example, currently there are additional uses for virtual reality and 360-degree videos, which are adding to the types of access and engagement that can occur with consumers. Included in this chapter is the theoretical background of adaptation of technology and the relationships with how individuals adopt and accept technology in their daily life. Further, literature was gathered for online service quality and the dimensions of online services quality. A focus of the literature review included the perceived service quality and its consequences, which contributed to the conceptual framework. Finally, the literature is examined in relationship to the growth, competition, and quality management of HEs.

2.1 Historical Background

The introduction of technology in HEs began with colleges offering access to classrooms through programs such as Blackboard and Moodle, where students were able to collect assignments, email instructors, and access the syllabus for the classroom (Mouakket & Bettayeb, 2015). Growth in the technology improved the ability for students to interact with each other, libraries created online databases, and many schools adopted the various types of consumer service software that allows students to engage with the school staff, including the instructor, in real-time. In the most recent growth of technology in colleges, instructors are able to interact in video

conferences, students access class through smartphones and tablets, and textbooks or other materials are available in a number of formats.

Prior to 2000, the interest in HEs offering only courses through technology, online, were limited; however, in the past two decades this has rapidly changed (Buckner, 2017). Colleges and universities around the world are offering students the ability to access classes through online technologies, e-learning. While a variety of different research studies have been conducted to examine how successful and satisfactory e-learning is, research examining satisfaction in other areas of HE's uses of technology are less well examined. Students are similar to all other consumers, they have the power to promote the college through word-of-mouth, including through social media, and they have the power to be return customers. It is critical to the continued success of HEs to understand the value of online services and the quality perceptions of students regarding these technologies.

2.2 Growth and Competition in Higher Education

Current growth of HE has been the strongest in the history of education, having occurred since the 1990s and increasing rapidly each year (Zapp, 2017; 38; Buckner, 2017). The growth is credited to a variety of different technologies and increased understanding of the importance of education in numerous countries around the world. Much of the growth has focused around the STEM degree programs that are recognized as key areas of competitive growth for populations, being Science, Technology, Engineering, and Mathematics (Zapp, 2017). Globally, countries are competing to develop more highly educated students, able to contribute to the rapidly growing sciences of the 21st century.

Mobility and increased resources have increased the access of consumers to various types of education, but it has also increased the competition at a global level (Taylor & Cantwell, 2015;

411). Resources available to universities is not restricted to the mobility of the student, due the increased technology, schools compete on offerings other than courses and instructors. In a study conducted by Esteves, Pereira, Veiga, Vasco, and Veiga (2018) a game-based learning (GBL) environment was introduced to students in courses such as computer and network technology. The participation in Esteves, et al's study was more than 300 students and the findings indicated that motivation was improved, and some students' grades were improved. The opportunity to provide GBL and other technology to the classroom is one of many areas that universities have the ability to improve communication and motivation in students.

Globally, universities are developing different types of curriculum and communication tools to reach students due to changes in the way Millennials, younger students, are spending their leisure time and daily life using digital technologies. The use of these technologies is found to be an important and expected part of most young people's daily life, with students in some countries using digital technologies for more than four hours each day (Lai and Hong, 2017). Concerns of universities are findings that the access and use of technology is not occurring in even or complete rates and the differences in use, between leisure and academic, may not be easily duplicated for students (Lai & Hong, 2017). Universities striving to implement digital technologies may struggle to maintain use by students with little or limited experience with technology, including students with large amounts of experience with social media (Lai & Hong). In order to improve upon value to students, universities must determine the needs of student and develop quality offerings. Theoretical foundations on quality and value provide an important element of structure to the evaluation of quality in this area.

2.3 Technology Used by HEs

In 2017, Tate reported that the challenge to university students is uncovering the information they need, specifically to find information on things such as tuition costs; however, this issue also applies to students already enrolled with a college. Some opportunities for students in universities are to be able to access their individual account information, such as address, name, and contact information using the student portals developed. Although web portal use and availability has increased in the past decade, the types of available access have not exceeded or even met the needs of students (Fathema, Ross, & Witte, 2014; 43). Systems expected to be available in the web portal have included course management, library systems, campus news, and even administrative processes, which should include financial aid or financial sections as applicable to the student. Use of web portals can be developed by schools for access using either computers or mobile devices. However, Shaltoni, et al. (2015) reported that information quality and availability in web portals has a direct influence on the student satisfaction, which was also explored from a cultural perspective. Further, the use of the web portal could be directly influenced by the perceptions of the university, or the website the university is using. Mobile access to the web portal may also be critical, including information relevant to the individual and being provided during other activities on the campus, or notifications of actions that may need completed for the course (El Said, 2018; 6). With the use of the internet and mobile applications, HEs have an advantage for keeping students aware of many aspects, including the administrative aspects of their attendance or financial situations. Research exploring these areas is limited in determining what aspects are specifically contributing to satisfaction and there have been no previous models exploring technology-based access for the web portal designs or mobile equivalents, outside of that in the case of online courses.

2.4 Technology Based HE Service Options

Some of the options that are available from universities in the region being explored are found to include:

1. Management of Enrolment and Courses in Degree program
2. View classes enrolled in for the semester
3. Add or drop classes
4. Classes needed for degree program
5. Schedule of exams
6. Schedule of assignments due
7. View grades
8. View course progress
9. View degree program progress
10. View lists of past courses and grades
11. View transcripts of courses taken
12. Verify eligibility to graduate
13. Apply to graduate
14. Details of the degree program of enrolment
15. Details of other degree programs available
16. Personal information including contact information
17. Requests to change degree program
18. Requests to change instructors or courses
19. Order transcripts
20. Manage financial information such as paying for courses

21. Review financial information such as past payments
22. Calculate future payments needed to complete the degree program
23. Ability to pay courses online
24. Ability to pay course fees online
25. Search for awards or scholarships through university website
26. View student financial services such as financial aid applications
27. Refund requests for dropped courses
28. Obtain door access cards or student identification
29. Obtain documentation to proof enrolment in the university
30. Review housing options
31. Apply for university housing
32. Access to the online learning management
33. Access to an online library
34. Access to online library assistance

In addition to these, other colleges offer services that are specifically for attending the courses through online environment. Other colleges offer students email services or online access to other students through forums or group websites. Generally, the university administrative services are those numbered above; however, some HEs do not consider library access to be part of the administrative options. Library services may be viewed as course offerings.

2.5 Theoretical Foundations and Conceptual Framework

Theories on quality perceptions of consumers include the dimension of perceived quality, as indicated in branding and marketing, which seeks to identify both extrinsic and intrinsic characteristics that create the perceptions (Garrido-Morgado, Gonzalez-Benito, & Martos-Partal,

2016). Literature indicates that quality perception can also influence customer loyalty (Garrido-Morgado, et al., 2016; para 5). The technology acceptance model was selected as a variable in the research, due to the relationships indicated in literature between the use, satisfaction, and willingness to use technology (Ibrahim, et al., 2017). Technology is reported by Ibrahim, et al (2017) as having been used in some form for more than 15 years, resulting in the study to understand if e-learning systems were being fully optimized by students and accepted generally. However, the study did not explore the use of other online services and technologies that are applicable in the HE environment. In addition to the theories of quality perceptions and technology acceptance, the theory of technology adoption, specifically the Decomposed Theory of Planned Behavior, was applied, in order to explore the relationship between technology acceptance and quality more completely. These are all explored further in the next chapter, the Literature Review.

Technology adoption models have been being developed since the late 1900s, and have come to include:

- Theory of Diffusion of Innovations (DIT)
- Theory of Task-technology fit (TTF)
- Theory of Reasonable Action (TRA)
- Theory of Planned Behavior (TPB)
- Decomposed Theory of Planned Behavior and
- Various versions of the Theory of Acceptance and Use of Technology: TAM, TAM2, UTAUT, and TAM3 (Lai).

Each are social science theories aimed at explaining the way and type of acceptance individuals have of technology present. The oldest being Theory of Diffusion of Innovations (DIT), from E.M. Rogers, 1962, which scales adopters of technologies into categories that include

innovators, early adopters, early majority, late majority, and laggards (Lai, 2017). Stages identified in this model included awareness, decision to use, observation of use, initial use, and continued use. The challenges of this model are the lack of ability to account for costs, access, and behaviours related to the adoption.

The second is the Theory of Task-technology fit (TTF), which focuses on the relationship between the tasks of the individual and the ability of the technology to either perform those tasks or improve the productivity of the user. Factors in the model included authorization, compatibility, quality, ability to locate, ease of use and training, productivity, reliability, and relationship with the users (Lai, 2017). Later this model was implemented into the TAM and provided a foundation for that model's development and popularity.

The Theory of Reasoned Action (TRA) is recognized as a model designed to persuade individuals to have the proper willingness to engage with technology and adopt its use. A focus is placed on the relationships of action with attitudes and behaviour, where the pre-existence of these can contribute either negatively or positively to the adoption (Lai, 2017). It is believed that motivation has a direct influence, similar to the idea that the purpose of the technology and the need of the individual directly influences the willingness to adopt.

Similarly, the Theory of Planned Behavior (TPB) was developed to explain the willingness to adopt technology as part of the behaviour, in both intentions and subjective norms. This theory is designed based on concepts from self-efficacy (SET), proposed as a theory that explains motivation and productivity of individuals based on their own perceptions of their ability to accomplish or understand the different conditions and situations related to the expectations or outcomes. TPB includes the variables of controlled beliefs, perceived behavioural control, normative beliefs, subjective norms, and conceptual and operational comparisons (Lai, 2017).

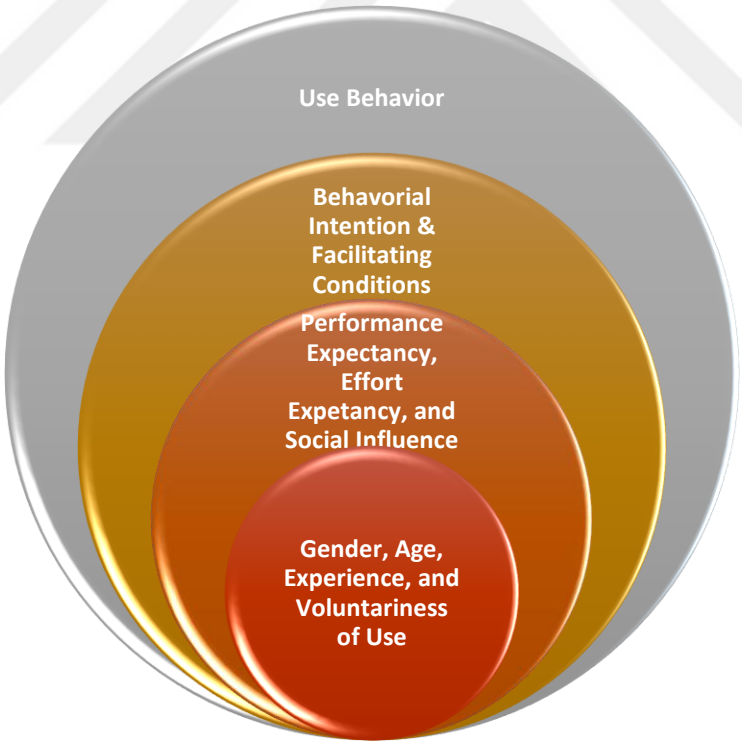
In addition to these theories, which resulted in TAM, was the Decomposed Theory of Planned Behavior. This theory focused on extending the TRA by increasing knowledge through the variable of non-volitional control over behaviour (Gangwal & Bansal, 2016; 358). In some research, both this and the TAM are used to evaluate the various acceptance levels of the respondents in the study (Gangwal & Bansal, 2016; 358).

TAM, or Theory of Acceptance and Use of Technology, has been redeveloped a variety of times to increase the ability of the model to be complete and useful to researchers and organizations. This research utilizes TAM and the Decomposed Theory of Planned Behavior, as defined by Gangwal and Bansal, in 2016, based previous research. TPB is perceptions of an individual that identify the ease of the behaviour and the ease of which the individual can behave in that way (Gangwal & Bansal, 2016; 358). The basis for its use in internet use behaviour has been studied by a number of researchers, including Ramayah, et al., finding that social norms also influenced decisions of potential online tax filing, in Malaysia. Perceived internal or external motivational factors directly influence behaviours in a number of ways, such as physical activity levels, student achievement, and adaptation of e-textbooks (Ahmadi & Seyed, et al., 2017; Alas, Yabit, et al., 2016; Hsiao, & Tang, 2014). TPB is identified as including subjective norms (SN), attitude (A), and perceived behavioural control (PBC) (Gangwal & Bansal, 2016; 358).

TAM was originally developed by Davis et al. (1989) and is used to evaluate individual behaviour towards information systems (IS), based on perceived usefulness and perceived ease of use (Gangwal & Bansal, 2016; 358). Wide use of TAM as a theoretical implication has resulted in research to identify the unified theory of acceptance and use of technology (UTAUT) with more than 174 articles in this area prior to 2015 (Williams, Rana, & Dwivedi, 2015). The model identified for UTAUT is based on the literature review of Williams, et al (2015) and consists of

performance expectancy, effort expectancy, social influence, facilitating conditions, which is being acted upon by gender, age, experience, and voluntariness of use. The primary factors then influence the behavioural intention and leads to use of behaviour (Williams, et al, 2015; 444). However, facilitating conditions, such as work requirements, directly influence use of behaviour, as well (Williams, et al, 2015; 444). The following figure was developed based on the findings of Williams, et al (2015; 444).

Figure 1: UTAUT Model



**Model derived from Williams, et al (2015; 444).*

2.6 Technology in Education

A variety of different types of technology are available to education, this includes nearly any technology currently available for consumer use. These range from online services through mobile applications. Education has also contributed to the available technology, through development of software that includes online databases, plagiarism detectors, and online classroom environments. Schools have tested the applicability of different technologies, such as virtual worlds in simulator environments and applications of video conferencing. These contributions are guiding technology growth; however, they are also creating opportunities for students to learn to use technology that will improve on their ability to find jobs after graduation.

2.7 E-commerce and Online Services

The internet has brought numerous types of services and functionality to individuals and to organizations, including e-learning and e-commerce. E-commerce and other online services, or e-services, have been rapidly growing in organizations for more than 20 years (Batagan, Pocovnicu, & Capiscu, 2009). Some of the features currently available are virtual shopping centres and online customer service representatives. In addition, e-services enable customers and consumers to have access to organizational information, as a form of transparency, which can improve upon brand value to a customer. Individuals can visit a website and find the company's moto, mission statement, vision, and even determine what types of people typically buy the products or services being offered. E-services are also widely advertised through other e-services, such as Facebook, Twitter, and LinkedIn. Social media is a service that allows individuals the ability to communicate information, regardless of accuracy, to others in a short space of time. HEs are able to utilize these types of technologies to improve the ability for students to obtain the proper tools for attendance and to reach instructors and school staff. Today, most colleges have a website,

Facebook page, and some other form of social media communication. This is especially true for colleges providing e-learning environments for students.

E-services are defined as having the characteristics of accessibility through electronic devices and networks and consumed using the Internet (Batagan, et al., 2009). Additionally, the services are defined as being intangible, due to inability for the service to amount in a product until such time as delivered, specifically in that the service is to acquire, whether products or services, that cannot be obtained at the time of purchase or viewing (Batagan, et al., 2009). While Batagan, et al (2009) indicates that previous literature has referred to e-services as perishable, it is arguable that the searches and information can be stored, items can be returned, the loss occurs in time and effort of using e-services. Interaction is a benefit that can occur in e-services and happens between a customer service provider and a customer. Further, it may be argued that engagement occurs through the use of user saved information, such as Google, which allows a user to repeat previous e-service activities or improves upon future e-service activities.

Technology is continuing to grow, along with the ability to apply gaming software to learning environments and the use of 360 or virtual technology to immerse students in the materials. Information provided through the technology options can include any variety of different resources, including face-to-face communications with instructors and storage of lectures. In many countries, universities can develop a financial portal that brings students to the government-based financial resources or to other financial institutions that provide students with financial aid to attend the college. E-services from universities also include messaging between students and support or technical staff and communication with course guidance administrators. In some cases, students can also receive email through their college servers and in most universities the library is available through the universities' portal as well.

2.8 SERVQUAL

In 2009, Chatterjee, Ghosh, and Bandyopadhyay reported the lack of quality evaluation literature, in the past few decades, as being different from expectations with the interest in rating teachers that had begun in the early 1900s. The definition of SERVQUAL, as a quality model, included the original five dimensions of "tangibility, reliability, responsiveness, assurance and empathy" (Chatterjee, et al., 2009; 1099). SERVQUAL evolved by the time of Chatterjee, et al (2009) to include the additional parameters of competence, courtesy, security, credibility, access, understanding, and communication (1100). However, authors vary on use of the parameters as demonstrated later in Đonlagić and Fazlić (2015), with only tangibles, responsiveness, reliability, assurance, and empathy (47); which were the only ones used in Panni and Sarker (2013) model to assess private universities in Bangladesh. Originally the concept and model were developed by Parasuman (Parasuraman, Zeithaml, & Berry, 1985). The model has been evaluated a number of times in literature, including the definitions of terms, as described by Chatterjee, et al (2009), and Rahman, et al. (2017), along with various changes.

SERVQUAL is used to evaluate a number of different types of service quality needs, from medical through education, and focuses on establishing problems in the service offering. Once problems are identified, organizations can categorize the quality offerings that are failing into specific steps designed to improve upon the quality and differentiate offerings to customers. Quality in services can also be defined as the offering of tangibles in addition, which provides another dimension to be measured. Higher education focuses on services that are designed to have long-term influence over the consumer, particularly in the case of a career and future occupations. However, unlike other service offerings, learning is more difficult to measure for the quality of the service and relies heavily on the perceptions of the overall offerings. Further, the SERVQUAL,

and later the SERVPERF, do not address the technology offerings as part of the overall educational package and its direct influence on the satisfaction levels of students.

2.9 HESQUAL

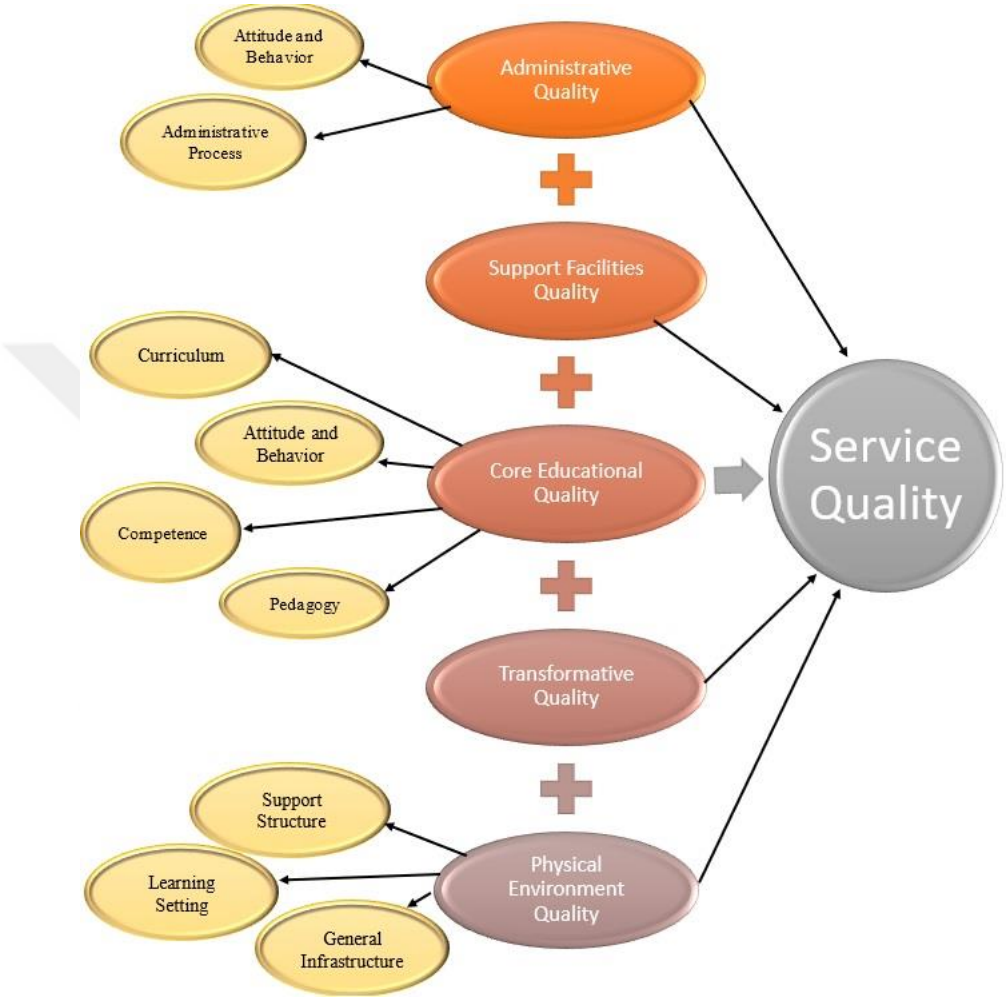
HESQUAL dimensions were developed and defined by Teeroovengadum, Kamalanabhan, and Seebaluck (2016) to include administrative, physical environment, core educational, support facilities, and transformative quality. These dimensions do not include information technology or knowledge management parameters. However, the results of the research demonstrated that the model for HESQUAL was best represented as including a number of different factors for each area, with only one in the areas of support facilities and transformative quality. As demonstrated in the following chart, the expectation is that perceptions of service quality are acted upon the parameters, where administrative quality is acting on attitude and behaviour and administrative processes (Teeroovengadum, et al, 2016; 254). Core educational quality was found to influence curriculum, attitude and behaviour, competence, and pedagogy (Teeroovengadum, et al, 2016; 254). Additionally, physical environment quality influences support infrastructure, learning setting, and general infrastructure (Teeroovengadum, et al, 2016; 254).

Curriculum is one of the most important service offerings from HE, because it is the results of the curriculum that can provide the student with future ability to succeed. Another area is the physical environment, which is not the same for all university experiences. Some students will attend college courses that occur only in online classrooms. The quality of the physical environment, for online courses is the physical classroom based on the different tabs and sections that a student uses to access coursework. Some areas that must be considered are the portal functionality, ease of use, and access. Another core quality area was found to be attitude and behaviour, and example might be the way in which instructors manage needs of new students with

limited technology experience. The attitudes of application staff could directly demonstrate the expectations that a potential student may have in the classroom. Use of the website, to identify methods of applying, course availability, and access to different departments could directly influence perceptions of the potential quality of the e-learning environment or the ease of accessing support and administrative staff.

Instructors and administrators must also have access to the same service offerings as the students, in order to evaluate accessibility and usability of the service offering. Instructors and administrators, or other staff, within the HE can provide valuable information on the quality of the offering. Some areas that can be evaluated are ease of use, functionality, availability, and need. However, university staff also utilize the service offerings from the HE to provide services to the students. Instructors enter grades into Blackboard, Moodle, or other educational software and administrators must manage financial information and course preferences. Different access occurs for instructors and administrators, as opposed to those of students; however, most universities will use the same servers and base software to develop the offerings. For MBA students, Icli and Anil (2014) noted that additional scale items were added for HESQUAL, "library services quality, supportive services quality, [and] quality of providing career opportunities" as dimensions for evaluation (33). However, these are considered focused for MBA students, as opposed to all students, and still fails to consider the technology implementations of many HEs globally. Figure 2 demonstrates the model, as presented by Teeroovengadum, et al (2016); which includes primary dimensions of administrative quality, support facilities quality, core educational quality, transformative quality, and physical environment quality as impacting service quality.

Figure 2: HESQUAL Model



**Model derived from Teeroovengadum, Kamalanabhan, and Seebaluck (2016) (254).*

2.10 HEdPERF

The introduction of HEdPERF came from Abdullah (2005) and was later tested in Abdullah's 2006 research using Malaysian HEs. This model was created based on SERVPERF, which is a variation of the SERVQUAL model, and was designed to address issues that are specific to the needs of HEs (Silva, et al., 2017; 420). Originally, the questionnaire developed for HEdPERF includes 41 items and are part of six dimensions: academic aspects, non-academic aspects, reputation, access, and program issues understanding (Silva, et al., 2017; 424).

2.11 Quality Management

Quality management in HEs has previously focused on two primary areas, the ability for students to obtain positions after graduation and the quality of instructors in the school. A largely ignored aspect of quality in colleges is student access to services through online resources. Current options for continuing education are not limited, due to increased competition, students have access to hundreds of colleges with varying levels of offerings and often available on a global level. As competition continues to increase, HEs will need to focus on the ability of online offerings, or technology offerings, to remain up-to-date and maintained in much the same way as the importance of the brick and mortar colleges that students visit prior to attending. Many students may visit a website for a preferred college prior to attending or applying. The first impression can have a direct influence on the interest a student has in a college, particularly if funding is available and their preferred program is available at a number of different universities and colleges.

The Quality Management Framework (QMF) can be used to understand and identify the relationships in the key areas of organizational knowledge, resources, business strategy, and other critical areas that influence the relationships with consumers and satisfaction (Batagan, Pocovnicu, & Capiscu, 2009; 373). Terms used in the QMF include object, requirements, process, evaluation, user, measure, measurement, and quality (Batagan, et al., 2009; 373). According to Batagan, et al (2009), the following principles are used in the QMF:

- "Principle 1: Customer Focus – organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations."

- “Principle 2: Leadership - leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.”
- “Principle 3: Involvement of people - people at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.”
- “Principle 4: Process approach – a desired result is achieved more efficiently when activities and related resources are managed as a process.”
- “Principle 5: System approach to management – identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.”
- “Principle 6: Continual improvement – continual improvement of the organization's overall performance should be a permanent objective of the organization.”
- “Principle 7: Factual approach to decision making – effective decisions are based on the analysis of data and information.”
- “Principle 8: Mutually beneficial supplier relationships – an organization and its suppliers are interdependent, and a mutually beneficial relationship enhances the ability of both to create value” (374).

Each area is defined based on the organization, leaders, customers, and processes necessary to develop quality in the organization.

2.12 Adoption of Technology

Researchers have widely explored the relationship between consumer satisfaction and intent to purchase. Similarly, adoption technology is found to be directly related to the usefulness

of the technology to many different groups of innovators and even laggards. Individuals that do not have an interest in an activity, will not purchase the product or try the technology. This is directly related to HEs, because students interested in attending online or e-learning classes are may be more likely to be interested in adopting the methods and tools than someone that is not interested in the type of course. Literature has been examining e-learning since the 1990s, hoping to determine if this type of education is able to provide a quality education for students. In some cases, primary education institutions have also adopted this technology to reach populations of students failing to complete their high school degrees.

The historical background of technology and online services of students is important to understanding initial quality expectations of students. Literature has been developed to understand student satisfaction in the areas of online services, as opposed or in addition to the studies examining e-learning and related offerings by HEs. Other areas examined in this chapter included the theoretical foundations and conceptual framework, which directly influences how the study was developed and the guiding concepts that framed the questions and results analysis. A further understanding of the topics and concepts of the online services was developed through the exploration of the growth and competition in higher education and technology in education. Online services available required an understanding what was available and why the growth has been rapid. Additionally, the application of online services, including e-commerce, has been examined in literature for adoption of technology and customer satisfaction. Quality management is a critical area of the student satisfaction, because it could directly indicate the engagement with students to continuously develop in the direction of student needs. Further, adoption of technology has a direct influence on the ability of students to find the online services satisfaction. It was critical to this

work to understand what type of adoption of technology was found to be directly related to customer satisfaction or to customer adoption of technology.

2.13 Dimensions and Definitions from Literature

TAM dimensions defined from the literature included perceived usefulness, perceived ease of use, intention to use, actual system usage, and the measures of external predictors, and contextual factors (Ahmadi & Seyed, et al., 2017; Alas, Yabit, et al., 2016; Hsiao, & Tang, 2014; Marangunić and Granić, 2015). Factors from the UTAUT model was based on the literature review of Williams, et al (2015). For use in HEs, the literature review resulted in limited numbers of exploring students' perceptions, with the primary finding being related to mobile learning adoption in Guyana, from Thomas, Singh and Gaffar (2013). These dimensions were utilized for application to the dimensions selected, including performance expectancy, effort expectancy, and social factors, as they act upon behavioural intention and where facilitating conditions and behavioural intention act upon use behaviour and are moderated by gender, age, experience, and voluntariness of use (Thomas, et al., 2013; 72). The definitions from Thomas et al (2013) are adopted for the technology acceptance aspect of the study and are found in the following table.

Table 1: Dimensions and Definitions of UTAUT Model

Dimension	Definition
Demographics	Gender, age, experience with technology, voluntariness of the use (willingness and interest in).
Performance Expectancy	Perceptions that the use of the technology will result in a specific performance gain and usefulness.
Effort Expectancy	Perceptions of effort or ease involved in using the technology.

Social Factors	Acceptance and use of the technology by others and the perceived importance or value that they place on the technology.
Facilitating Conditions	Perceptions of the support, infrastructure, and organizational structures are established and will result in expected use of the technology.
Behavioural Intention	The intent and behaviour of the individual regarding use of the technology.

HESQUAL dimensions were developed and defined by Teeroovengadum, Kamalanabhan, and Seebaluck (2016) to include administrative, physical environment, core educational, support facilities, and transformative quality. Later, the development of changes in HESQUAL resulted in the additional factors of "library services quality, supportive services quality, [and] quality of providing career opportunities" as dimensions for evaluation (Icli & Anil, 2014; 33). In the original five dimensions of SERVQUAL are "tangibility, reliability, responsiveness, assurance and empathy" (Chatterjee, et al., 2009; 1099). Research then evolved to SERVPERF, which was used by Abdullah (2005) to create and test the HEdPERF model (Icli & Anil, 2014; 33).

Dimensions missing from the previous research is the direct application of services to the online offerings of colleges. The following definitions identify the different dimensions in available in the current literature, demonstrated in Table 2.

Table 2: Definitions of Dimensions

Dimension	Definition	Primary Sources

Tangibles	"Appearance of physical facilities, equipment, personnel and communications materials"	Panni & Sarker, 2013, 6; Silva et al., 2016, 417
Reliability	"Ability to perform the promised service dependably and accurately" "emphasis on the ability to provide the pledged service on time, accurately and dependably"	Panni & Sarker, 2013, 6; Abdullah, 2006, 38; Silva et al., 2016, 417
Responsiveness	"Willingness to help customers and provide prompt service"	Panni & Sarker, 2013, 6; Silva et al., 2016, 417
Assurance	"Knowledge and courtesy of staff and their ability to convey trust and confidence"	Panni & Sarker, 2013, 6; Silva et al., 2016, 417
Empathy	"Caring and individualized attention to the customer" "individualized and personalized attention to students with clear understanding of their specific and growing needs while keeping their best interest at heart"	Panni & Sarker, 2013, 6; Abdullah, 2006, 38; Silva et al., 2016, 417
Non-Academic Aspects	"duties and responsibilities carried out by non-academic staff"	Abdullah, 2006, 38; Icil & Anil, 2014, 32; Silva et al., 2016, 423

	"items that are essential to enable students to fulfil their study obligations, and related duties carried out by non-academic staff"	
Academic Aspects	"key attributes… having positive attitude, good communication skill, allowing sufficient consultation, and being able to provide regular feedback to students" "responsibilities of academics"	Abdullah, 2006, 38; Icil & Anil, 2014, 32; Silva et al., 2016, 423; Lazibat, et al, 2014, 925
Reputation	"Importance of higher learning institutions in projecting a professional image"	Icil & Anil, 2014, 32; Silva et al., 2016, 423; Lazibat, et al, 2014, 925
Access/Accessibility	"includes issues as approachability, ease of contact, availability and convenience"	Icil & Anil, 2014, 32; Silva et al., 2016, 423; Lazibat, et al, 2014, 925
Program Issues/Study Programs	"importance of offering a wide ranging and reputable academic programs/specializations with flexible structure and health services" "including items related to the comprehensiveness and reputation of study programmes"	Icil & Anil, 2014, 32; Silva et al., 2016, 423; Lazibat, et al, 2014, 925

Understanding	"items related to understanding students' specific need in terms of counselling and health services"	Icil & Anil, 2014, 32; Silva et al., 2016, 423

2.14 Scales from the Literature

The first part of the questionnaire was developed to assess the demographic aspects of the respondents and determine if the respondents were users of the technology-based areas of the HE. These questions were developed similar to the questionnaire area of "Demographic attributes of the respondents" as found in Wu and Wang (2005, 724) and adapted to meet the needs of the HE. This section of the questionnaire developed is located in Appendix B: Demographic Questions and Access to Technology Questions. However, the questionnaire did not include the voluntariness from the TAM model, which was utilized in the development of the new model and these questions were presented in the technology acceptance section of the questionnaire.

Scales examined in this section include the Technology Acceptance Model (TAM), SERVQUAL, HESQUAL, and HEdPERF, with some inclusions as indicated based on other instruments developed for these models and related theories. The first instrumentation design examined is TAM, which includes a large number of variations, structured around key elements in the design, identified by Marangunić and Granić (2015). A large literature review conducted for 1986 through 2013 demonstrated that the primary area of questions, for the instrument, must be developed from the questions of perceived usefulness, perceived ease of use, intention to use, actual system usage, and the outside measures of external predictors, and contextual factors where the consideration must be given for factors that may occur as a result of other theories or usage measures (Marangunić and Granić, 2015; 90). Survey questions are located in Appendix B:

Technology Acceptance and UTAUT model questions, where the questions were developed based on the questionnaire items developed by Awwad and Al-Majali (2015, Appendix: Questionnaire Items).

Changes were made to each of the questions for accurate application to the needs of HE students and their access to the technology or use of it. Results from Awwad et al included items for four items for each Performance Expectancy (PerfEx), Effort Expectancy (EE), and Social Influence (SI); and three items for each Facilitating Conditions (FC), Behavioural Intention (BI), and Use Behaviour (UB). The final TAM and UTAUT model instrument required dimensions of each identified in the study; however, did not include all of the parameters needed for this study, variables required included access to courses, instructors, course information, non-academic personnel, payment systems, program information, support staff for technology, and a number of other factors as indicated in the variables. Further, the instrument includes questions designed to determine if the use of technology is a requirement of the school, based on the perception of the student. Selected from other instruments were 32 questions in areas of the UTAUT and TAM, which was reduced to prevent respondents from failing to complete the long resulting questionnaire. Each of these questions were from the result of needing to identify the areas in which students may have access to or need to use technology. These included:

- The university's online coursework platform.
- The university's online library databases.
- The university's mobile applications.
- The university's online administrative services for accessing account or reviewing my individualized information.

Regarding HESQUAL, in the original scale developed by Teeroovengadum, et al (2016), the following dimensions were identified to include seven variables in administrative quality, twelve variables for physical environment quality, twenty variables for core educational quality, six variables in the area of support facilities quality, and eight variables for transformative quality. The following table is from the items identified in the study.

Table 3: HESQUAL Dimensions and Scale Items

Dimension	Scale Items
Administrative Quality Attitude and Behavior	1. Willingness of administrative staff members to help students. 2. Ability of administrative staff members to solve student's problems. 3. Politeness of administrative staffs. 4. Behavior of administrative staff members imparting confidence in students.
Administrative Processes	5. Well standardized administrative processes so that there is not much bureaucracy and useless difficulties. 6. Administrative procedures are clear and well structured so that service delivery times are minimum. 7. Transparency of official procedures and regulations.
Physical Environment Quality: Support Structure	8. Availability of adequate cafeteria infrastructure. 9. Availability of adequate library infrastructure. 10. Availability of adequate recreational infrastructure. 11. Availability of adequate sports infrastructure.

Learning Setting	12. Having adequate lecture rooms.
	13. Having quiet places to study within campus.
	14. Availability of adequate teaching tools and equipment.
General Infrastructure	15. Favourable ambient prevailing within the campus.
	16. Safety on campus.
	17. Appearance of buildings and grounds.
Core Educational Quality	18. Lecturers understanding students' needs.
Attitude and Behavior	19. Lectures giving personal attention to students.
	20. Availability of lecturers to guide and advise students.
	21. Prevalence of a culture of sharing and collaboration among lecturers.
	22. Behavior of lecturers instilling confidence in students.
	23. Lecturers appearing to have students' best interest at heart.
Curriculum	24. Clearly defined course content and course objectives.
	25. Usefulness of module content and design to cater for the personal needs of students.
	26. Challenging academic standards of programs to ensure students' overall development
	27. Relevance of course content to the future/current job of students.
Pedagogy	28. Use of multimedia in teaching (use of projector, presentations, etc.).
	29. Active participation of students in their learning process.

	30. Provision of regular feedback to students with respect to their academic performance.
	31. Well-designed examinations and continuous assignment to promote the enhancement of knowledge skills.
Competence	32. Theoretical knowledge, qualifications, and practical knowledge of lecturers.
	33. Communication skills of lecturers.
	34. Lecturers are up to date in their area of expertise.
Support Facilities Quality	35. Reasonable pricing and quality of food and refreshments on campus.
Support Facilities	36. Availability of adequate IT facilities.
	37. Availability and adequacy of photocopy and printing facilities.
	38. Availability of transport facilities.
	39. Amount of opportunity for sports and recreational facilities.
	40. Availability and adequacy of extra-curricular activities including those through clubs and societies.
Transformative Quality	41. Enabling students to be emotionally stable.
Transformative Quality	42. Increase in self-confidence of students.
	43. Development in students' critical thinking.
	44. Increase in self-awareness of students.

45. Development of problem-solving skills with respect to their field of study.
46. Enabling students to transcend their prejudices.
47. Acquiring adequate knowledge and skills to perform future job.
48. Increase in knowledge, abilities, and skills of students.

(Retrieved from Teeroovengadum, et al., 2016, 251-252).

The Higher Education Performance (HEdPERF) scale was developed by Abdullah in 2005 and tested by Silva et al, in 2016 (Silva et al, 2017). HEdPERF dimensions are expected to be academic aspects, non-academic aspects, reputation, access, program issues, and understanding. Each area is identified in Appendix A, where 13 of the questions were adapted from the SERVPERF.

In the results of Icli and Anil (2014; 37), the final factors identified for the results of the study included these dimensions and question areas, as demonstrated in the following table.

Table 4: Dimensions and Questions Icli and Anil (2014)

Administrative Quality	1. Opportunity of having a good communication with academicians. 2. Positive attitudes/behaviours towards all students. 3. High academic support towards students from academicians. 4. Flexible curriculum.
Administrative Services Quality	5. Having enough knowledge about systems and procedures. 6. Rapid Service.

	7. Timely notification to students regarding schedule changes and/or cancellations, new decisions, activities, etc.
	8. Clear guidelines.
	9. Promise keeping.
	10. Availability of information material.
	11. Sufficient working hours.
	12. Friendliness.
	13. Easily Accessible Administrative personnel. (phone, email).
Library Services Quality	14. Availability of textbooks and journals.
	15. Availability of e-library and online journal membership.
	16. Easy borrowing process.
	17. Appropriate working hours. (Long working hours).
	18. Friendliness.
Supportive Services Quality	19. Size of the classrooms.
	20. Necessary equipment in the classrooms (computer, digital projector, etc).
	21. Catering services and cafes.
Quality of Providing Career Opportunities	22. Providing knowledge which contributes to finding a job.
	23. Effective career center.
	24. Good career after graduation.
	25. Find a job easily and quickly.
	26. Provide better career opportunities compared with other universities.

(Retrieved from Icli & Anil, 2014, 38).

The results of these instruments and dimensions indicated that there are potentially 15 dimensions with 8 sub-sections and 114 items. Due to the size of the technology access questionnaire, it was determined that this section of the question should not contain more than 33 questions. It is expected that reducing the size of the questionnaire may contribute to increased response rate and improve on the number of completed surveys returned. Using the definitions provided for each of the different dimensions, the result found that the previous 11 dimensions would cover the majority of the items indicated in the previous instruments. From the dimensions, a selection was made to include questions that were not duplicate and were found to most identify the areas needed for this research. The 11 dimensions were tangibles, reliability, responsiveness, assurance, empathy, non-academic aspects, academic aspects, reputation, access and accessibility, program issues and study programs, and understanding. Finally, a new instrument was developed that focused on the online aspects of the college and added to the Appendix B: Satisfaction with the University Questions. In total, the questionnaire contains questions designed to include the following areas: demographic, access to technology, Technology Acceptance and UTAUT Model, and satisfaction with the university. Areas of satisfaction included: tangibles, reliability, responsiveness, assurance, empathy, non-academic aspects, academic aspects, reputation, access/accessibility, program issues/study programs, and understanding.

2.15 Summary

Based on the results of the literature review, it is expected that a new model would be found in the results of the questionnaires developed. Relationships that may occur are expected to be between dimensions in the technology model and the quality models. Overlaps may occur as a result of the similarities between questions, which are explored further in the methodology section.

Similarly, it is expected that the new model will enable future researchers to combine elements between models to simplify the processes involved in understanding how students perceive quality in the online offerings and experiences at HEs.

3. Conceptual Framework and Hypotheses

3.1 Hypotheses

Based on the literature and previous models, it is expected that an overlaps will be created in the varied dimensions of TAM, UTAUT, and quality models on Intention to Use as an end indicator to students satisfaction.

Hypotheses developed for this research included the following:

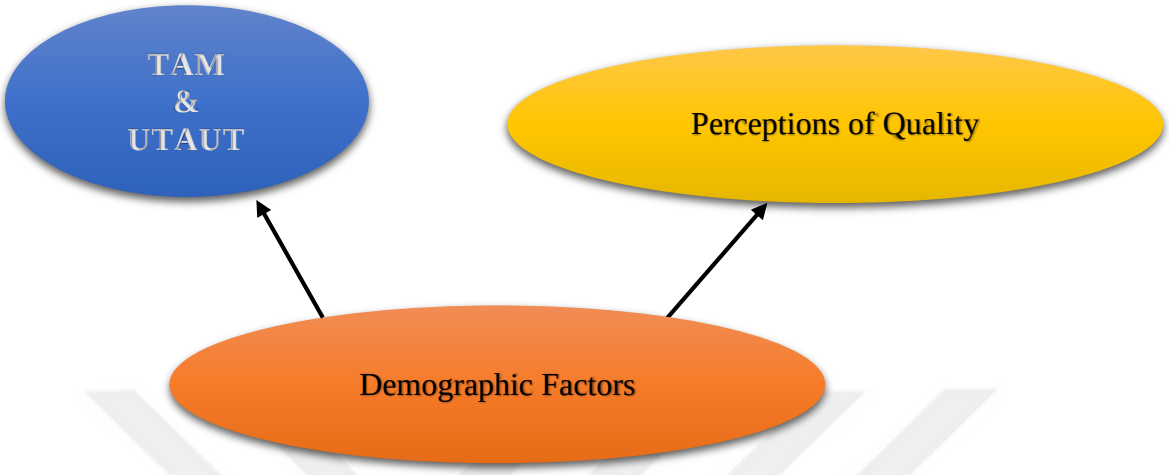
- Intention to Use will be related to the Performance Expectancy dimension.
- Intention to Use will be related to the Social Influences dimension.
- Intention to Use will related to Non Academic aspects dimension.
- Intention to Use will related to Perceived Ease of Use dimension.
- Intention to Use will related to Assurance dimension.
- Intention to Use will related to Empathy dimension.
- Demographic factors will moderate Intention to Use.

Null hypotheses are the direct opposites of these hypotheses developed, and all the dimensions identified in the conceptual model, figures below, are tested individually and as related to each other. These included variables and items as indicated previously.

3.2 Conceptual Model

The conceptual model is based on previous models identified and the hypotheses described previously. As a result of influences expected to occur from demographic factors, they are first examined as possible modifiers to other results. Demographic questions for this research consider age, gender, education, and how the student accesses the university (such as laptop or computer). Expected influences are as demonstrated in the figure below.

Figure 3: Modifiers Conceptual Model

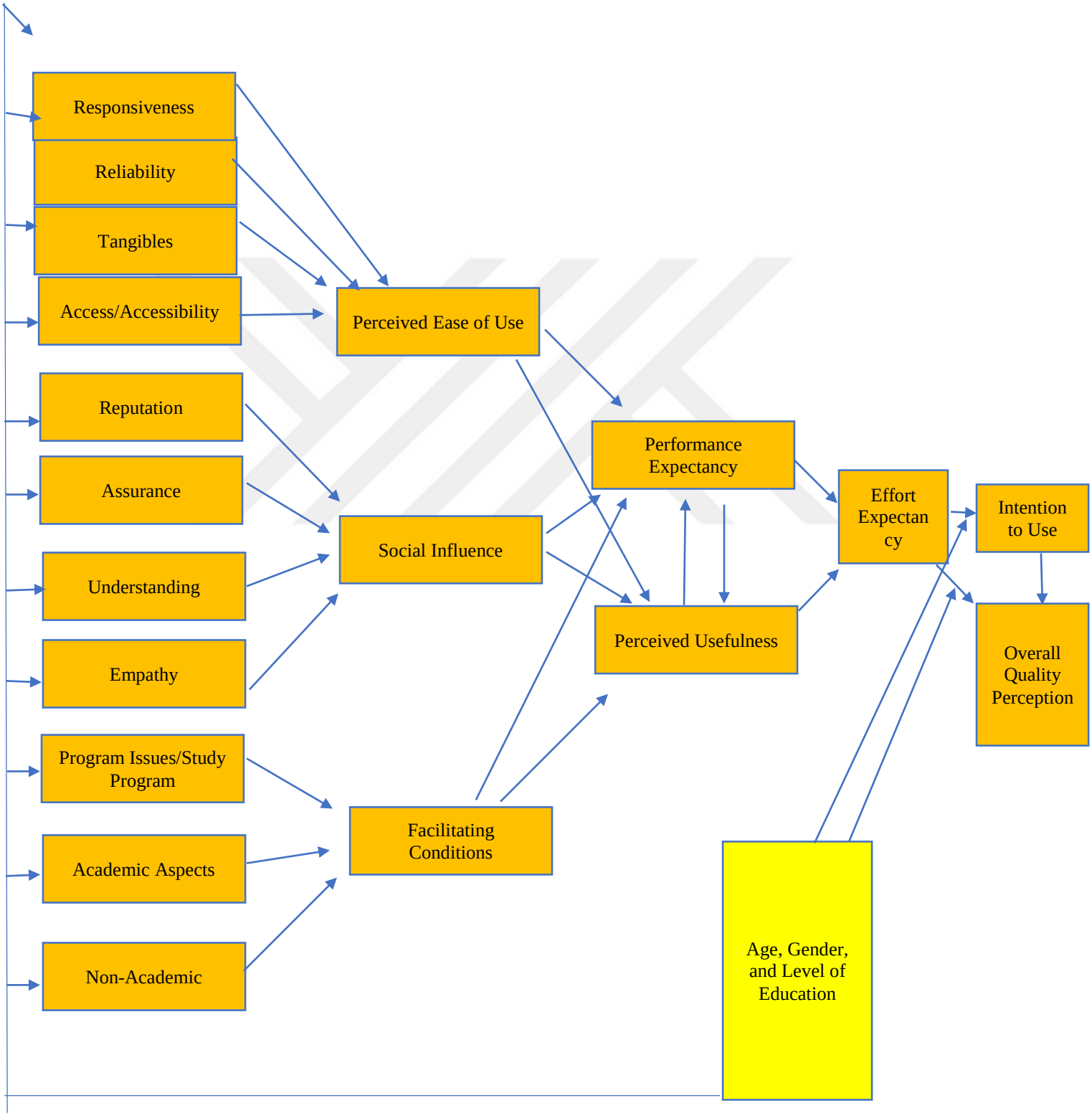


Following this, it is expected that the relationships will include the following conceptual model, which indicates that technology acceptance, as demonstrated by both TAM and UTAUT models, would be directly influenced by the Perceptions of Quality that are the dimensions gathered from SERVQUAL, HESQUAL, and HEdPERF models of quality. The following figure demonstrates the expected relationship. Although the figure represents all the dimensions of TAM, UTAUT, and the combined quality dimensions from the selected models, as acting upon by the perceptions of university quality, it is expected that each area will also act on each other. It is also possible that elements of the combined quality model would be duplicate of the TAM and UTAUT elements. The purpose of this conceptual model, and its study, is to determine if overlapping areas of the conceptual model can clarify the value in the elements and eliminate areas that are duplicate, unrelated, or combine areas that are similar. After gathering and processing the research, it is expected that the model will include at least half of these elements and eliminate some.

Further, the research sought to determine if the variables act on each other, it could be that the conceptual model would become more complicated, and complete, as well. For example, tangibles may act upon all the elements and become a modifier. Additionally, it is expected that

either the demographic factors moderate prior to the relationships, in the area of perceptions of quality, or after these have influenced the other areas, and is demonstrated as either moderating in the beginning or after. However, according to the UTAUT model, moderators present influences in all areas prior to intent to use, indicating that a stronger relationship may occur at the end of the model. The name selected for the proposed model is TechnoQual.

Figure 4: TechnoQual Initial Concept Model



4. Methodology

Due to the increased utilization of online services in the recent past, this research will focus on assessing the impact of online services quality on student satisfaction. The results of the study will show if students feel that the quality of services online has a direct effect on customer satisfaction as well as influences the customer's intention to return to specific websites or universities apps. A quantitative methodology was selected due to the ability for the researcher to utilize data from a larger base of respondents in a shorter period. Further, the data collected could be utilized to assess significance in the population. Exploratory methodology was used for the development of the concept models and testing of the models, which included exploring how different dimensions, items, and variables might work together to achieve a more efficient and effective mode. This chapter includes the research methodology, hypotheses, variables, data collection methods, sample population, instrumentation, data analysis, limitations, delimitations, and ethical considerations of the research.

Quantitative methodology was selected for this research, due to the ability for quantitative data to explore results from questionnaires gathered from a larger number of participants. Interviews, which are qualitative data, would have provided rich details for the study; however, only a small population could have been interviewed, due to time restrictions and access to the population. The sample population was aimed at 500 respondents. Additionally, the use of quantitative data allowed the researcher to structure questions around the very specific concepts for examination, offer respondents Likert type response selections, and gather data from different universities in Turkey. Data collection was conducted using an online survey site, which permitted the researcher to have the data available in an Excel sheet without individual data transfer. The

data was then easily opened with a statistical software package for analysis. To draw conclusions from the data, the results were analysed using significance and results are reported in Chapter 4.

4.1 Research Methodology

Quantitative methodology provides a foundation for researchers to derive answers to questions, hypotheses, from a larger population of respondents. An advantage of quantitative research is the focus on scientific methodology that includes obtaining data that can be transformed into numeric data and measured using confidence levels and other types of statistical formulas (Stoudt, 2018; 670). Structured questionnaires were designed for this research, where all results were entered into a statistical software program, which will determine the statistical validity of the results gathered. One of the risks of using quantitative data and statistical evidence to develop results is that a single sample population may not completely identify the true population being studied. This indicates that the ability to infer or to generalize results may not be true for the population as a whole but may be indicative of results that are only applicable to another similar or same population (Stoudt, 2018; 671). Further, some risks to quantitative data occur in defining or determining if results indicate a casual-relationship, which suggests that one variable is directly influencing another variable and changes occur between these variables as opposed to others (Stoudt, 2018; 671).

4.2 Structural Equation Modelling (SEM)

Structural Equation Modelling has a valuable importance to researchers because it can assist in uncovering relationships, testing causality in variables, and helping to indicate if a hypothesis should be accepted. Much of the research in the area of use of SEM and variations of SEM are conducted by researchers such as Hair, et al (2017), Kenny, et al (2010) and Ali, et al (2018); however, a variety of other researchers have demonstrated validity or reliability in a variety

of fit indexes or methods of conducting the SEM, regardless of type of SEM, through use of research aimed at demonstrating reliability and validity in the different types of reporting and treatment of the data. As a result, use of SEM, in all variations, can be difficult to conclusively indicate if the results are positive or negative unless strong results are reported in all possible areas tested and at least a CB-SEM and PLS-SEM are both used to test the results. This research will attempt to provide that much in all the results to ensure that the decision to accept or reject the results are available for scrutiny.

The use of covariance-based Structural Equation Modelling (SEM) has increased in research since the late 1900s and is typically used to assess or indicate causality in data that allows relationships to be compared between various variables based on the items considered to indicate those variables or to establish if a survey question, item, belongs to a specific variable (Hair, Babin, & Krey, 2017). Use of SEM begins with examining data with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), which enables the model to be developed from the data, as opposed to exclusively from the theoretical foundations developed prior to the research. Specifically, the EFA allows the data to be explored for relationships between items and the CFA confirms if these relationships exist (Assis Gomes, Almeida, and Núñez, 2017).

Modeling of data has increased due to the increase in available software to improve on the ability for researchers to examine data for relationships and build models. However, there are a variety of challenges associated, including how missing data, groups, latent variables, and reporting occurs (Lee &Cai, 2012; Hwang, et al, 2010; Biddle and Marlin, 1987). The most common management of missing items is imputation, such as with mean replacement, but may result in data that is not completely accurate in future research (Wolgast, et al., 2017). Additionally, there are a variety of different types of SEM, including PLS-SEM, BSEM, and ESEM, variations

on both methodology, output, reporting, and structure designs (Cheung, 2014; Martin, 2011; Usakli and Kucukergin, 2018; Hwang, et al., 2010). However, the importance of structural modeling is well understood in the literature as an important aspect for theoretical testing in numerous disciplines and can create value in theories to practical application, such as by businesses, hospitals, and in education (Essounga-Njan, 2011; do Valle and Assaker, 2016; Olson, Hayduk, and Thomas, 2013; Hair, Jr., et al., 2014). Use of SEM should be reported as conducted, allowing other researchers to examine the methods to either test on future data gathered or to examine if errors in data may result in a different method. However, many different perceptions on best reporting and most productive methods of SEM can create challenges in meeting expectations in all researchers and theorists' views. Further, SEM can have problematic results, such as results indicating same results between two or more models or in the case of reporting results that are significant in some areas but not able to be duplicated in those same areas (Chin & Todd, 1995).

One of the challenges identified by Assis Gomes, et al (2017) was that items were dismissed from models when they appeared to load, or measure, more than one possible latent variable and the testing must result in at least two items per latent variable. Results of a strict approach to the EFA and CFA conflict with true relationships that cannot be reduced in human subjects, particularly as items may have different meanings or expectations from the respondent and between respondents, that cannot be accounted for by wording of an item explicitly. Due to risks of exclusion in items, exploratory structural equation modeling (ESEM) was developed in the early 2000s, and studied by Assis Gomes, et al (2017) as a technique that allowed the items to be used, as long as two of the items are loading only on the latent variable and then selection is made in the CFA for items that demonstrate a close to zero loading. This particular method is

important for questionnaires that include items that are closely related, as indicated in the personality five-factors that are used in studies of personality trait relationships (Assis Gomes, et al., 2017).

Prior to Assis Gomes, et al (2017), Howard, et al., (2016) also stated that the challenges in CFA and related test of goodness-of-fit standards were challenged by researchers due to the lack of scales that were able to reliably fit expected models or to pass the independent cluster model (ICM) requirements and restrictions. Although recognized as an important step in research to increase validity and reliability of results, the challenges in the methodology resulted in a lack of meaningful ways to consistently verify the same types of data over various repeats of similar or same questionnaires and in applied research, as opposed to theoretical research (Howard, et al., 2016).

Generally, there are no types of data measurement and testing that are lacking either support or criticism, including EFA, CFA, and their measurements within (Assis Gomes, et al., 2017; Howard, et al., 2016; Kenny, 2015; Kenny, Kaniskan, & McCoach, 2014). Some conflicts occur due to perceptions of relationships between EFA and CFA due to the divide between exploratory, or data focused, and theoretical designs in guiding research (Howard, et al., 2016). In the case of Howard, et al., (2016) and later in Assis Gomes, et al., (2017) a solution was derived from the use of bifactor exploratory structural equation modelling, previously applied in psychology. The B-ESEM and ESEM are methods for measurement that may reduce risks applied to either EFA or CFA used exclusively.

Two types of modelling approaches can be used to examine the relationships between variables in a model, multilevel modelling and structural equation modelling (SEM) (Hong & Kim, 2019). The purpose of using SEM is to increase the ability to measure errors and to determine

specific factor loadings that allow the model fit to be further understood (Hong & Kim, 2019). It is expected that in various types of data different relationships occur that can create distinguishable and recognizable structures, referred to as dyadic data models occurring as either indistinguishable or distinguishable models (Hong & Kim, 2009; Kenny and Ledermann, 2010). SEM is also used as a Bayesian structural equation modelling (BSEM) approach, utilizing similar concepts of inadequacies, which are managed by reporting predictive aspects of the study, when values utilized are not restricted by loadings in EFA and CFA restrictions to zero (Dombrowski, et al., 2018). Confidence levels, variance, communality, and uniqueness were amongst the reporting values from Dombrowski, et al (2018) in use of BSEM.

Reporting of SEM and ESEM models and fit vary. Hong and Kim (2009) used a variety of methods to examine data gathered, including SEM, which reported Cronbach's alpha for reliability coefficients of variables, correlation means and standard deviations for correlations, utilized estimation and full information maximum likelihood, with a final reporting of the model fit based on Tucker-Lewis index (TLI), root mean square error approximation (RMSEA), and comparative fit index (CFI). According to Hong and Kim (2009) expected good fit is 0.9 for both CFI and TLI and RMSEA values should be lower 0.08. In the research article from Ali, Li, and Cobanoglu (2016), the argument was that PLS-SEM should report a minimum of R^2 and Q^2 where the reporting indicates the relationships in strength of impact of the variable. Additionally, these researchers suggested that composite reliability (CR) was critical in the investigation and that prior to any type of SEM there must be normalized data or data that primarily demonstrates normalized patterns, as reported by the kurtosis and skewness. During the investigation of literature and use of CB-SEM and PLS-SEM, Ali, et al (2016) stated that common reporting values from CB-SEM, such as AMOS, are RMSEA, CFI, DF, and AVE (421).

In a study of a model for self-regulatory strategies, self-efficacy, L2 anxiety, academic achievement, and intended effort, Shih (2019) reported number of items with Cronbach alphas, and all model fit indexes of GFI, adjusted goodness-of-fit (AGFI), CFI, TLI, (Incremental fit index) IFI, Normed fit index (NFI), and RMSEA. It is expected that an absolute value of critical ratio in the causal relationship must not exceed p=.05, and a relationship is not confirmed where p>.05 (Shih, 2019). Research regarding locus of control and math anxiety in SEM reported correlation using mean and standard deviations along with sub-scale analysis with Pearson-moment correlation (Ciftci, 2019). Further, this work by Ciftci (2019) reported multivariate regression between variables and utilized a population of 402. Goodness-of-Fit was reported using RMSEA, CFI, GFI, and AGFI, followed by stability coefficients (Ciftci, 2019). Similarly, exploration of locus of control and perceptions in patients was conducted with a population of 241 respondents and reported Akaike information criterion (AIC), Bayesian information criterion (BIC), Sample-Size Adjusted BIC, and RMSEA (Shiri, et al. 2019).

According to Mohammed, et al., (2015), the AIC is primarily utilized to estimate the ability of the model to predict future values in the variables and the BIC is designed to examine the model fit in comparison to its complexity. Tanti, et al., (2018) examined preservice science teachers' beliefs to construct a model with self-regulated strategies of studying for physics using a final population total of 244 responses. An EFA was conducted using principal component analysis and varimax, an orthogonal rotation method of data testing, where Kaiser-Meyer-Olkin (KMO) values of significance were accepted if a significance of KMO > 0.5 (Tanti, et al., 2018). Items were reported for loading factor, along with Eigenvalue, variance, cumulative and reliability (Tanti, et al., 2018). Additionally, Cronbach's alpha, average variance extracted, t statistics and p values were reported (Tanti, et al., 2018). However, in the work of Tanti, et al., (2018), model fit indices

were not reported. Other work has focused exclusive on elements of the steps prior to the SEM modelling techniques applied in both AMOS by IBM and Smart PLS, including to use values exclusively from the EFA or CFA, such as in the case of Tanti, et al., (2018), and Sterba (2016). ESEM and CFA were used by Weisheng Chiu, Rodriquez, and Won, (2016) in a study of Leadership Scale for Sport factors and a population of 201; reporting mean, standard deviation, CFA loading significance, and model fit indices of CFI, TLI, RMSEA, SRMR, BIC, and AIC.

Finally, two software options for modelling in SEM or developing CFA and EFA, are IBM's SPSS with AMOS (https://www.ibm.com) and Smart PLS from Smart PLS GmbH (https://www.smartpls.com/). Research does not strongly promote or discourage the use of either software for modelling and the variety of different researchers selected did not specify a preference. Educational videos and instructions are available for both programs, making each fairly easy to learn with the knowledge of the statistics and the various terms. Some differences are the ease of use in Smart PLS, as opposed to AMOS, and another is the way in which Smart PLS reports the results using colour coding to allow the user to identify areas of problems quickly. One strong disadvantage of AMOS is that there are often no error warnings for things that the program requires to run the data. However, AMOS reports the largest number of model fit indices, as opposed to only two main indices of SRMR and NFI reported by Smart PLS. As a result of these differences, all data was tested in both AMOS and Smart PLS and reported as indicated in the Results Chapter.

4.3 Dimensions and Definitions

Some definitions were retained for the current study, with the exception of their relationship to support or services that cannot be completed in the online environment. Elements removed from the definitions resulted in the primary dimensions and their definitions for the

purposes of this study. Each area is demonstrated in the following table, which represents all the areas that were considered for the scale development and variables designed for the research. The first set of dimensions are from the UTAUT, evaluated and retained for comparison to the results of the survey regarding the remaining dimensions and located previously in Table 1. It was the objectives of this research to explore online offerings satisfaction, but reliability of the results would be dependent on understanding if other theories interacted with those results. The most critical interaction would be acceptance of technology, which has been found in literature to influence use and satisfaction of technology applications. Each of the following definitions were derived from the previous versions and adapted to the online aspects.

Table 5: Dimensions and Definitions Applied

Dimension	Definition
Tangibles	Availability of personnel, communication tools (email, phone numbers, online communication, physical mailing addresses, etc), and ability to replace personal access equipment through student programs, loans, or grants.
Reliability	Ability to access school and school technology from student available equipment in an accurate, timely, and dependable manner.
Responsiveness	Ease of access to personnel and willingness of personnel to provide prompt service.
Assurance	Knowledge, courtesy, and abilities of available staff to build trust and confidence, through technology access.

Empathy	Perceptions of caring and individualized attention to student needs using the technology and information provided in the technology or from responsiveness of staff using the technology.
Non-Academic Aspects	Non-academic staff, communications, and technology ability to provide students with support and fulfil their duties, such as technical support, for students in a caring and responsible manner.
Academic Aspects	Availability of materials and communication that enable the students to achieve success in the areas of academics through tools and personnel available, including feedback from instructors or other academic services.
Reputation	Professional image of online appearance and availability of the courses and materials that create a positive reputation for the HE.
Access/Accessibility	Access to the online offerings, knowledge of the availability, ease of contact through these offerings and convenience of use.
Program Issues/Study Programs	Availability of the courses through the online environment and their flexibility for various student needs, specifically focusing on providing resources that include student well-being, access to a large variety of courses, and

	comprehensive information of the options and importance of these online services.
Understanding	Knowledge and understanding of student issues related to use of online services, development of technology skills, and consideration of needs that may develop as a result of the non-traditional learning environment, including student social needs, health needs, mental health needs, and learning needs.

Dimensions were used to develop the variables that would be explored for the purposes of this research. Each of the dimensions are previously used in the different models, SERVQUAL, HESQUAL, and HEdPERF, where they were not used to exclusively examine online offerings that are becoming more rapidly available, globally, to students in HEs. The following section examines the variables.

4.4 Dependent and Independent Variables

The variables identified for the research included perceived quality, technology acceptance, availability of online services, types of technology used by students, types of technology, and satisfaction of the online services and access to these services. Dimensions defined previously were used as the variables and included performance expectancy, effort expectancy, and social factors, as they act upon behavioural intention and where facilitating conditions and use behaviour. Independent variables are recognized as the demographic section of the questionnaire, this includes age, gender, access to technology and education. The dependent variables are recognized as those that are dependent on another, it is expected that the results of the technology acceptance questionnaire will influence the results of the quality and satisfaction with the

technology in the university. This would suggest that the dependent variables would also include the dimensions of performance expectancy, effort expectancy, and social factors, as they act upon behavioural intention and where facilitating conditions and behavioural intention act upon use behaviour and are moderated by gender, age, experience, and voluntariness of use (Thomas, et al., 72). The results will indicate new relationships between the variables and help to identify which variables are dependent and independent.

4.5 Data Collection Methods

Data was be collected using structured questionnaires that was be delivered to potential participants using an online survey site. Students were encouraged to access the site based on recommendations from friends, promotion through social media, and other word-of-mouth promotion. Collection occurred by the survey site gathering, recording, and storing the data for later collection by the researcher. Results were retrieved in an Excel file, which can be used in any statistical software program. The researcher did not collect any other data, outside of the collection done by the survey site. To aid in the collection of the data, a team was developed with 12 members that each had numbers and different links to the survey. The team members were asked to provide the survey to students in their university and encourage the students to complete the questionnaire in its entirety. Use of social media and email lists had not provided sufficient responses, which was corrected by the use of the team. Additionally, the questionnaire could be answered over days, and this improved on completeness in responses. Complete responses occurred more often during the evenings and over holidays.

4.6 Sample Population

The sample population was selected from twelve universities located in Turkey, currently using online educational services for students. Questionnaire results are expected to be gathered

from 500 students after accounting for incomplete questionnaires. Private HEs in Turkey were selected due to the larger online and technology related offerings in these colleges and universities, which differ from the current offerings in government HEs in the country. Ability to access online courses, administrative processes, and personnel was necessary for the study to understand if the current offerings in this area were achieving student satisfaction for HEs that had currently implemented these types of availability. The sample population was selected from the total of 595,116 students listed as enrolled in the 77 Turkish foundation universities, as indicated by the Council of Higher Education (YÖK), Turkey (https://istatistik.yok.gov.tr/).

4.7 Focus Group

A focus group was designed to evaluate the questionnaire by first having a group of five students evaluate the questions for clarity and recommend changes where they were needed. The second part of the focus group was a different group of five students from the researcher's college that were able to complete the questionnaire and identify questions that they were unable to answer, did not understand, or considered duplicates of previous questions in the questionnaire. Results from the focus group determined the final questionnaire to be administered to the sample population.

4.8 Instrumentation

Using structured questionnaires, students were asked to assess the quality of services by answering questions posed to them in online surveys, each of which would consist of at least 30 questions. Questions began with demographic questions including age, university, experience with technology in the learning environment, degree program, and prior technology experience.

The following questions were developed from the hypotheses the study used to develop conclusions. Appendix B includes the completed instrument for this research. Questions were

developed to determine if the students had access to the technology necessary to answer regarding quality. Second questions for each of the hypotheses were Likert responses that allowed the respondents to select “strongly agree”, “agree”, “no opinion”, “disagree”, or “strongly disagree”.

Demographic questions are asked of the respondents and were compared to the results using the SPSS software to determine if any of the demographic questions are moderating the results, including age, year of education, and even types of access. The final selection of moderating values were determined after the analysis of the data. All the questions are available in Appendix B.

4.9 Data Analysis

After completion of data entry, a statistical analysis was conducted using IBM’s SPSS software, specifically the AMOS addition due to the capabilities for structural equation modelling. The purpose was to ensure that the modelling of the data is complete and determine if it conforms to the expected model or creates a new model. SPSS also provides other aspects of model testing, such as the factor analysis and correlation. All data collected was entered as received, the survey administered through the online service provided results in an Excel file that can be loaded into SPSS; however, all personally identifiable information was removed. Data containing missing responses were calculated based on replacement of the missing information as using the mean of the population, except in cases where the responses that are completed are less than 25% of the survey. Surveys missing more than 25% of the responses were removed from the results.

Coding was reversed for any responses where the questions purposefully asked negative questions, such as “The library cannot be accessed at all times?”. Reverse coding is used to eliminate errors that can occur when wording is designed to vary the questions in a way that is opposite their intended response type. Finally, the results included frequency evaluation and all

variables were examined for their importance in the final model. Other methods utilized will include the bivariate correlation, exploratory factor analysis, and confirmatory factor analysis, which are methods to test the validity and reliability of the data prior to being tested for the model.

Finally, Structural Equation Modelling (SEM) was used to examine the variables and their relationships, to assess the dimensions identified and test the hypotheses. SEM is a method of casual modelling that seeks to identify if relationships are considered to be significant, and valid, in a set model that can be tested or changed and tested again. The tests conducted on the model included a variety of significance testing, such as Cronbach's Alpha, confirmatory factor analysis (CFA), and items noted in the SEM section of the chapter. These methods allowed the results to be assessed based on a variety of findings to check for errors in the results. Popularity of SEM modelling has existed since the 1900s, and access to software to assist in analysing these methods, such as AMOS in SPSS and Smart PLS, have increased their use; however, researchers largely do not agree regarding which reports are the most significant or preferred (Kenny, 2015; Mancha & Leung, 2010). Due the large availability of differences in reporting, data analysis reporting includes the most common reporting of the Smart PLS results of SRMR and NFI and recognizes other reporting and relationships with expected results for those reports.

4.10 Limitations and Delimitations

Limitations of this research include the access to populations, which includes that the research data collection utilizes technologies that may not be available to all potential respondents. The reach of the researcher is limited, due to the potential number of students that could be surveyed from higher education. Another limitation is the time available to complete the research, which limits the ability to collect from a larger population, or to reach a population outside of the geographic area of the researcher. Lastly, limitations occur in quantitative research as a direct

result of the inability for respondents to select answers that are not present in the options for responses. An example might be that the respondent agrees with the statement for the Likert response, but not always. The options for Likert responses and the questions will aim for clarity and simplicity to increase the validity of the response selections. Findings from this research will contribute to the larger body of knowledge but may not have generalizability to all possible populations.

Delimitations of this research are the parameters of the investigation, which are limited to university students attending school in Turkey universities. Further, respondents will only be selected from colleges offering online educational environments and options. Respondents were collected using an online survey. For this research, there will not be treatments provided to the respondents and it is expected that the questionnaire will not result in any treatment having occurred.

4.11 Ethical Considerations

Ethics are important to the success of a study because it supports the needs of human respondents to be protected when participating in studies and research (Shore 447). In addition to gaining approval from the appropriate boards to study the populations in these colleges, this research does not intend to influence or change any aspect of the respondent's conditions. Data gathered was completely anonymous and the data collection process will not store any information that was personally identifiable to the individual submitting results. All respondents will need to accept the conditions of the survey, including if any risks were to occur and how to obtain a final result of the study, prior to completing the questions. Respondents that do not accept these terms of survey completion were unable to continue in the survey. As a result of the survey gathering no information from the participant, surveys cannot be retracted after the survey has been submitted

to the system. Respondents electing to withdraw permission to use the survey, must exit the survey prior to the last question submission. The research will not retain any incomplete surveys, as they were recognized as permissions for use having been revoked. Finally, it is the goal of this research to provide safety to all respondents, which will improve on the honesty of respondents and adhere to the regulation of studies involving human participants.

5. Results

Results were gathered from students over multiple months, resulting in a reach of students in 12 universities. This section reviews the management of the data and reports on the results gained from the questionnaires distributed. Included in the results is the information regarding the critical values in each area of the concept model and how the data was found to be related. Following this, the conclusions and discussion chapter reviews the results in more detail and as compared to the literature review findings.

The final questionnaire was determined based on the review of a small focus group, resulting in a survey including a total of 107 possible questions, which included responses to multiple selection questions. This final survey is located in Appendix B, along with the sections each question was intended, as applicable to the concept model. Questionnaires were distributed to students in 12 different universities, with responses from 514 students. Respondents completing only the demographic section of the survey were removed, resulting in a total of 393 surveys used in the results. Surveys were reviewed for amount of completeness following removal of non-respondents. Reverse coding was applied to questions that were asked in the negative, as opposed to positive. Following this, frequencies were obtained from all results in order to evaluate the ability to use the mean in areas where responses were rarely obtained and for possible question removal. In the final steps of data analysis, one set of university responses were removed to test for stability in the data, which may have been negatively influenced by missing responses largely occurring in that group. The final sample population was 318.

A frequency evaluation of the responses indicated missing responses in a variety of areas. There were no missing responses found in age, gender, or education. As a result of the missing responses not exceeding 4%, all remaining missing responses were coded to be replaced with the

series mean. The beginning and ending frequency charts are found in Appendix C. As a result of the mean addition to missing responses, means did not change between questions; however, standard deviations were reduced due to the change from a calculated 0 response to the mean. Further, Kurtosis results were reviewed, and 11 questions were reported as other than a normal distribution. The new variables developed from these results were used for all tests, with the exception of the descriptive statistics.

5.1 Treatment of the Data

Data gathered was first organized based on the frequencies and tested with the original 393 respondents to the study. However, original data demonstrated inconsistencies in one university's set of responses, and those were removed. The remaining data of 318 was opened in SPSS, at which time the frequencies were checked for missing data. Missing data was replaced with the series means for all missing areas. Following this, a Cronbach's alpha was used to assess the internal consistency of the data, and as reported later the data was found to be consistent. Following this step, the data was assessed for cross-tabulations, which would help to guide if moderators would be present by demonstrating if the demographic and access items were consistently related to any other factors. Another measure taken was the bivariate correlation and exploratory factor analysis (EFA), which indicates relationships between items and provides for demonstration of where problem areas would exist. After this, all data was initially tested in various models in SPSS AMOS, where failing items or latent variables were removed as indicated as lacking significance in the relationship or as failing to be well representative of the latent variable. Results from AMOS were reported in areas that are critical to the results later in this chapter. These steps did not eliminate final testing of all items but ensured that the data would be recognized as failing if the previous steps were unsuccessful in areas expected.

Finally, models were then completed in Smart PLS. Again, all items were tested and low loadings in outer loadings indicated either a lack of predictability in a latent variable or a failure in the relationship that was tested. Items and latent variables were removed until a final model was found to be significant. Additionally, model relationships were tested between various different variables, even when they were expected, based on literature, to have no relationship or to be related differently. All items, all predicted variables, all dimensions as expected per the literature, and conceivable interrelationships were tested in various ways, including by inter-loading items on variables if the EFA had suggested this could be a factor in the dimensions. In total, more than 200 variations were tested from the results gathered, regarding models and expected models. These results are reported in the following sections.

In Smart PLS, all models reported R Square, R Square Adjusted, f square for each area. Testing of the models was conducted with Consistent PLS, Latent Variables connected for initial calculation, Factor analysis and Path analysis were both run, and a maximum of 1000 iterations with a stop criterion of 7. Missing variables had previously been replaced by the mean and weighting was not used. According to Smart PLS, the Consistent PLS uses the algorithm to perform corrections of the constructs' reflective correlations to achieve results expected to be equal to the results of a factor-model, and the research to support this is reported as "Dijkstra, 2010; Dijkstra, 2014; Dijkstra and Henseler, 2015; Dijkstra and Schermelleh-Engel, 2014" (Consistent PLS information section of Smart PLS). Further, it is noted that the Nunnally's 1978 work was utilized in the correction for attenuation formula. It is important to note that Dijkstra (2014) argued that PLS is a critical element of modelling that should not be ignored and contributes to the literature and development of models at least as effectively as that of factor modelling.

In addition to the Consistent PLS, Smart PLS was used to conduct Bootstrapping, at 1000 subsamples, with do parallel processing selected, and basic bootstrapping, with the advanced settings as bias-corrected and accelerated bootstrap, two-tailed, and significance level of 0.05. Again, the maximum iterations were 1000, stop criterion of 7, and conducted as both factor and path analysis. Bootstrapping is reported as a nonparametric process designed to examine the statistical significance of the PLS-SEM results using Cronbach's alpha, R^2 values, and HTMT. The purpose of the bootstrapping is a result of the issues with non-parametric methods ignoring the need for distributional assumptions. According to Smart PLS, this use of the nonparametric bootstrap is to test significance, as per the research of "Efron and Tibshirani, 1986; Davison and Hinkley, 1997" and is further examined by Hair, et al (2017) (Smart PLS Bootstrapping information). Hair et al (2017) stated "Bootstrapping is available as an alternative to traditional t values for parameter significance" (175). In each section, all gathered data is reported in its entirety.

Outer loadings and weights are also reported for each of the combined models, and the final TechnoQual model proposed. The outer loadings are composite reliability and expected to be either greater than 0.70 and if used in exploratory research, such as this work, can be as low as 0.60. Due to the exploratory nature of this research, loadings were accepted as low as 0.60 or as indicated. Outer weights are considered a formative measurement assessment and are considered to be relevant at greater than 0.50; however, due to the exploratory nature of this research outer weights were not considered if the outer loadings were consistent with expectations. These are, however, reported for the combined and final models.

5.2 Demographic Results of Respondents

A demographic profile of respondents included a similar response rate between male and female students (46.9% male and 51.3% female) and 1.9% of respondents preferred not to answer. Respondents were found to be primarily between the ages of 18 and 24 (59.1%); however, the majority of respondents were reported to have more than four years of university, 31.8%; followed by first year, 24.2%. The following charts depict the results gathered.

Figure 5: Gender of Respondents

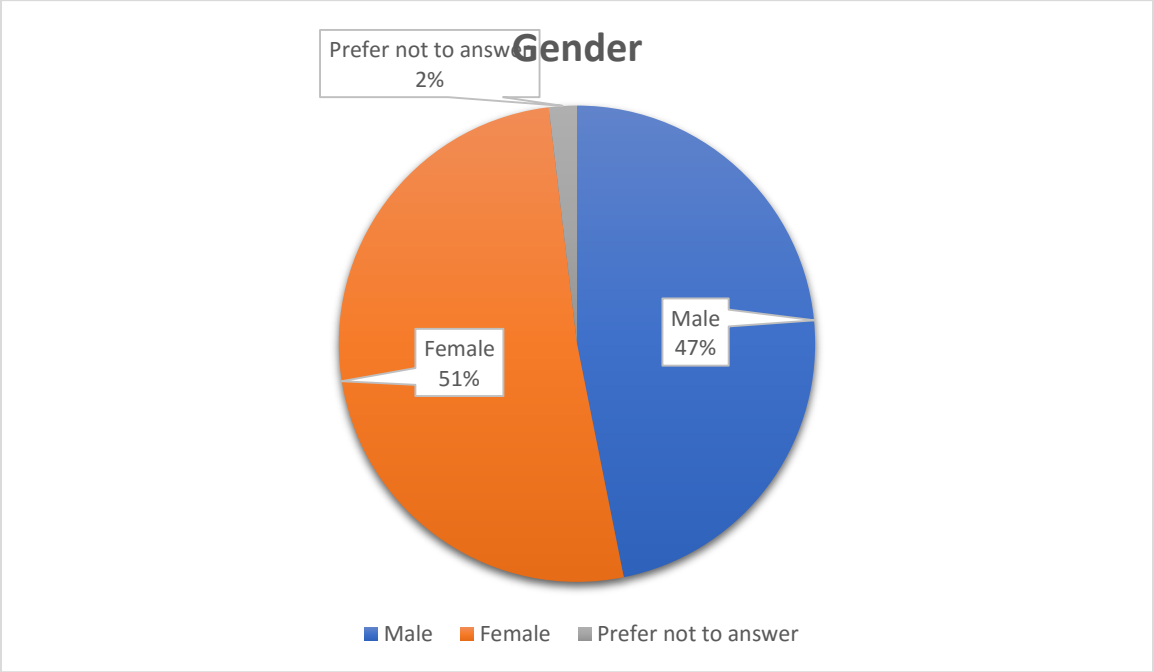


Figure 6: Ages of Respondents

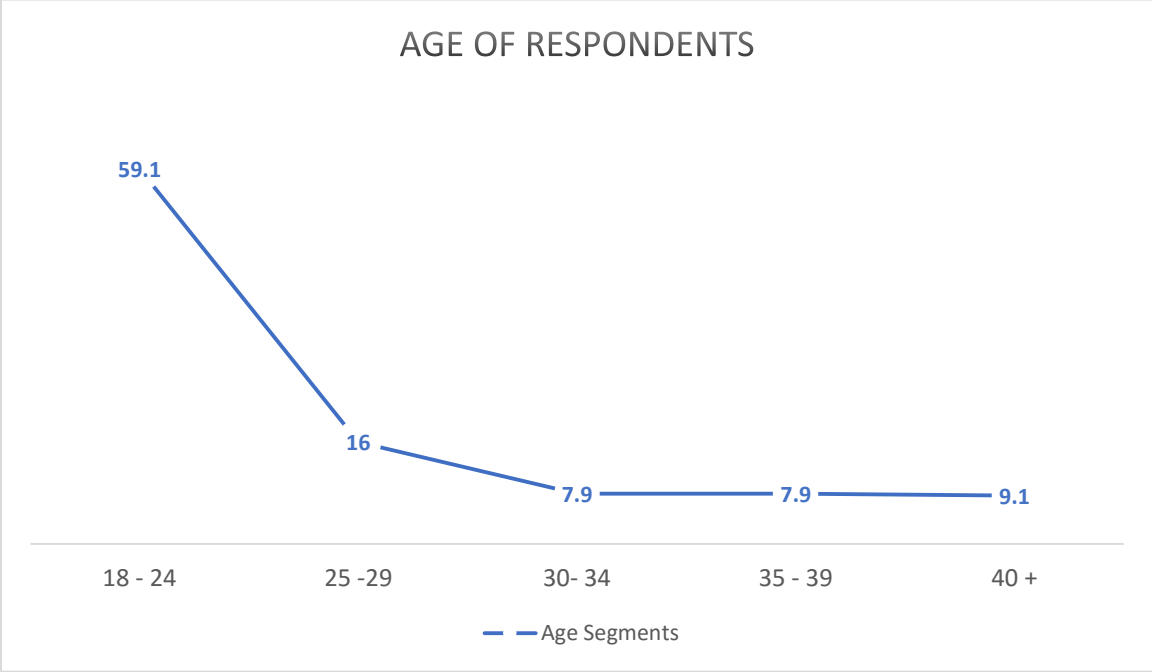
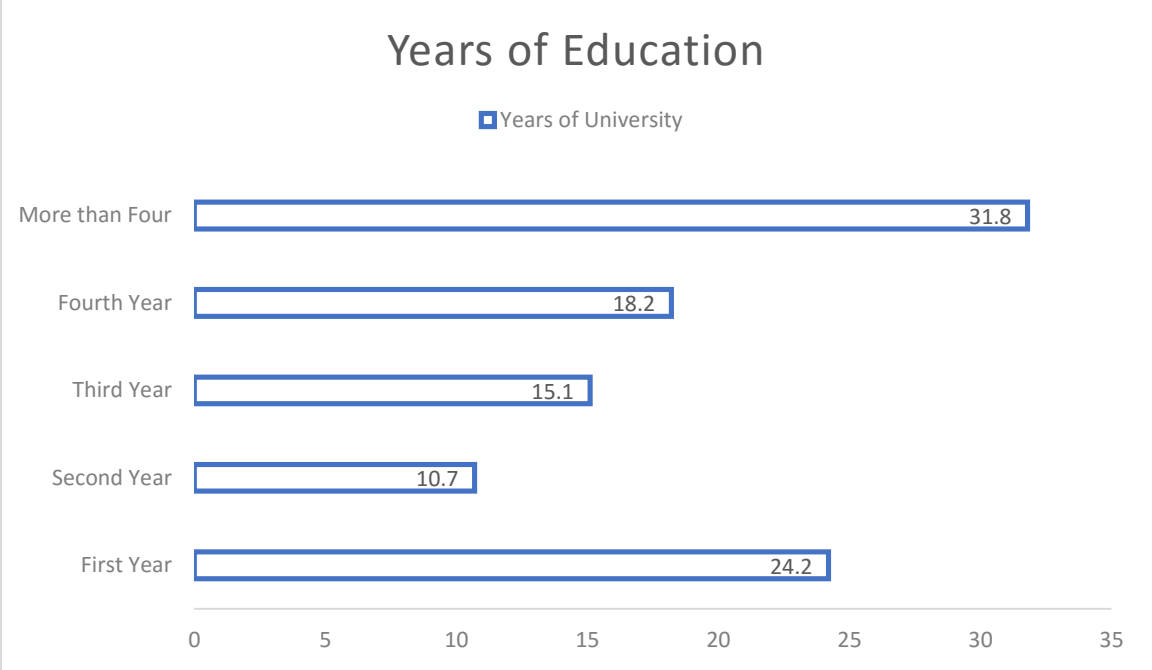


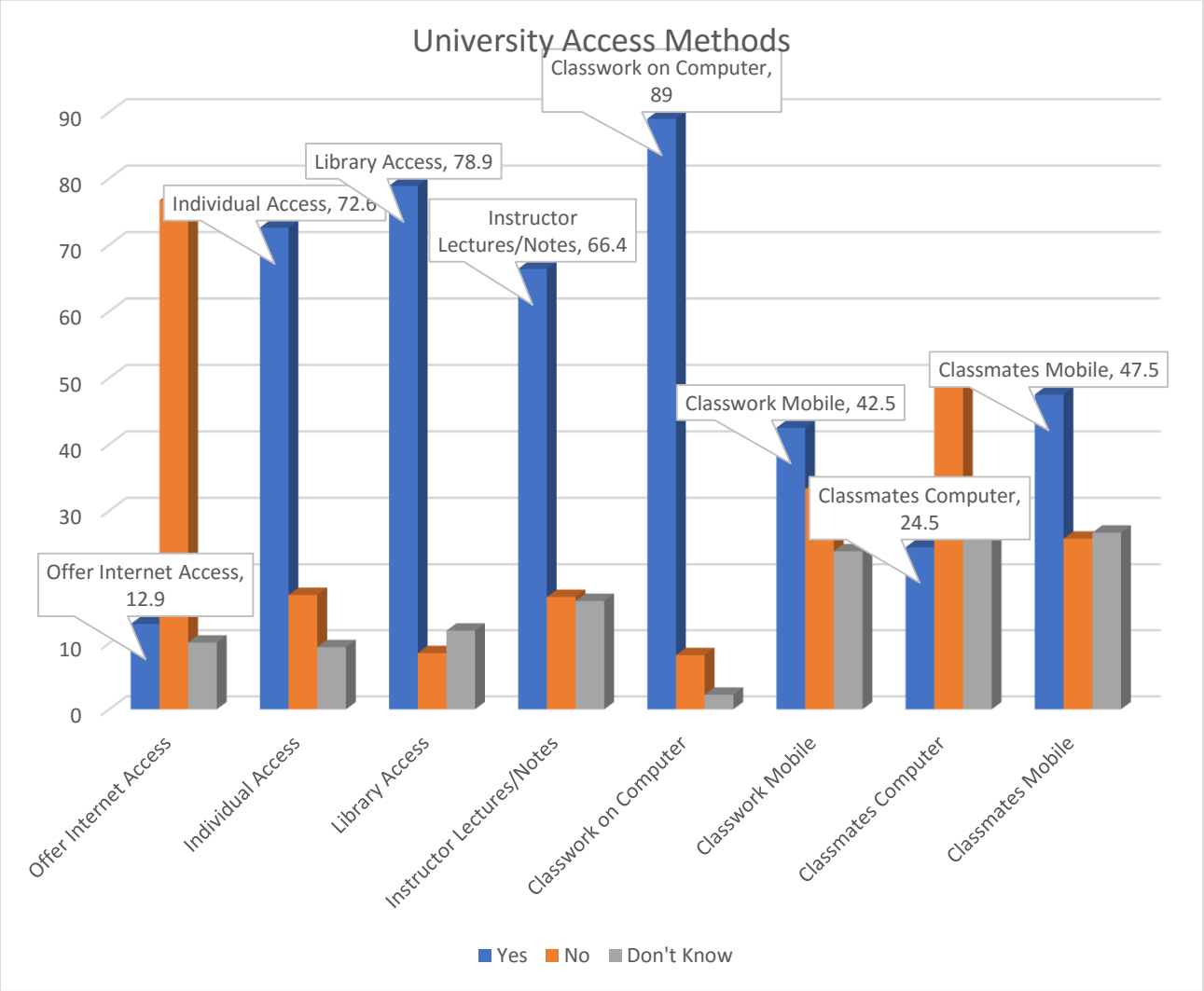
Figure 7: Years of University



In addition to these areas, demographics were gathered to determine knowledge of university access through the internet, ability to access the library, access and submit coursework,

and methods of accessing the university. Eight questions were used to determine if respondents were able to use a computer, tablet, laptop, or smartphone device to access university tools such as the website and platforms. The results found that the largest access to the university was through computers, and more than 78% of respondents agreed they had library access outside of the campus. More than 20% of all respondents did not know if they had access to course and class work from a mobile device, or access to their classmates through a university app for a mobile device.

Figure 8: Types of Access to the University



Methods of accessing the university were gathered using a multiple-choice selection method. Respondents reported access to the university through a smartphone as the leading method, 73.9% and at the campus 66.7%. The following table demonstrates the percentage of use for each type of possible access to the university.

Table 6: Methods of Accessing the University

Item	
Smartphone	73.9%
At the Campus	66.7%
On a Laptop	53.5%
Online on Computer	31.4%
Tablet	9.4%

Respondents then answered what they could do at the university based on their access. Respondents answered that they had access to schedule of exams, 82.1%, management of enrolment, 79.2%, and ordering transcripts 70.4%, as the most often selected choices. The following table demonstrates the results gathered for each possible selection.

Table 7: Abilities When Accessing University

Item	
Schedule of Exams	82.1%
Management of Enrolment	79.2%
Order Transcripts	70.4%
Personal & Contact Information	66.0%
Details of Degree Program/Enrolment	60.7%

Access to an Online Library	49.4%
Obtain Documentation Proof of Enrolment	40.9%
Manage Financial Information and Payment	23.0%
Request changes to Instructor/Courses	25.5%
Apply for University Housing	7.2%

The least accessed for the universities was the application for university housing, 7.2%. Following these questions, respondents were asked to begin answering the next section of the survey, which was answered using Likert Response selections. These results are reported in the next section.

5.3 Technology Acceptance and UTAUT Model Questions

Respondents were asked to answer questions selected from the technology acceptance model and UTAUT model. These questions began with 33 questions; however, after the focus group they were reduced to a total of four questions for Perceived Ease of Use (PE), four questions for Social Influence (SI), three questions for Performance Expectancy (PerfE), five questions for Perceived Usefulness (PU), ten questions for Effort Expectancy (EE), and three questions for Intention to Use (IU). Facilitating Conditions (FC) was derived from the access questions examined above and tested for dependency and model placement. Generally, the smallest percentages were found in the "Strongly Disagree" selection, and the highest were found in "Agree"; however, "Neither" also had percentages of responses that climbed over 20% in some of the questions presented to respondents. Each of the questions were expected to fit into the specific items but were explored for relationships that may be more strongly fitting to the question and the resulting relationships. The following table is the descriptive characteristics of the respondents, with the exception of previously reported facilitating conditions.

Table 8: Technology Acceptance and UTAUT Questions

Question	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
PerfE1	19.9	66.2	8.2	4.7	.9
PerfE2	17.7	60.1	14.2	6.6	1.3
PerfE3	19.2	46.7	23.7	8.8	1.6
PU1	13.0	47.2	27.5	8.9	3.5
PU2	16.2	65.6	13.4	3.5	1.3
PU3	17.5	42.9	24.8	12.1	2.9
PU4	18.0	65.8	10.4	3.8	1.9
PU5	18.4	61.9	13.0	5.4	1.3
EE1	7.6	41.5	33.2	16.5	1.3
EE2	13.0	58.5	15.8	11.4	1.3
EE3	11.7	63.9	11.7	10.1	2.5
EE4	5.1	60.8	15.2	17.1	1.9
EE5	6.6	33.9	26.9	26.6	6.0
EE6	7.0	51.1	20.3	17.8	3.8
EE7	6.0	27.3	28.9	30.8	7.0
EE8	5.7	53.5	21.2	17.1	2.5
EE9	5.4	49.2	27.3	15.9	2.2
EE10	5.4	52.7	27.3	12.4	2.2
PE1	6.6	65.0	15.5	11.0	1.9

PE2	5.4	72.5	11.4	9.5	1.3
PE3	4.4	68.6	15.9	8.9	2.2
PE4	5.1	38.3	40.5	14.2	1.9
SI1	17.7	62.0	12.7	3.8	3.8
SI2	29.7	52.7	10.7	4.1	2.8
SI3	30.0	42.3	16.4	9.1	2.2
SI4	31.0	48.9	12.8	4.8	2.6
VOL1	3.8	18.0	21.5	38.9	17.7
VOL2	3.8	13.4	22.9	40.8	19.1
USE1	8.6	65.7	14.9	8.6	2.2
USE2	19.7	66.2	8.3	4.8	1.0
IU1	16.9	61.7	16.0	3.5	1.9
IU2	23.7	58.2	13.3	3.8	.9
IU3	19.6	59.2	13.9	4.7	2.5

Results from the technology acceptance and UTAUT model questions were expected to provide insight regarding the interest and adaption of technology offerings to the students. Although there were responses that were unexpected, such as the range of response rates in effort expectancy, these were able to be compared with the results gathered from the Satisfaction with the University section of the questionnaire. The following section reviews the results from this section of the study.

5.4 Satisfaction with the University: Descriptive Statistics

Development of the satisfaction portion of the study was originally developed with 60 questions, assigned to the areas of tangibles, reliability, responsiveness, assurance, empathy, non-academic aspects, academic aspects, reputation, access/accessibility, program issues/study programs, and understanding. The final delivery of the survey to respondents included 61 questions, where extra questions were added in the areas of access/accessibility, reputation, understanding, and program issues/study program, to improve upon clarity. Similar to previous results, respondents were found to generally agree with positive statements, as opposed to strongly disagreeing. Results for disagree were slightly higher in a variety of different areas and the selection of "Neither" typically was below 23%. Results were reverse coded for questions that were written negative; however, respondents generally agreed with these as well, as indicated in the table demonstrating the various selections by highlighting the largest percentage for each question. The following table includes all responses prior to changing of missing responses and including all the questions from the satisfaction section of the survey.

Table 9: Satisfaction with University

Question	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
1	9.9	75.6	9.6	4.2	.6
2	11.5	55.9	20.1	11.2	1.3
3	7.0	45.7	29.4	16.0	1.9
4	10.3	68.6	8.7	11.2	1.3
5	1.9	34.9	17.9	36.5	8.7
6	7.1	79.4	8.4	4.2	1.0
7	7.4	51.3	17.1	19.0	5.2

8	1.9	14.4	12.8	59.6	11.2
9	1.3	11.5	13.7	59.1	14.4
10	1.0	9.9	12.8	63.1	13.1
11	4.5	40.1	14.4	35.3	5.8
12	5.8	42.1	11.6	34.7	5.8
13	2.9	23.8	11.3	53.4	8.7
14	5.8	54.0	19.9	16.7	3.5
15	10.5	71.9	9.9	6.1	1.6
16	4.9	77.0	11.0	4.9	2.3
17	14.2	66.8	11.0	5.8	2.3
18	10.6	45.7	18.0	23.5	2.3
19	9.3	50.3	20.2	17.9	2.2
20	12.5	68.8	14.1	3.5	1.0
21	9.0	77.1	7.7	4.5	1.6
22	11.5	70.5	11.5	4.2	2.2
23	11.6	67.4	14.8	4.5	1.6
24	5.8	19.6	21.2	42.4	10.9
25	5.8	36.0	19.3	33.8	5.1
26	5.8	73.6	12.2	6.1	2.3
27	9.4	69.3	13.3	6.1	1.9
28	9.6	71.4	12.5	5.5	1.0
29	5.8	21.9	23.5	37.6	11.3
30	4.2	19.7	31.0	33.9	11.3

31	5.8	68.7	12.9	10.6	1.9
32	6.4	67.5	15.6	8.9	1.6
33	3.5	38.9	19.0	33.8	4.8
34	2.6	24.3	16.6	43.5	13.1
35	2.3	11.3	18.3	50.2	18.0
36	4.2	49.8	30.7	12.9	2.3
37	30.3	63.2	3.9	1.6	1.0
38	20.4	68.7	8.9	1.3	.6
39	4.5	59.6	21.7	11.8	2.5
40	7.0	78.1	10.8	2.5	1.6
41	4.2	68.8	13.2	13.2	.6
42	8.6	73.5	11.8	3.8	2.2
43	4.2	36.7	13.7	38.7	6.7
44	25.3	46.5	8.3	13.8	6.1
45	3.5	9.3	17.9	50.8	18.5
46	6.4	76.0	10.6	5.1	1.9
47	6.0	54.3	16.8	19.4	3.5
48	6.1	63.9	11.8	16.9	1.3
49	4.5	43.3	14.3	31.5	6.4
50	4.5	66.2	16.2	11.1	1.9
51	5.4	31.0	18.8	39.3	5.4
52	3.5	19.4	18.8	48.1	10.2
53	1.9	13.1	23.1	46.2	15.7

54	3.8	53.5	18.9	19.6	4.2
55	3.8	43.6	29.2	19.2	4.2
56	2.9	38.9	33.8	19.7	4.8
57	6.4	64.1	19.9	8.0	1.6
58	7.8	67.0	19.4	4.5	1.3
59	3.9	28.9	34.1	25.1	8.0
60	9.3	51.8	24.3	9.9	4.8
61	32.5	48.1	13.4	4.5	1.6

All the data was found to be consistent with positive views on both technology and the university. Results from some of the questions were expected to need further review. Prior to developing the model in AMOS, through SPSS, the data was examined using a bivariate correlation to report on any significant relationships and exploratory factor analysis to determine which variables will not be used in the model. Reports of these results and the concept model are found in the following sections.

5.5 Reliability, Bivariate Correlation, and Exploratory Factor Analysis

The first test run on the data was reliability using Cronbach's alpha, which found that all items received a range of 0.88 and 0.927, indicating reliability. A bivariate correlation test was run on the data, using Pearson Correlation, which provided insight regarding expected correlations between the data. This information was utilized to examine the results and provide important insight into the model development. Findings from the bivariate correlation test identified 2-tailed significance at least p =. 05 in all questions and many had numerous findings of p = 0.01. This indicated that all the questions were able to be utilized for the exploratory factor analysis and considered to be valid for further testing.

The exploratory factor analysis was done through SPSS, using a principal axis factoring and varimax rotation methodology to compare relationships that were expected. An all items EFA was unsuccessful and expected to be inaccurate. The UTAUT and TAM model questions were expected to be significantly related. Similarly, it was expected that the results from satisfaction in the university offerings would be related. The first test was to examine TAM and UTAUT items of Perceived Use (PU), Effort Expectancy (EE), Facilitating Conditions (FC), Social Influence (SI), Performance Expectancy (PerfE), and Perceived Ease of Use (PE). The results are found in the following table.

Table 10: Initial TAM UTAUT EFA

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.880
Bartlett's Test of Sphericity	Approx. Chi-Square	5585.510
	df	820
	Sig.	.000

A total of ten factors were extracted; however, it was found that only one item in facilitating conditions was well-suited to the group. All FC items were removed to be applied as possible moderators and tested as individual relationships. The following is the KMO and Bartlett's Test and resulting rotated factor matrix.

Table 11: Final TAM and UTAUT EFA

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.899

	Approx. Chi-Square	4879.218
Bartlett's Test of Sphericity	df	528
	Sig.	.000

Table 12: Rotated Factor Matrix TAM and UTAUT

Rotated Factor Matrix[a]

	Factor						
	1	2	3	4	5	6	7
SMEAN(PU2)	.697						
SMEAN(PerfE2)	.675						
SMEAN(PU5)	.651						
SMEAN(PerfE1)	.638						
SMEAN(PU3)	.618						
SMEAN(PU1)	.611						
SMEAN(PerfE3)	.583						
SMEAN(PU4)	.580						
SMEAN(IU1)		.743					
SMEAN(IU3)		.732					
SMEAN(IU2)		.667					
SMEAN(USE2)		.524					
SMEAN(USE1)		.497					
SMEAN(EE6)			.642				

SMEAN(EE8)		.630				
SMEAN(EE4)		.621				
SMEAN(EE7)		.595				
SMEAN(EE9)		.566				
SMEAN(EE5)		.553				
SMEAN(PE3)			.730			
SMEAN(PE1)			.632			
SMEAN(EE10)			.567			
SMEAN(PE2)	.364		.476			
SMEAN(PE4)			.447			
SMEAN(SI2)				.787		
SMEAN(SI1)				.669		
SMEAN(SI4)	.329			.646		
SMEAN(SI3)				.616		
SMEAN(EE2)					.699	
SMEAN(EE3)					.672	
SMEAN(EE1)					.593	
SMEAN(VOL2)						-.681
SMEAN(VOL1)						-.671

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

In the rotated factor matrix, components of PU and PerfE were found to be closely related to each other, and this was noted as a single component for the concept model. SI, PE, and EE were found to primarily be applicable to each other, apart from three questions in EE. Further, EE factor results indicated that multiple factors were present in this area. Another result indication was that both IU and USE were a single factor.

Following this, the quality questions were evaluated. The KMO and Bartlett's Test were found to be similar to the results of the TAM and UTAUT. Generally, a KMO result should be closer to .5 or .6, indicating that the samples collected may be in need of further changes. However, the following is the initial report from the quality questions.

Table 13: Initial Quality EFA

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.877
Bartlett's Test of Sphericity	Approx. Chi-Square	7667.222
	df	1830
	Sig.	.000

Numerous cross loadings were detected, and questions were removed to gain a significant EFA result. However, the initial results were utilized in Smart PLS as well. There were no loadings in the EFA that was consistent with expectations for quality model alone, even as SERVQUAL or HEdPERF. These were the findings for each individually, where removal of elements did not improve, or made the results worsened. The KMO reporting for SERVQUAL was .853 and HEdPERF was .845.

Table 14: Initial SERVQUAL EFA

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.845
Bartlett's Test of Sphericity	2216.937	3809.186
	300	630
	.000	.000

Table 15: Initial HEdPERF EFA

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.877
Bartlett's Test of Sphericity	Approx. Chi-Square	7667.222
	df	1830
	Sig.	.000

Table 16: SERVQUAL EFA

Rotated Factor Matrix[a]							
	Factor						
	1	2	3	4	5	6	7
SMEAN(ASSUR1)	.737						
SMEAN(ASSUR2)	.695						
SMEAN(RESP5)	.678						
SMEAN(ASSUR5)	.514	.398					
SMEAN(RESP4)	.478						

SMEAN(EMP2)		.751				
SMEAN(EMP3)		.596				
SMEAN(EMP1)	.387	.577				
SMEAN(REL1)		.396		.336		
SMEAN(EMP4)			.530			
SMEAN(RESP2)			.475			
SMEAN(RESP3)			.441			
SMEAN(TANG5)			.440			
SMEAN(TANG3)				.527		
SMEAN(RESP1)				.489		
SMEAN(ASSUR4)				.443		
SMEAN(EMP5)				.351		
SMEAN(ASSUR3)						
SMEAN(REL4)					.642	
SMEAN(REL5)					.525	
SMEAN(REL3)			.416		.476	
SMEAN(TANG2)						.612
SMEAN(TANG1)						.374
SMEAN(TANG4)			-.323			.343
SMEAN(REL2)						

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Table 17: HEdPERF EFA

Rotated Factor Matrix[a]

	Factor								
	1	2	3	4	5	6	7	8	9
SMEAN(NonA1)	.675								
SMEAN(REPU5)	.674								
SMEAN(NonA3)	.667								
SMEAN(NonA2)	.598								
SMEAN(ACCESS1)	.485								
SMEAN(UNDER3)	.387		.354			.339			
SMEAN(REPU3)	.363		.302						.343
SMEAN(PROG3)	.351								
SMEAN(ACCESS5)	.302								
SMEAN(REPU1)									
SMEAN(PROG1)									
SMEAN(ACAD5)		.668							
SMEAN(PROG5)		.605							
SMEAN(NonA4)		.576							
SMEAN(NonA5)		.511							
SMEAN(ACCESS4)	-.339	.368			.328				
SMEAN(PROG2)		.358							

SMEAN(UNDER7)	.366		.608							
SMEAN(UNDER6)			.587							
SMEAN(UNDER5)		.348	.514							
SMEAN(UNDER4)	.350		.502							
SMEAN(UNDER1)				.847						
SMEAN(UNDER2)				.764						
SMEAN(PROG7)	.328			.359						
SMEAN(ACCESS6)					.681					
SMEAN(ACCESS3)					.520					
SMEAN(ACCESS2)					.357					
SMEAN(PROG4)					.351					
SMEAN(ACAD1)						.539				
SMEAN(ACAD2)	.360					.472				
SMEAN(REPU4)	.322						.691			
SMEAN(REPU6)	.395						.455			
SMEAN(ACAD4)		.528						.642		
SMEAN(ACAD3)								.622		
SMEAN(REPU2)	.322									.641

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 13 iterations.

5.6 Conceptual Model Testing- TAM UTAUT

The conceptual model proposed integrated a variety of different models that are expected to influence how people accept, adapt, and are satisfied with technology offerings and use of those technologies. As result of the findings during the EFA, some questions were removed. Questions removed from the loading could have been influenced by a variety of different conditions, one of these is that the survey was distributed amongst students whose first language may not have been served well in the survey design and another is due to the order of questions. It was also previously discovered that the questions asked in the negative (I cannot as oppose to I can), were unexpected results when properly coded as a result of the number of responses that were contrary to what would be expected in those cases. No missing values were present, as a result of the previous treatment of the data as described. In the TAM model, it was expected that external variables (FC) would influence perceived usefulness (PU) and perceived ease of use (PE); however, external variables loaded mostly far below the expected minimum of 0.5 and was removed from the model. Overall, the final model resulted in the construct reliability being significant without external variable and Use as a latent variable. The final model is demonstrated in the graph below, with expectation that PE and PU share many commonalities in discriminate validity and would be combined in future examination. The model fit chi-square was 130.752, SRMR, 0.047, and NFI of 0.906. The construct reliability and validity table follows the graph.

Figure 9: TAM Model Significant Relationships

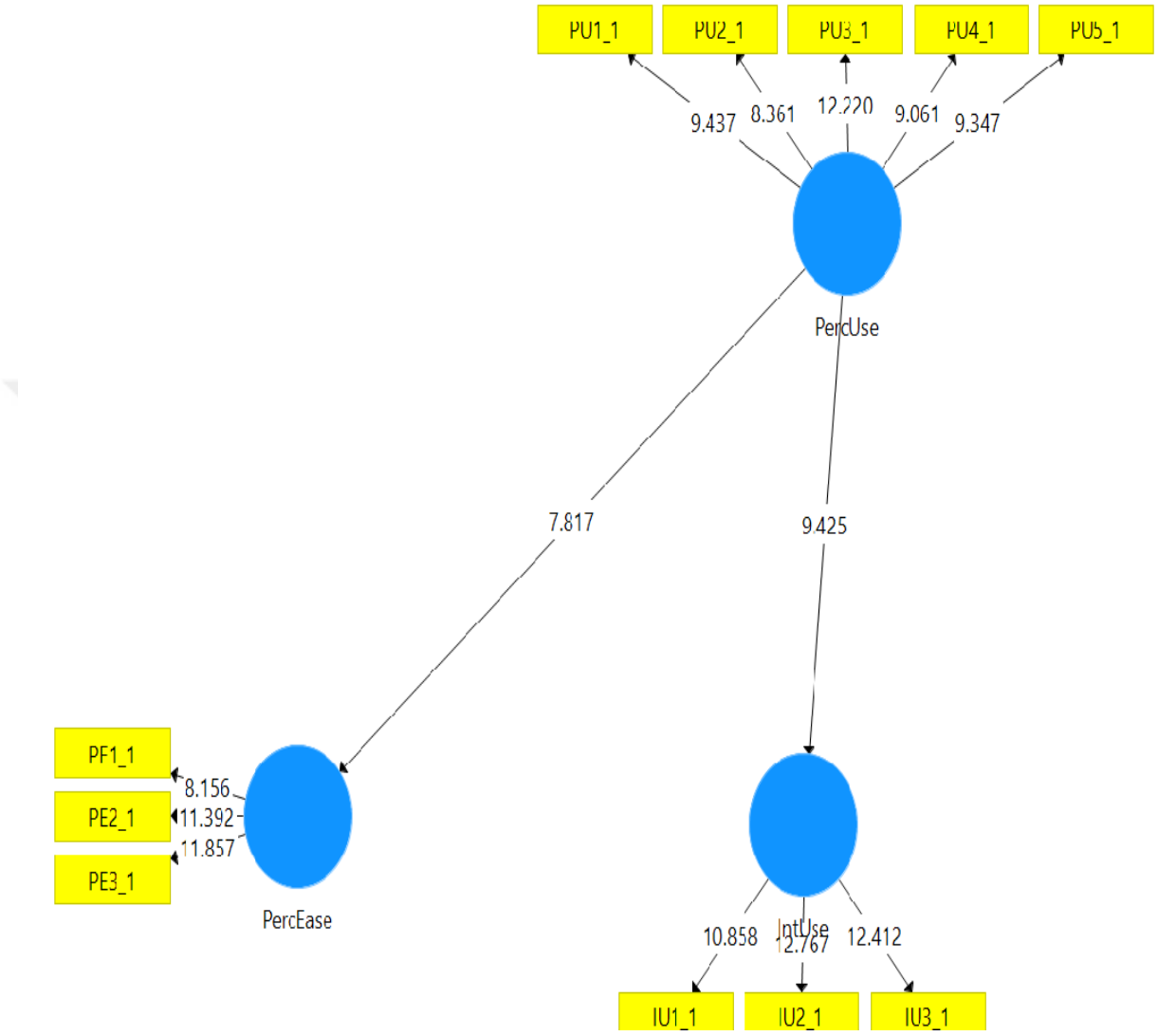


Table 18: Construct Reliability and Validity TAM

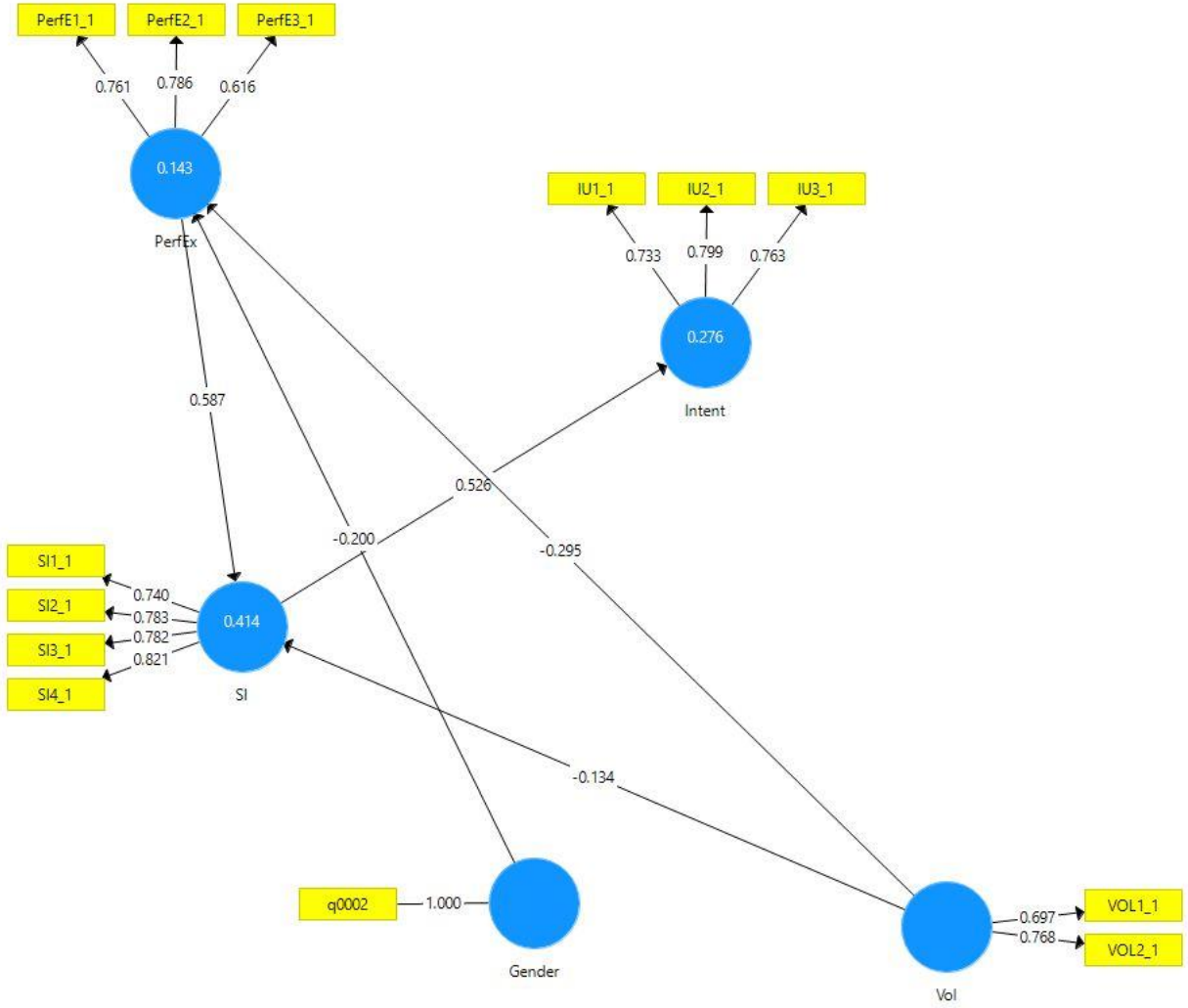
	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Intent	0.81	0.811	0.809	0.586
PE	0.768	0.774	0.768	0.526
PU	0.838	0.838	0.837	0.508

As TAM was not the final model for the technology acceptance test, the following sections are conducted with only these specific areas and further reporting is found in the combined model. The second concept model test for the data was the UTAUT base model. As previously found, the facilitating conditions remained unable to fit in this model, similar to this was the Use latent variable. All questions with outer loadings lower than 0.5 were removed from the model. Additionally, Smart PLS indicated that all EE factors were below .7 and should be discarded. Further, the average variances could not be improved for the effort expectancy variable (EE), and it was removed from the model. As demonstrated in the following table and graph, the model was successful with the remaining variables; however, voluntariness (VOL) was expected to be a poor indicator due to the Cronbach's alpha reporting of only 0.698. Another consideration was that age and education were not found to be a significant indicator in any of the variables. Lastly, gender only had an influence on Performance expectancy (PerfEx). The model resulted in an SRMR of 0.041, chi-square 128.360, and NFI of 0.917.

Table 19: Construct Reliability and Validity UTAUT

	Cronbach's Alpha	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**
Gen	1	1	1	1
Intent	0.81	0.81	0.809	0.586
PerfEx	0.761	0.776	0.767	0.526
SI	0.863	0.864	0.863	0.611
Vol	0.698	0.702	0.699	0.538

Figure 10: Final UTAUT Model



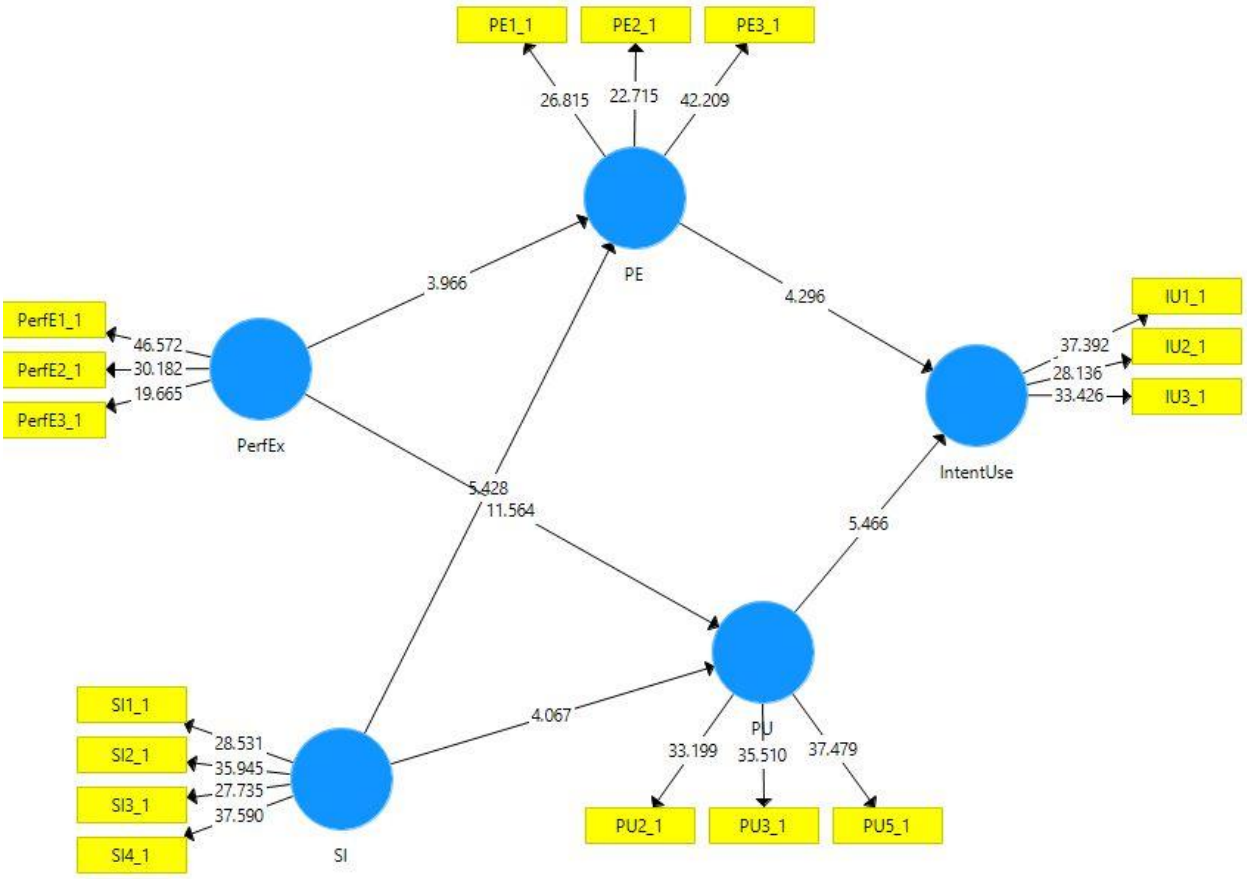
After reviewing the items that were able to be maintained from the two test models, the combine model indicated in the previous evaluation of the literature was tested for model fitness using the variables loading into these models. A combined UTAUT and TAM model was expected to include areas that were most like each other and could then be tested for moderation by items such as age, gender, education, and possibly voluntariness of use. Although Effort Expectancy and Facilitating Conditions performed poorly in all tests, except the base reliability test, it was also tested in this model. After adjusting for errors and testing various patterns, the result was found that Performance Expectancy (PerfE), Perceived Usefulness (PU), Perceived Ease of Use (PE),

Social Influences, and Intent to Use were applicable to the model. The final model resulted in the SRMR of 0.045, chi-square 243.661, and NFI of 0.899. A construct validity and reliability is located in the following table and then a graph depicting the final model.

Table 20: Construct Reliability and Validity TAM and UTAUT Combined Model

	Cronbach's Alpha	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**
IntentUse	0.81	0.81	0.809	0.586
PE	0.768	0.768	0.766	0.522
PU	0.783	0.783	0.783	0.546
PerfEx	0.761	0.766	0.764	0.519
SI	0.863	0.863	0.863	0.611

Figure 11: TAM UTAUT Combined Model



In addition to the reporting as indicated above, the following are all the data collections from Smart PLS. AMOS was not repeated for this model, because it is not the final model tested, these are the initial models. The first table is the sample mean, standard deviation, t statistics, and p values.

Table 21: TAM UTAUT T Statistics and P Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
PE -> IntentUse	0.322	0.319	0.076	4.211	0
PU -> IntentUse	0.297	0.3	0.057	5.198	0
PerfEx -> PE	0.26	0.262	0.067	3.883	0
PerfEx -> PU	0.599	0.6	0.05	11.883	0
SI -> PE	0.374	0.373	0.068	5.496	0
SI -> PU	0.201	0.203	0.047	4.232	0

The next table provided from the bootstrapping is the confidence intervals, as reported in the following table.

Table 22: TAM UTAUT Combined Confidence Intervals

	Original Sample (O)	Sample Mean (M)	2.50%	97.50%
PE -> IntentUse	0.322	0.319	0.154	0.462
PU -> IntentUse	0.297	0.3	0.187	0.412
PerfEx -> PE	0.26	0.262	0.125	0.39
PerfEx -> PU	0.599	0.6	0.496	0.69

SI -> PE	0.374	0.373	0.235	0.499
SI -> PU	0.201	0.203	0.112	0.291

In the case of the consistent PLS analysis of the model, the following R Square and R square adjusted reported are found in the next table.

Table 233: TAM UTUAT Combined Model R Square Values

	R Square	**R Square Adjusted**
IntentUse	0.396	0.392
PE	0.451	0.447
PU	0.827	0.826

The next table includes the f square values reported for this same model in Smart PLS.

Table 24: TAM UTAUT Combined Model F Square Values

	IntentUse	**PE**	**PU**	**PerfEx**	**SI**
IntentUse					
PE	0.176				
PU	0.134				
PerfEx		0.116	2.555		
SI		0.187	0.019		

In the next tables are reported latent variable correlations and covariances, which are the same.

Table 25: TAM UTAUT Combination Latent Variables Correlations and Covariances

	IntentUse	**PE**	**PU**	**PerfEx**	**SI**

IntentUse	1	0.561	0.539	0.423	0.525
PE	0.561	1	0.529	0.59	0.622
PU	0.539	0.529	1	0.907	0.62
PerfEx	0.423	0.59	0.907	1	0.634
SI	0.525	0.622	0.62	0.634	1

The next table presented for the combined model is the outer loadings, as indicated in the Treatment of the Data section, it was accepted if the amount was >0.60.

Table 26: TAM UTAUT Combined Model Outer Loadings

	IntentUse	**PE**	**PU**	**PerfEx**	**SI**
IU1_1	0.737				
IU2_1	0.79				
IU3_1	0.769				
PE1_1		0.677			
PE2_1		0.765			
PE3_1		0.724			
PU2_1			0.727		
PU3_1			0.738		
PU5_1			0.751		
PerfE1_1				0.752	
PerfE2_1				0.733	
PerfE3_1				0.675	

SI1_1	0.77
SI2_1	0.762
SI3_1	0.771
SI4_1	0.823

Finally, the outer weights are also reported; however, were not used in validation of the results due to the outer loadings achieving exploratory status.

Table 27: TAM UTAUT Combined Outer Weights

	IntentUse	**PE**	**PU**	**PerfEx**	**SI**
IU1_1	0.377				
IU2_1	0.404				
IU3_1	0.393				
PE1_1		0.379			
PE2_1		0.428			
PE3_1		0.405			
PU2_1			0.393		
PU3_1			0.399		
PU5_1			0.406		
PerfE1_1				0.422	
PerfE2_1				0.412	
PerfE3_1				0.379	
SI1_1					0.293

SI2_1	0.29
SI3_1	0.293
SI4_1	0.313

5.7 Conceptual Model Testing – HEDPERF/SERVQUAL

The first part of the testing was to determine which of the variables were consistent with models indicated in the SERVQUAL and HEdPERF models. A specific final indicator was not depicted by a single or set of questions asking for satisfaction in the university offerings. As a result, the successful intent to use was applied as the latent variable for these factors. It is assumed in these results that intent to use would indicate quality in the offerings of the university as applied to the technology. Additionally, it is expected that the performance expectancy and perceived usefulness would replace the variables of expected service and perceived service in the model, which would then influence intent to use.

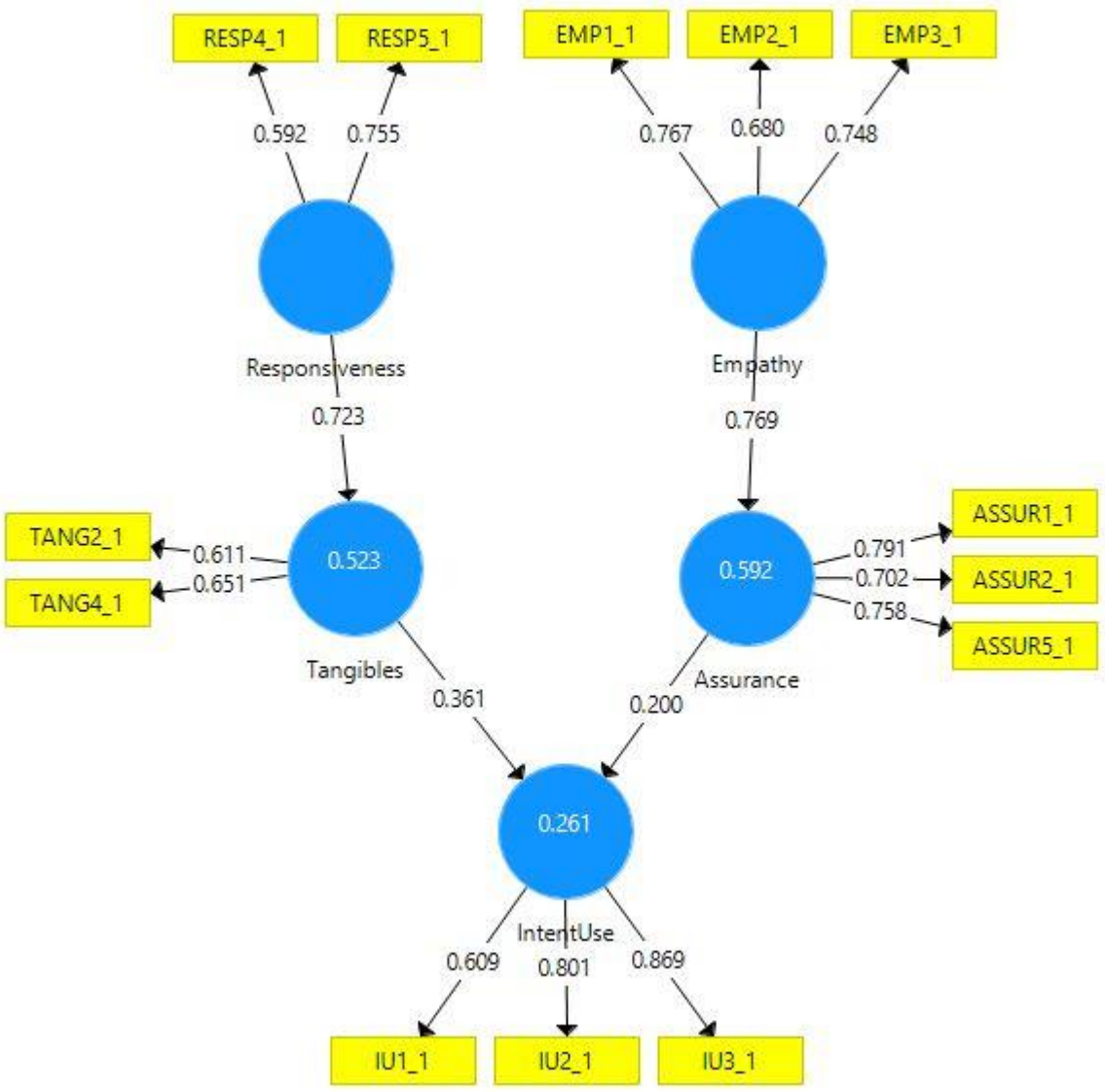
SERVQUAL was conducted as indicated in Smart PLS, with the following results. As with previous steps, all outer loadings below 0.5 were removed from the model. Further, it was required that reliability be removed to all lower outer loadings. Bootstrapping tests indicated that initial model could not produce sufficient connections and model fit was unsatisfactory. The final model selected performed well in SRMR, at 0.075, chi-square at 268.300, and NFI was only 0.837. Another problem area was that the results indicated a poor validity and reliability in tangibles and responsiveness; however, removal of only responsiveness resulted in improvement as SRMR 0.051, chi square 150.803, and NFI 0.884. Removal of both left only three variables, empathy, assurance, and intent to use, with SRMR of 0.052, chi-square 130.008, and NFI of 0.882. The model prior to removal of those two was selected for further analysis. The following validity and

reliability are reported, followed by the graph. As the goal of this area was to develop a combined model, no further information is reported on this model, but the combined model includes additional information.

Table 28: Construct Reliability and Validity SERVQUAL

	Cronbach's Alpha	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**
Assurance	0.795	0.797	0.795	0.564
Empathy	0.778	0.779	0.776	0.537
IntentUse	0.81	0.828	0.808	0.589
Responsiveness	0.618	0.642	0.627	0.46
Tangibles	0.569	0.571	0.57	0.399

Figure 12: SERVQUAL Final Model



The next test conducted was the HEdPERF model, as indicated in research. As per the previous examination, intent to use was applied as the quality detector. Procedures regarding outer loadings were as conducted in the prior tests, and Academic, Access and Program Issues were removed. There was no model that reached expectations for the model standards. However, the

primary expectation was that a combined model would be found for these two models as had previously been used in the TAM UTAUT testing.

The first test of the combined model was tested in SPSS AMOS. As part of the model testing, prior to the final model tests, the combination of HEdPERF and SERVQUAL were tested to determine if the results indicated a relationship between the two models in related to correlations between each of the latent variables. In the final model, as depicted in the following figure, it was found that the only latent variables that interacted at a significant level were tangibles, reliability, assurance, empathy, understanding, non-academic aspects, academic aspects, reputation, and program issues. A resulting regression table is found in Appendix F. Due to the missing questions needed to test the final results, the latent variables of SERVQUAL and HEdPERF could not be compared to quality scores of respondents. However, the ultimate test was the model's expected relationship to the TAM and UTAUT scores that would have an end result in influencing intent to use and use of the university online offerings.

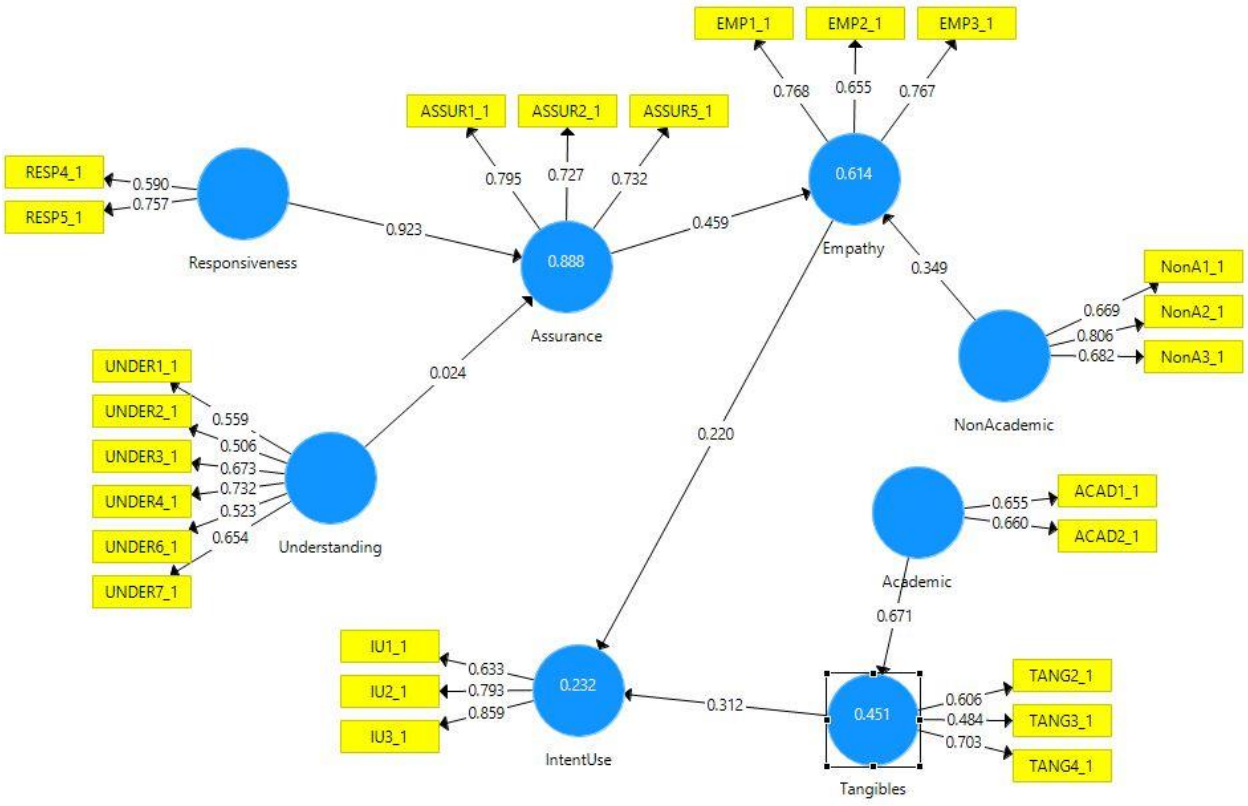
The second test was conducted in Smart PLS for relationships between the latent variables to indicate intent to use. Treatment to outer loadings was as previously conducted and the best model obtained resulted in an SRMR of 0.061, chi-square 675.203, and NFI of 0.806. This was only acceptable in the SRMR; however, issues remained in the reliability and validity of the construct. In Appendix E, the total effects are reported with sample mean, standard deviation, t-statistics, and p values. As part of the process, this was explored further in the next section; however, the table and graph are reported below.

Table 29: SERVQUAL HEDPERF Combined Construct Reliability and Validity

	Cronbach's Alpha	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**

Academic	0.604	0.604	0.604	0.432
Assurance	0.795	0.797	0.796	0.565
Empathy	0.778	0.78	0.775	0.536
IntentUse	0.81	0.824	0.809	0.589
NonAcademic	0.763	0.771	0.764	0.521
Responsiveness	0.618	0.643	0.628	0.461
Tangibles	0.625	0.645	0.628	0.365
Understanding	0.782	0.791	0.781	0.377

Figure 13: SERVQUAL HEdPERF Combined Model



For this combined model, bootstrapping was conducted as previously described and the following tables were gathered from Smart PLS. The path coefficients contain the mean, standard deviation, t statistics, and p values.

Table 30: HEdPerf and SERVQUAL Combined T Statistics and P Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Academic -> Tangibles	0.434	0.441	0.053	8.245	0
Assurance -> Empathy	0.384	0.381	0.08	4.785	0
Empathy -> IntentUse	0.233	0.235	0.059	3.934	0
NonAcademic -> Empathy	0.324	0.329	0.071	4.594	0
Responsiveness -> Assurance	0.462	0.46	0.056	8.31	0
Tangibles -> IntentUse	0.23	0.232	0.063	3.672	0
Understanding -> Assurance	0.36	0.364	0.056	6.404	0

Next the bootstrapping resulted in the following confidence intervals achieved for this combined model.

Table 31: HEdPERF and SERVQUAL Combined Model Confidence Intervals

	Original Sample (O)	Sample Mean (M)	2.50%	97.50%
Academic -> Tangibles	0.434	0.441	0.324	0.541
Assurance -> Empathy	0.384	0.381	0.219	0.531
Empathy -> IntentUse	0.233	0.235	0.123	0.356
NonAcademic -> Empathy	0.324	0.329	0.193	0.466
Responsiveness -> Assurance	0.462	0.46	0.354	0.567
Tangibles -> IntentUse	0.23	0.232	0.112	0.351
Understanding -> Assurance	0.36	0.364	0.253	0.471

R Square values for this model are located in the following table, followed by the f square values as reported from Smart PLS after the consistent PLS was run on the data.

Table 32: HEdPERF and SERVQUAL Combined Model R Square Results

	R Square	R Square Adjusted
Assurance	0.888	0.887
Empathy	0.614	0.611
IntentUse	0.232	0.227
Tangibles	0.451	0.449

Table 33: HEdPERF and SERVQUAL Combined Model F Square Results

	Academic	Assurance	Empathy	IntentUse	NonAcademic	Responsiveness	Tangibles	Understanding
Academic							0.821	

Assurance	0.124		
Empathy		0.038	
IntentUse			
NonAcademic	0.071		
Responsiveness	2.227		
Tangibles		0.077	
Understanding	0.001		

Correlations and covariance, having the same values, are also reported for this combined model and are located in the next table.

Table 34: HEdPERF and SERVQUAL Correlations and Covariances

	Academic	**Assurance**	**Empathy**	**IntentUse**	**NonAcademic**	**Responsiveness**	**Tangibles**	**Understanding**
Academic	1	0.671	0.65	0.32	0.713	0.744	0.671	0.783
Assurance	0.671	1	0.766	0.424	0.879	0.942	0.622	0.799
Empathy	0.65	0.766	1	0.415	0.752	0.753	0.626	0.654
IntentUse	0.32	0.424	0.415	1	0.375	0.31	0.45	0.394
NonAcademic	0.713	0.879	0.752	0.375	1	0.769	0.579	0.691
Responsiveness	0.744	0.942	0.753	0.31	0.769	1	0.694	0.841

Tangibles	0.671	0.622	0.626	0.45	0.579	0.694	1	0.637
Understanding	0.783	0.799	0.654	0.394	0.691	0.841	0.637	1

Outer loadings and outer weights are reported in the next tables. Due to the exploratory aspect of this study and the accepted outer loading values, steps were not taken as a result of any outer weight scores. In the case of the outer loadings, some questions performed below the expected 0.60 scoring; however, removing them caused even lower scoring in all other scores and each was maintained to keep the best scoring overall SRMR and NFI scores in the model. It is important to note that the primary goal of the combined models was to assess fit overall in the data and to explore how well the data worked in these models previously identified.

Table 35: HEdPERF and SERVQUAL Combined Model Outer Loadings

	Academic	**Assurance**	**Empathy**	**IntentUse**	**NonAcademic**	**Responsiveness**	**Tangibles**	**Understanding**
ACAD1_1	0.655							
ACAD2_1	0.66							
ASSUR1_1		0.795						
ASSUR2_1		0.727						
ASSUR5_1		0.732						
EMP1_1			0.768					
EMP2_1			0.655					
EMP3_1			0.767					
IU1_1				0.633				

IU2_1	0.793				
IU3_1	0.859				
NonA1_ 1		0.669			
NonA2_ 1		0.806			
NonA3_ 1		0.682			
RESP4_ 1			0.59		
RESP5_ 1			0.757		
TANG2 _1				0.606	
TANG3 _1				0.484	
TANG4 _1				0.703	
UNDER1_1					0.559
UNDER2_1					0.506
UNDER3_1					0.673
UNDER4_1					0.732
UNDER6_1					0.523
UNDER7_1					0.654

Table 36: HEdPERF and SERVQUAL Combined Model Outer Weights

	Academic	Assurance	Empathy	IntentUse	NonAcademic	Responsiveness	Tangibles	Understanding
ACAD1_1	0.589							
ACAD2_1	0.593							
ASSUR1_1		0.418						
ASSUR2_1		0.383						
ASSUR5_1		0.385						
EMP1_1			0.422					
EMP2_1			0.36					
EMP3_1			0.422					
IU1_1				0.325				
IU2_1				0.407				
IU3_1				0.441				
NonA1_1					0.376			
NonA2_1					0.453			
NonA3_1					0.384			
RESP4_1						0.514		
RESP5_1						0.659		

TANG2_1	0.444	
TANG3_1	0.355	
TANG4_1	0.515	
UNDER1_1		0.22
UNDER2_1		0.199
UNDER3_1		0.265
UNDER4_1		0.288
UNDER6_1		0.206
UNDER7_1		0.258

5.8 TechnoQual Model Testing and Design

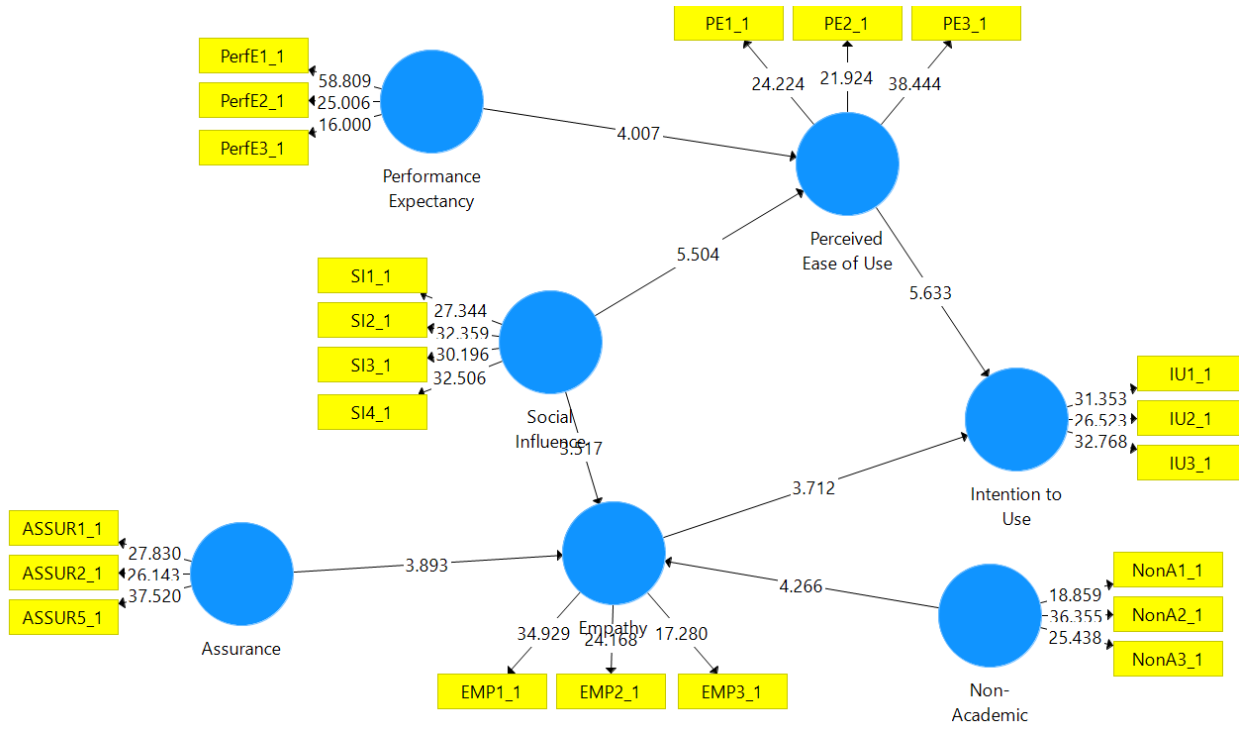
The final concept model design was aimed at determining if the quality models could be used to indicate responses in the TAM and UTAUT combined model. A secondary option was if the combined model could predict the outcomes of the quality model. Results of the quality model were found to have no significance in any relationship combination tested in SPSS AMOS. More than 20 different combinations were tested and found to either cause inconsistencies in the TAM/UTAUT model or to have no significant relationships at all. Tests were also conducted for inverse relationships, where latent variables in the TAM and UTAUT combined model would be correlated with the latent variables identified in the quality combined model. Results were found to be insignificant in a variety of tests. Some examples were that there was an expected direct relationship between social influence and assurance and empathy.

Following this, the model was run in Smart PLS, which is expected to handle larger numbers of latent variables with more success. Results were tested with findings that were indicated strongly in AMOS; however, the final model included only performance expectancy, perceived usefulness, social influences, empathy, assurance, non-academic aspects, and intent to use. The final model results included the SRMR of 0.048 and NFI of 0.845; however, a slight difference occurred between factor and path analysis, which was an NFI of 0.844. Additionally, composite reliability (CR) was analysed and found to be within the expectations of CR according to the literature, the range is found to be between 0.768 and 0.863. A final table of construct reliability and validity, along with the figure of the new model, are presented below.

Table 37: TechnoQual Model Construct Reliability and Validity

	Cronbach's Alpha	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**
Assurance	0.795	0.796	0.794	0.563
Empathy	0.778	0.783	0.777	0.539
Intention to Use	0.81	0.813	0.809	0.587
Non -Academic	0.763	0.768	0.764	0.52
Perceived Ease of Use	0.768	0.768	0.766	0.522
Performance Expectation	0.761	0.777	0.767	0.526
Social Influence	0.863	0.863	0.862	0.611

Figure 14: Final TechnoQual Model



Following the findings of the Smart PLS model, the model was tested again in SPSS AMOS. The model was found to have significance in the areas of RMSEA and CFI, Results from AMOS are in the following table, which includes all reported model fit items indicated in the results. A chi-square report from AMOS was 426.827, degrees of freedom = 196, and a probability level of .000. Additionally, the significance value for non-academic aspects and assurance did not have as strong results in AMOS as had been reported in the Smart PLS results. Additionally, the data was run through AMOS with the estimated means and intercepts to gather the GFI and AGFI results. These were not significant, due to needing to be equal or greater to 0.95 and 0.90, respectively. GFI was 0.892 and AGFI was 0.86.

Table 38: TechnoQual AMOS Reported Fit Indices

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	79	426.827	196	0	2.178
Saturated model	275	0	0		
Independence model	44	3453.245	231	0	14.949

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.876	0.854	0.929	0.916	0.928
Saturated model	1		1		1
Independence model	0	0	0	0	0

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	0.848	0.744	0.788
Saturated model	0	0	0
Independence model	1	0	0

NCP

Model	NCP	LO 90	HI 90
Default model	230.827	175.004	294.393
Saturated model	0	0	0
Independence model	3222.245	3035.78	3416.033

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	1.346	0.728	0.552	0.929
Saturated model	0	0	0	0
Independence model	10.894	10.165	9.577	10.776

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.061	0.053	0.069	0.012
Independence model	0.21	0.204	0.216	0

AIC

Model	AIC	BCC	BIC	CAIC
Default model	584.827	597.188		
Saturated model	550	593.027		

Independence model	3541.245	3548.13

ECVI

Model	**ECVI**	**LO 90**	**HI 90**	**MECVI**
Default model	1.845	1.669	2.045	1.884
Saturated model	1.735	1.735	1.735	1.871
Independence model	11.171	10.583	11.782	11.193

HOELTER

Model	**HOELTER 0.05**	**HOELTER 0.01**
Default model	171	182
Independence model	25	27

As had been reported with the combined models previously mentioned, the TechnoQual model was analysed in Smart PLS and the following are the tables of from both the Consistent PLS and the Bootstrapping. The first table is the t statistics and p values, where the Smart PLS reported the t statistics as significant.

Table 39: TechnoQual T Statistics and P Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Perceived Ease of Use -> Intention to Use	0.375	0.374	0.067	5.633	0
Social Influence -> Perceived Ease of Use	0.372	0.369	0.068	5.504	0
Assurance -> Empathy	0.331	0.338	0.085	3.893	0
Non-Academic -> Empathy	0.285	0.279	0.067	4.266	0
Performance Expectancy -> Perceived Ease of Use	0.265	0.27	0.066	4.007	0
Empathy -> Intention to Use	0.203	0.201	0.055	3.712	0
Social Influence -> Empathy	0.201	0.198	0.057	3.517	0

The next table demonstrates the confidence intervals found for this model.

Table 40: TechnoQual Model Confidence Intervals

	Original Sample (O)	Sample Mean (M)	2.50%	97.50%
Assurance -> Empathy	0.331	0.333	0.166	0.493
Empathy -> IntentUse	0.204	0.204	0.095	0.318
NonA -> Empathy	0.284	0.285	0.142	0.421
Perceived Ease -> IntentUse	0.374	0.371	0.245	0.500
Performance Expectancy -> Perceived Ease	0.265	0.270	0.148	0.396

Social -> Empathy	0.201	0.197	0.086	0.307
Social -> Perceived Ease	0.372	0.369	0.233	0.500

Next tables provided include the R Square and F Square tables. According to the r square values, Performance Expectancy and Social Influences explain 45.4% of Perceived ease of Use. Social Influences, Assurance and Non-Academic explain 65.2% of Empathy. Lastly, Perceived ease of Use and Empathy explain 35.1% of intent to use.

Table 41: TechnoQual Model R Square Values

	R Square	**R Square Adjusted**
Empathy	0.652	0.648
Intention to USE	0.351	0.347
Perceived Ease of Use	0.454	0.450

Table 42: TechnoQual Model F Square Values

	Assurance	**Empathy**	**IntentUse**	**NonAcademic**	**PercievedEase**
Assurance		0.100			
Empathy			0.054		
IntentUse					
NonAcademic		0.075			
PercievedEase			0.275		
PerformanceExpectancy					0.118
SocialInfluences		0.080			0.200

The next table for the TechnoQual model is the reporting of the covariances and correlations, which were found to be the same.

Table 43: TechnoQual Model Correlations and Covariances(PATH)

	Empathy	**IntentUSE**	**NonA**	**PercE**	**PerfEX**	**SocialInf**	**Assurance**
Empathy	1	0.415	0.751	0.44	0.493	0.553	0.772
IntentUSE	0.415	1	0.376	0.564	0.417	0.524	0.425
NonA	0.751	0.376	1	0.34	0.583	0.467	0.866
PercE	0.44	0.564	0.34	1	0.587	0.624	0.479
PerfEX	0.493	0.417	0.583	0.587	1	0.623	0.646
SocialInf	0.553	0.524	0.467	0.624	0.623	1	0.529
Assurance	0.772	0.425	0.866	0.479	0.646	0.529	1

Outer loadings and outer weights are also reported for this model. As this model was exploratory but expected to be the final model and most relevant in the study, loadings below 0.60 were removed.

Table 44: TechnoQual Model Outer Loadings

	Assurance	**Empathy**	**IntentUSE**	**NonA**	**PercE**	**PercU**	**PerfEX**	**SocialInf**
ASSUR1_1	0.766							
ASSUR2_1	0.637							
ASSUR5_1	0.835							
EMP1_1		0.836						
EMP2_1		0.67						

EMP3_1	0.686						
IU1_1		0.724					
IU2_1		0.782					
IU3_1		0.79					
NonA1_1			0.618				
NonA2_1			0.835				
NonA3_1			0.699				
PE1_1				0.686			
PE2_1				0.769			
PE3_1				0.709			
PerfE1_1					0.856		
PerfE2_1					0.664		
PerfE3_1					0.644		
SI1_1						0.809	
SI2_1						0.734	
SI3_1						0.801	
SI4_1						0.775	

As with previous models tested, outer weights were not used once loadings achieved the minimum 0.60.

Table 45: TechnoQual Model Outer Weights

	Assurance	**Empathy**	**IntentUSE**	**NonA**	**PercE**	**PerfEX**	**SocialInf**
ASSUR1_1	0.407						

ASSUR2_1	0.338						
ASSUR5_1	0.443						
EMP1_1		0.459					
EMP2_1		0.367					
EMP3_1		0.376					
IU1_1			0.37				
IU2_1			0.4				
IU3_1			0.404				
NonA1_1				0.348			
NonA2_1				0.47			
NonA3_1				0.394			
PE1_1					0.384		
PE2_1					0.43		
PE3_1					0.397		
PerfE1_1						0.478	
PerfE2_1						0.371	
PerfE3_1						0.359	
SI1_1							0.309
SI2_1							0.28
SI3_1							0.305
SI4_1							0.296

Finally, the TechnoQual model was the primary focus of the model evaluations and underwent a variety of different tests based on findings in the literature review, to report on various types of tests. As indicated by Ali, Li, and Cobanoglu (2016) Q^2 is a method of evaluating structural model predictivity expected to be moderate or better when reported above 0, and this is a blindfolding technique in Smart PLS (423). As demonstrated in the following table, the construct cross validated redundancy was not found for Empathy or Non-academic aspects. Medium predictability was found in all other variables. Higher predictability was found in the variables of performance expectancy and assurance. Although the model produced without Empathy and Non-academic aspects had failed to provide a viable model, it is expected that these two variables are not strongly indicating the results of the model.

Table 46: TechnoQual Blindfolding Results

	SSO	**SSE**	**Q^2 (=1-SSE/SSO)**
Assurance	954	713.232	
Empathy	954	674.719	0.293
IntentUSE	954	806.104	0.155
NonA	954	954	
PercE	954	767.266	0.196
PerfEX	954	954	
SI	1,272.00	1,272.00	

5.9 Hypotheses Tests

Following tests for the conceptual models, hypotheses were reviewed to conduct the testing. Hypotheses developed for this research were:

- Intention to Use will be related to the Performance Expectancy dimension.
- Intention to Use will be related to the Social Influences dimension.
- Intention to Use will related to Non Academic aspects dimension.
- Intention to Use will related to Perceived Ease of Use dimension.
- Intention to Use will related to Assurance dimension.
- Intention to Use will related to Empathy dimension.
- Demographic factors will moderate Intention to Use.

Perceptions of students were compared in a variety of ways, the final concept model indicated that the Intention to Use was found to be influenced in the areas of Assurance, Empathy, Perceived Ease of Use, Performance Expectancy, Social Influences, and Non-Academic aspects. These hypotheses are found to be accepted.

Demographic factors expected to moderate Intention to Use was unsuccessful as moderators in the model design. During a correlation test of the data, $p \leq 0.05$ only occur in a random number of areas that were not consistent or distinct enough for further evaluation. The table of cross tabulation results is in the appendix G section.

5.10 Summary

Results were gathered from more than 500 respondents, but trimmed due the lack of complete responses, of more than 25% of the survey, and as a result of inconsistency in missing responses in a set of data from one population. Data treatment of remaining missing responses was replaced by the mean. After a number of reliability, validity, and testing strategies on the data, the conceptual models from the literature were able to be verified as found to occur in the data. Following the test of current models, a test was conducted that concluded a final, though trimmed, concept model could be used to indicate a relationship between the various models as an overall

model for the results gathered. The figures presented demonstrated each model and regression weights and related results were reported. Finally, the hypotheses results indicated that six of the original hypotheses could be accepted as introduced. Further analysis and examination of the results occurs in the following chapter.

6. Conclusions and Discussion

Higher education classrooms can be supported by a variety of different technologies that increase the access of the college and classroom to students anywhere during the day or during travel. In the past decade, the number of people, globally, with internet access and smartphones has rapidly increased and this provides HEs with increased ability to reach students and increase convenience in meeting classroom requirements. However, perceptions of universities application of technology offerings and ability to reach the school or classroom through technology has not been widely studied in Europe. Researchers such as Mang and Wardley (2013) and Abbad and Jaber (2014) have explored perceptions of students based on use of different technology or access to the e-learning systems. Although many researchers in the past have introduced the risks of technology acceptance into the proposal to increase technology in areas such as work and school, the benefits have been found to be valuable to most students. Technology also has the potential of increasing competitiveness between HEs.

6.1 Discussion of the Findings

The primary purpose of this study was to examine the perceptions of online and mobile quality perceptions of students attending universities located in Turkey, where online and mobile educational services were available for students. Questionnaire results are expected to be gathered from 500 students after accounting for incomplete questionnaires. Private HEs in Turkey provide a variety of different offerings that are differentiated from state universities and these related offerings could provide valuable opportunities if implemented in offerings of government managed HEs. Valuable information was gathered from the respondents that provided insight into the perceptions of students; however, generally the population was satisfied with the quality of the offerings from their universities. As reported in the results section, moderating factors were not

able to provide overwhelming evidence of relationships between responses and those of demographic factors, such as age, gender, and education level.

A few areas of concern were indicated in higher selection of disagree in quality questions of 5, 8, 9, 10, 13, 24, 29, 34, 35, 43, 45, 51, 52, and 53. Some of these disagree results were in the areas of reverse coded questions, which indicates that respondents may have misunderstood the question or did not recognize the responses were expected to be in the negative. The areas of concern were noted as students did not agree that the university was providing information for career and job hunting, which should be addressed by improvements in either access or in information on how to access this area of the university website. Another area with a large percentage of disagree responses was the area of both knowledge and convenience in the use of the technology for reaching and working with the university staff. Universities using technology service options should consider training programs for staff members and creating easily accessible icons that allow the student to quickly select contact for different university support teams. As noted in a previous statement, the universities selected tended to have numerous responses of disagree regarding many of the services for both career and jobs outside of the university. Universities can improve upon offerings by providing videos with local employers discussing interview processes or job openings, links to websites with available job listings, and even providing updated short educational modules for managing job and career growth for students. These were the primary areas of concern regarding the overall responses of the students in the study.

This studied also aimed to explore a new model, TechnoQual, that could be used to verify student acceptance of the technology offerings, satisfaction resulting from the technology, and if this increased quality perceptions or use of the technology available. To examine the question,

literature was gathered in the areas identified, particularly in examination of the TAM and UTAUT models used to explore acceptance of technology. Additionally, literature was gathered in areas of SERVQUAL, HESQUAL, and HEdPERF, which were models developed to examine service quality and HE quality. Differences in how models are managed in the literature provided examples of for the various interpretations, which engaged the research in an exploratory manner to uncover relationships that can better help predict student acceptance of aspects of the university that would create perceptions of quality.

6.2 Concept Models Discussion

Challenges in the models were the different values placed on the various measurements, both statistical and reliability in the research. The most commonly reported item in SEM is the RMSEA and SRMR values (Kenny, 2015). However, in some research it is indicated that this is not a qualifying result measurement due to inherent flaws. A variety of different explorations of data occurred as part of the literature in the Methodology section, finding that various factors should be considered when both developing and accepting SEM results. Each of the models examined were able to provide future researchers with opportunities to examine how questionnaires can be reduced to predict and understand perceptions of students by fewer numbers of questions. Additionally, the model would provide an opportunity for universities to understand how different aspects of the offering is influencing the perceptions of the quality.

Results of the final concept model, as indicated in the Results chapter, combined the variables from the TAM, UTAUT, HEdPERF, and SERVQUAL. Previous literature in these areas indicated that relationships occur that can vary from impacting the ability of an individual to adapt to changes in technology, use offerings involving technology, and in the areas of service quality and performance of the higher education institutions being studied. Some of the research

specifically identified variables that were applied to this research and other studies were able to contribute specific questions that were used to identify the necessary variables in each of the models. However, the results of this study obtained unexpected results in the final model, as compared to the reported literature. Another concern was the lack of consistency in expected reporting of significance in SEM modelling methods or designs. As indicated in the methodology, SEM includes a variety of modelling types that examine, prepare, and use the data differently based on which method is preferred by the researcher (Cheung, 2014; Martin, 2011; Usakli and Kucukergin, 2018; Hwang, et al., 2010; Essounga-Njan, 2011; do Valle and Assaker, 2016; Olson, et al., 2013; Hair, Jr., et al., 2014). Researchers also report various different outcomes of the model testing for the reliability and validity of the model, ranging from GFI through RMSEA and SRMR. However, each of the different reporting possibilities have expected outcomes, as indicated in the results section that SRMR should be below 0.08. Good fit values were obtained for SRMR at 0.04. RMSEA at 0.061, CFI at 0.928, and lower than expectations for GFI at 0.892, AGFI at 0.86 and NFI at 0.881. It is important to note that the lower than expected values were either expected to exceed 0.9, and these numbers were fairly close to those expectations. It was intended that the model should demonstrate as many possible positive and good fit analysis in the final results, but it is not within the scope of this research to ensure that any specific report value is more likely true than another. Researchers may explore this long into the future prior to determining an exact model fit index that is most often accurate and complete.

The final model indicates that performance expectancy has a direct influence on perceived ease of use, and then on intent to use. Further, non-academic aspects influenced empathy, along with assurance and social influences. Empathy then acted on intent to use. Social influences also acted on perceived ease of use. This could indicate that if the responses from the university were

empathetic, including assurances, that the student's social influences were increased and perceptions of the ease of use were either increased or decreased. Additionally, the lack of model fit for other aspects of the different models indicated that further research should be conducted to ensure that meanings are translating well for English second language students and that the questions are not overly similar between different areas.

Similarly, and possibly as a result of, the ability to elect to use the service, social influences are directly impacted by voluntariness, indicating a less likely need for input based on requirement. Also, effort expectancy acted upon social influences, suggesting that possibly if the task is difficult than students could seek out confirmation of need to use from other sources. Finally, both perceived usefulness and social influences directly influenced intent to use and use of the university online service offerings. Overall, the final concept model was only successful when intent to use or use was acting upon the other values, but required the removal of a number of expected variables for the model. The removed latent variables were expected to be facilitating conditions, due to similarities in question content; however, these were not applicable overall. Further research could review a different relationship by testing the quality questions in those areas with small changes that best suited the external variables. Other research in this model should explore various ways to reduce the numerous questions associated with the model overall, in order to receive a higher response rate from participants.

Finally, as indicated previously, the challenge in SEM, both CB-SEM, as completed in AMOS, and PLS-SEM, as completed in Smart PLS, is reporting the various possible predictors of fitness, reliability, and validity, based on various types of research indicating a variety of different recommendations and requirements. For this particular model, the following table was developed for the overall statistics, as referred to in literature, and their expected values, along with accept or

reject model indicators. A total of 8 items are examined for the fitness, of these, four indicate the model should be accepted.

Table 47: TechnoQual Fitness Index Totals

Fitness Index	Obtained Value	Expected Value
SRMR	0.048	<0.08
NFI	0.845	≥0.90
Chi-Square P Value	0.00	>0.05
RMSEA	0.061	<0.08
GFI	0.892	≥0.90
AGFI	0.86	≥0.90
CFI	0.928	≥0.90
AVE	0.520 – 0.633	>.5

In the blindfolding test, there was indication that removal of additional latent variables would improve upon the model fitness indexes; however, removal generally did not improve upon the results and would have resulted in less than four potential variables in the model.

6.3 Hypotheses Evaluation

To guide the research, seven hypotheses were developed based on expectations of the literature review findings.

All of the hypotheses were examined for either acceptance or rejection, based on both initial data evaluation, correlations testing, and concept model testing. Hypotheses developed for this research are located in the following table, including the status of acceptance and related notes.

Table 48: Hypotheses Table

Hypothesis	Rejected or Accepted	Notes
Intention to Use will be related to the Performance Expectancy dimension.	Accepted.	
Intention to Use will be related to the Social Influences dimension	Accepted.	
Intention to Use will related to Non Academic aspects dimension.	Accepted.	
Intention to Use will related to Perceived Ease of Use dimension.	Accepted.	
Intention to Use will related to Assurance dimension	Accepted	
Intention to Use will related to Empathy dimension	Accepted	
Demographic factors will moderate intention to Use.	Refused.	

Perceptions of students were compared in a variety of ways, the final concept model indicated that the Intention to Use was found to be influenced in the areas of Assurance, Empathy, Perceived Ease of Use, Performance Expectancy, Social Influences, and Non-Academic aspects. These hypotheses are found to be accepted.

Demographic factors expected to moderate Intention to Use was unsuccessful as moderators in the model design. During a correlation test of the data, $p \leq 0.05$ only occur in a

random number of areas that were not consistent or distinct enough for further evaluation. The table of cross tabulation results is in the appendix G section.

This research examined the relationship of student perceptions in the condition of quality of available online services and student satisfaction. The examination of different dimensions and numerous variables indicated by previous researchers when exploring satisfaction in offerings resulted in a survey of more than 100 questions. One of the risks associated with the largeness of the survey was respondents failing to complete the entire survey, quitting partway through the questions. However, the largest number of failed responses were found in respondents answering only demographic questions and no other questions. This was large portion of the missing questions that resulted in removal of these questions from the study population. In some cases, a variety of different questions were skipped; however, they did not appear to create a large risk in the data analyzation and treatment of the data removed the general risk. A result of using a larger than 200 respondent population was the improved value in data processing that occurred

6.4 Comparisons of the Results and Literature

Literature findings included a variety of different types of theories that are utilized in studies examining the willingness or acceptance of technology in various settings. This research examined TAM and UTAUT, which are models that have been combined and utilized together in the past to examine the user perceived values and indicated variables as previously identified. Unlike the findings in research, such as Williams, et al, gender, age, and experience (education) were found to have limited correlations with the results gained from the respondents. However, voluntariness of use was found to be one of the outlying variables acting upon complete model.

The universities selected for this research currently utilize a variety of offerings, including mobile access to various service offerings, including courses, to the students. This supports the

views of the various types of availability and meets expectations of the globally growing technology use that includes online services such as e-commerce. Another important growth globally has been social media, giving students a wider reach of social influences to guide their decision-making processes. Interaction with technology is inevitable, but these services offerings are still limited to the private colleges in the study area selected. This study aims to demonstrate the importance of these offerings, as indicated by the overall satisfaction levels of the respondents.

Chatterjee, et al were the guiding literature sources for the examination of SERVQUAL; however, literature using their model, since 2009, has greatly varied on the importance of various variables the researchers had assigned. This research indicated that the results for the perfection of a SERVQUAL model could be strongly dependent on the initial factor of intent to use, as opposed to evaluation of the other elements. However, it is critical to note that these elements are similar between all the models and it could be that overall this is all a single model that could be combined and utilized. Specifically, this resulting conclusion is based on the ability to have achieved other models during the study. In the Results section, both TAM and UTAUT were combined. Later, the SERVQUAL and HEdPERF were combined. In both cases, the models were found to have acceptable values that could support that these models were valid and reliable, or strongly correlated between each other.

6.5 Recommendations for HEs

Recommendation for HEs is to evaluate students based on their interests in the university offerings; however, some areas of the questionnaire are redundant to information already gathered by the university. There are three examples of areas that may excluded based on their lack of clear correlation in the data collected, these are age, gender, and type of technology used to access the university. Further, some areas of the TAM, UTAUT, and quality models were generally found to

have a poor fit with the rest of the model. Universities often acquire types of access by students from their login, which can be tabulated for exploration. Further, universities typically have age and gender information available as part of the enrolment data. A critical area that had correlations was year of education; however, generally it may not moderate anything more than experience with the offering from that university. The proposed survey for use of evaluating the service quality of online offerings for students is available in Appendix G and is based on the significance findings in the results for the models and other recommendations.

Finally, HEs can provide services that fit the needs of students by gathering information from students. Some examples would be to conduct entrance surveys to gather knowledge regarding use of technology or confidence with using technology. Other types of surveys could be conducted during the year, such as short surveys with interesting and exciting names: "How often do you put down your phone?" The survey could contain ten short questions about smartphone use and tendency to use it over other types of communication, such as talking on the phone or face-to-face interactions. Limiting the knowledge of the university prevents the ability to grow with society and meet student expectations. Competitiveness in education has increased rapidly and is expected to continue to grow, managing students' needs will provide a university with a differentiation approach that will promote continued growth and relevance.

6.6 Future Research

Researchers have worked for many decades to develop quality models that fit any type of situation and are interchangeable to different industries or needs. The TAM and UTAUT models were theoretical areas that were expected to remain confident at providing value. These models were also well interconnected when tested in this research, as indicated by the combined model in the Results chapter. However, generally models are found to be inconsistent or take more

researchers to examine the model and build upon it to create a model that is most effective in predicting and understanding respondents, consumers, and customers. In the future, areas of focus should begin by examining how these various models are similar, particularly based on the items used in the surveys, and design a single questionnaire that is both short and efficient for use. Large questionnaires are a problem in both acquiring enough respondents to report valid results and in processing data due to numbers of possible variables. Further, larger models tend to have several risks to both reliability and validity and few researchers agree on which tests are most accurate.

As a result of the size of the questionnaire and models, it was found that every possible combination or explanation for the model findings could not be explored. In the future, research should include developing correlations between expectations of the technology and quality models. Development in these areas will contribute to knowledge that HEs can gather regarding application of new technology, value of different services, and how the communities they serve are best suited to the various applications available. One example is the introduction of mobile educational services, which would not be valuable to a population that is currently not using smartphones. Currently, smartphones are critical part of most communities, increasing the value and knowledge of their use. Additionally, further research should be conducted to validate if the expectations of the models result in a final question of "Are you satisfied with your university". This would provide improved confirmation for the models.

Finally, future research should examine if technology experience and preferences are different between different disciplines and majors in university students. Examples would include if students in technology courses, such as programming or communication tend to respond more positively to the technology service offerings of the university, as opposed to those in areas of language and history, or in the case of international studies. Differences in perceptions may occur

as a result of background in specific areas, such as pervious use of technology or in the case of preferences for technology.

6.7 Conclusion

The survey results were balanced in the area of gender; however, generally it is expected that the largest population of respondents would be female, as opposed to that of male. An interesting finding from the results were that a larger percentage of the respondents had more than four years of college, and this was expected to have an influence on the results. Respondents from the survey generally selected "Agree" as the primary selection; however, there were some respondents who did not agree or selected neither. In the case of Likert questions, respondents may generally select more positive answers; however, in this survey, this also occurred with the questions that were worded negatively. Research for SERVQUAL, HESQUAL, and HEdPERF, indicated that dimensions may include tangibles, reliability, responsiveness, assurance, empathy, non-academic aspects, academic aspects, reputation, access, accessibility, program issues, study programs, and understanding, which are expected to influence the perceptions of quality and satisfaction of individuals. A final concept model was presented in the Results chapter and demonstrates how these variables are acted upon by the TAM/UTAUT model.

This study aimed to build upon the ability to understand how students perceived the service quality of the university online offerings. It was expected that the students would generally report satisfaction with the university, and it was hoped that the models developed would provide further insight. Of the insights gathered from the models, one of the most critical areas of value was the relationship of intent to use and use on the different perception variables of the quality models. This indicates that these models are directly influencing each other and acting on the ability of

students to intend to use the service offering, and this would likely decrease the perceptions of quality.

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Appendix A: HEDPERF Scale Items

Table 49: HEdPERF Scale

Dimension	Question
Academic Aspects	1. The teaching staff is knowledgeable for answering my questions regarding course syllabi. 2. The teaching staff assists me in a careful and polite manner 3. The teaching staff is never too busy to refuse my requests for assistance 4. When I have a problem, the teaching staff is sincerely interested in solving it 5. The teaching staff has a positive attitude toward students 6. The teaching staff communicates well in the classroom 7. The teaching staff provides feedback on my progress 8. The time available for consulting the teaching staff is sufficient and convenient 9. The teaching staff is highly qualified and experienced in its respective field of knowledge

Non-Academic Aspects	10. When I have a problem, the institution's clerical staff is sincerely interested in solving it 11. The institution's clerical staff provides individual attention 12. Questions and complaints are dealt with quickly and effectively 13. The clerical staff is never too busy to take my requests for assistance 14. The clerical staff keeps accurate records that can be referred to 15. When the clerical staff promises to do something within a certain time, they do it 16. The working hours of administrative services are convenient 17. The clerical staff has a positive attitude toward their work and the students 18. The clerical staff communicates well with the students 19. The clerical staff is knowledgeable of its systems and/or procedures 20. I feel secure in my relationships with this institution 21. The institution provides services within the expected deadlines.

Reputation	22. The institution has a professional appearance and/or image
	23. The student housing facilities and equipment provided by the institution are adequate and necessary
	24. The academic facilities are adequate and necessary
	25. The institution executes programs of excellent quality
	26. The recreational facilities are adequate and necessary
	27. The sizes of groups allow personal classroom assistance
	28. The institution location is ideal, and the layout and appearance of campuses are excellent
	29. The institution provides highly respectable programs
	30. The institution's graduate students are easily employable
Access	31. The students are treated equally and respectfully by the institution
	32. The students are free to express their opinions
	33. The clerical staff respects the confidentiality of information I disclose to them
	34. It is easy to contact the clerical staff by telephone
	35. The institution fosters and promotes the creation of student organizations
	36. The institution appreciates feedback from students to improve the delivery of services
	37. The institution has a standardized and simple procedure for providing services

Program Issues and Understanding	38. The institution provides a wide range of programs with several specialties 39. The institution provides an excellent counselling service 40. The health care services provided by the institution are adequate and necessary

(Retrieved from Silva, et al., 2016, 424)

Appendix B: Questionnaire

Demographic Questions

1. Please select your age
2. Please select your gender:
3. Please select your education:
4. Please select all of the following that you use to access your university
    i. At the campus
    ii. Online on computer
    iii. On a laptop
    iv. Smartphone
    v. Tablet

Responsiveness

1. The university library has a large selection of materials for the classes.
2. University staff take a long time to respond to emails and form requests from the website.
3. It is difficult to use to the university website to reach a staff member when I need help.
4. I can quickly receive technical help from the university technical staff.
5. When I contact staff members through the university communication systems (forms, email, mobile) I am always greeted with friendly responses.

Reliability

1. The university website is available when I need to access it.

2. The university mobile website is functional for my needs when I am away from my computer or laptop.
3. I cannot find things I need in the university website.
4. It can take a long time for university webpages and applications to load.
5. At times that I need to access the university through the computer it is unavailable.

Tangibles

1. My university provides access to the administrative functions for personal program, including areas of personal information, billing, and loan information
2. The university includes a variety of online access to staff and technology assistance through their website.
3. Our university has website that appears professional.
4. I can use my university website to accomplish things I would usually have to do in person or on the phone.
5. The university website does not function as well as other websites I like to use.

Access/Accessibility

1. The access to the university services provides information that I need for attending the university.
2. The university website does not share enough of the guidelines and information about the university.
3. Some of the information on the website is not available to be used.
4. The library cannot be accessed at all times.
5. The university website makes it easy to access my coursework and classroom materials.

6. There are times when the university website does not have access to support or instructors and causes me to have problems.

Reputation

1. The university has a reputation for excellent online services.
2. Overall, I believe my university could improve on the offering of online services
3. The introduction and explanation of the use of the online services is adequate and necessary for my university experience.
4. The university online services are easy to access.
5. The university online services are reliable.
6. The university services are easy to locate on the website.

Assurance

1. The university administrative staff is knowledgeable about their area of expertise.
2. The university technical staff is knowledgeable in their area of expertise.
3. The university instructors are knowledgeable in their area of expertise.
4. The communications provided by the university staff members are courteous and consistent.
5. The communication from the technical staff is always courteous and consistent.

Understanding

1. The university website supports my emotional stability for my educational experience.
2. The university administrative online services support my emotional stability for my educational experience.
3. I have increased self-confidence in my coursework as a result of my access to course materials on the university website.

4. My development in managing technology to accomplish my goals has been aided by the university's administrative online services.
5. The university administrative online services have many tips for improving critical thinking skills that apply to my courses.
6. The university administrative online services have many tips to help with problem solving in my courses or in managing my courses.
7. Access to the administrative online services increases my knowledge of the university's commitment to my education and development of skills.

Empathy

1. Administrative staff members are willing to help students.
2. The administrative staff members have the ability to help students solve problems
3. The administrative staff members help to build confidence in using the online systems at the university.
4. Some of the staff at the university discourages use of the online systems, such as the website.
5. The instructors at the university are interested in helping students become more proficient at using the online functions for the courses.

Program Issues/Study Program

1. The website provides clear information about the content of my courses.
2. The website provides convenient access to my course materials.
3. The website fits the needs of my individual program at the university.
4. There are times when the website does not provide me with enough information for my daily course needs.

5. There are excellent resources in the university website for career planning.
6. There are excellent resources in the university website for planning to get a job.
7. The university website provides resources for aspects of my university life, such as health, that are not directly related to my education.

Academic Aspects

1. I am able to receive feedback regarding my academic performance using the online services of my university.
2. The university provides opportunities to use the online services for participation in the learning process of my class.
3. The staff communicates using the technology and has a positive attitude towards the technology.
4. The staff is knowledgeable about the use of the available technology.
5. I receive sufficient and convenient support from the staff regarding the use of the university technology.

Non-Academic

1. I feel secure in my relationships with the university.
2. Administrative staff can help me use the online services to learn about the policies and procedures of the college.
3. The online access to the website improves my knowledge of the college and administrative processes.
4. The online access at my university provides me with information on my career and job hunting.

5. The career opportunities of my university, available in online services, are catered to my individual needs.

Perceived Ease of Use

1. I have control over the use of the university's administrative online services.
2. I have the knowledge to use the university's administrative online services.
3. I have the resources to use the university's administrative online services.
4. I have the ability to use the university's administrative online services

Social Influence

1. People who influence my behaviour think I should use the university's administrative online services.
2. People who are important to me think I should use the university's administrative online services.
3. My peers think I should use the university's online administrative online services.
4. People whose opinions I value prefer that I use the university's administrative online services.

Facilitating Conditions

1. Please select all the following items that you have access to at your university.
    vi. Management of enrolment at the university
    vii. Manage financial information such as paying for courses
    viii. Schedule of exams
    ix. Details of degree program of enrolment
    x. Personal information including contact information
    xi. Order Transcripts

xii. Obtain documentation to prove enrolment in the university

xiii. Requests to change instructors or courses

xiv. Access to online library

xv. Apply for university housing

2. Does your university offer courses online for access when away from the campus?
3. Do you have access to your coursework when you are away from campus?
4. Does your college provide the ability to access library databases from a computer?
5. Are you able to access instructor lectures and notes using mobile devices, such as tablets and smartphones?
6. Are you able to submit classwork using a computer?
7. Are you able to submit classwork using mobile devices, such as tablets and smartphones?
8. Can you communicate with classmates using a computer through your university platform?
9. Can you communicate with classmates using mobile devices, such as tablets and smartphones, in the university platform?

Performance Expectancy

1. The technology offering from my university enables me to accomplish more tasks quickly.
2. The technology offering from my university has improved the quality of my experience at the university.
3. The technology offering from my university makes it easier to communicate with administrative services, such as school counsellors and financial aid.

Perceived Usefulness

1. The technology offering from my university improves on my productivity.
2. The technology offering from my university increases my control over my courses.
3. The technology offering from my university improves on my ability to work in teams.
4. The technology offering from my university improves on my ability to contact my instructor.
5. The technology offering from my university increases the effectiveness of completion of courses.

Effort Expectancy

1. My interactions with the university's technology offerings has been clear and understandable.
2. Overall, the university's technology platforms are easy to use.
3. Learning to use the university technology options were easy for me.
4. I rarely become confused when I am using the university's platform for course access.
5. I rarely become confused when I am using the university's mobile platform for course access.
6. I rarely make errors when using the university's platform for courses.
7. I rarely make errors when using the university's mobile platforms.
8. I rarely become confused when using the university's online library databases.
9. I rarely become frustrated when using various technologies from the university.
10. I am able to confidently use the university's administrative online services.

Intention to Use

1. I intend to use the university's online accessibility to complete my degree program.

2. I intend to use the university's online administrative services for accessing my account or reviewing my individualized information.
3. I intend to frequently use the university's online accessibility to complete my degree program.

Appendix C: Frequency Charts

Table 50: Frequency Chart and Missing

Question	N	Missing	*M*	SD	Kurt.	N	Missing	*M*	Kurt
Please select your age:	318	0	1.9182	1.34314	.185				
Please select your gender:	318	0	1.5503	.53489	-1.189				
Please select your education:	318	0	3.2264	1.57634	-1.472				
Does your university offer courses online for access when away from the campus?	317	1	1.9716	.47980	1.373	318	0	1.9716	1.387
Do you have access to your coursework when you are away from campus?	316	2	1.3639	.65015	1.100	318	0	1.3639	1.126
Does your college provide the ability to access library databases from a computer?	316	2	1.3259	.67947	1.629	318	0	1.3259	1.659

Are you able to access instructor lectures and notes using mobile devices, such as tablets and smartphones?	317	1	1.4984	.76151	-.336	318	0	1.4984	-.327
Are you able to submit classwork using a computer?	316	2	1.1266	.39415	10.569	318	0	1.1266	10.654
Are you able to submit classwork using mobile devices, such as tablets and smartphones?	317	1	1.8139	.79559	-1.340	318	0	1.8139	-1.335
Can you communicate with classmates using a computer through your university platform?	317	1	2.0126	.71146	-1.015	318	0	2.0126	-1.009
Can you communicate with classmates using mobile devices, such as tablets and smartphones, in	318	0	1.7925	.83742	-1.457	318	0	1.7925	-1.457

the university platform?									
The technology offering from my university enables me to accomplish more tasks quickly.	317	1	2.0063	.74627	2.877	318	0	2.0063	2.895
The technology offering from my university has improved the quality of my experience at the university.	316	2	2.1361	.82645	1.417	318	0	2.1361	1.445
The technology offering from my university makes it easier to communicate with administrative services, such as school counselors and financial aid.	317	1	2.2681	.92471	.105	318	0	2.2681	.115
The technology offering from my	316	2	2.4272	.94504	.370	318	0	2.4272	.391

university improves on my productivity.									
The technology offering from my university increases my control over my courses.	314	4	2.0796	.73916	2.862	318	0	2.0796	2.937
The technology offering from my university improves on my ability to work in teams.	315	3	2.4000	1.00254	-.185	318	0	2.4000	-.158
The technology offering from my university improves on my ability to contact my instructor.	316	2	2.0570	.77863	3.295	318	0	2.0570	3.335
The technology offering from my university increases the effectiveness of completion of courses.	315	3	2.0921	.79875	1.929	318	0	2.0921	1.976

My interactions with the university's technology offerings has been clear and understandable.	316	2	2.6234	.89120	-.449	318	0	2.6234	-.433
Overall, the university's technology platforms are easy to use.	316	2	2.2943	.87945	.476	318	0	2.2943	.498
Learning to use the university technology options were easy for me.	316	2	2.2785	.88997	1.252	318	0	2.2785	1.279
I rarely become confused when I am using the university's platform for course access.	316	2	2.5000	.89974	-.048	318	0	2.5000	-.029
I rarely become confused when I am using the university's mobile platform for course access	316	2	2.9146	1.05212	-.829	318	0	2.9146	-.815

I rarely make errors when using the university's platform for courses.	315	3	2.6032	.98297	-.326	318	0	2.6032	-.300
I rarely make errors when using the university's mobile platforms.	315	3	3.0540	1.04984	-.791	318	0	3.0540	-.770
I rarely become confused when using the university's online library databases.	316	2	2.5728	.92466	-.230	318	0	2.5728	-.213
I rarely become frustrated when using various technologies from the university.	315	3	2.6032	.89478	-.212	318	0	2.6032	-.185
I am able to confidently use the university's administrative online services	315	3	2.5333	.86031	.237	318	0	2.5333	.268
I have the knowledge to use the university's	317	1	2.3659	.83733	1.060	318	0	2.3659	1.072

administrative online services									
I have the resources to use the university's administrative online services	316	2	2.2880	.76177	2.080	318	0	2.2880	2.112
I have the ability to use the university's administrative online services	315	3	2.3587	.79502	1.876	318	0	2.3587	1.922
I have control over the use of the university's administrative online services	316	2	2.6962	.84485	-.101	318	0	2.6962	-.082
People who influence my behavior think I should use the university's administrative online services.	316	2	2.1392	.88349	2.622	318	0	2.1392	2.657
People who are important to me think I should use the university's	317	1	1.9779	.90855	2.136	318	0	1.9779	2.152

administrative online services									
My peers think I should use the university's online administrative online services.	317	1	2.1136	1.00931	.177	318	0	2.1136	.187
People whose opinions I value prefer that I use the university's administrative online services	313	5	1.9904	.92849	1.525	318	0	1.9904	1.597
Although it is helpful, the university does not require that we use the administrative online services	316	2	3.4873	1.09392	-.670	318	0	3.4873	-.655
Although it is helpful, the university does not require the use of the university's online administrative	314	4	3.5796	1.06124	-.335	318	0	3.5796	-.301

services for accessing my account or reviewing my individualized information.									
I have used the university's online accessibility to complete my degree program.	315	3	2.3016	.83007	1.663	318	0	2.3016	1.707
I have used the university's online administrative services for accessing my account or reviewing my individualized information.	314	4	2.0096	.74767	2.857	318	0	2.0096	2.931
I intend to use the university's online accessibility to complete my degree program.	313	5	2.1182	.79386	2.441	318	0	2.1182	2.527

I intend to use the university's online administrative services for accessing my account or reviewing my individualized information.	316	2	2.0000	.78072	1.779	318	0	2.0000	1.809
I intend to frequently use the university's online accessibility to complete my degree program.	316	2	2.1139	.86171	2.062	318	0	2.1139	2.094
My university provides access to the administrative functions for personal program, including areas of personal information, billing, and loan information	312	6	2.0994	.64134	4.261	318	0	2.0994	4.400

The university includes a variety of online access to staff and technology assistance through their website.	313	5	2.3482	.87164	.317	318	0	2.3482	.371
Our university has website that appears professional.	313	5	2.6006	.90419	-.311	318	0	2.6006	-.268
I can use my university website to accomplish things I would usually have to do in person or on the phone.	312	6	2.2468	.83338	1.370	318	0	2.2468	1.454
The university website does not function as well as other websites I like to use.	312	6	3.1506	1.05769	-1.210	318	0	3.1506	-1.175
The university website is available when I need to access it.	310	8	2.1258	.62859	5.757	318	0	2.1258	5.981

The university mobile website is functional for my needs when I am away from my computer or laptop.	310	8	2.6323	1.03667	-.461	318	0	2.6323	-.395
I cannot find things I need in the university website.	312	6	3.6378	.92843	.256	318	0	3.6378	.319
It can take a long time for university webpages and applications to load.	313	5	3.7380	.88889	.535	318	0	3.7380	.592
At times that I need to access the university through the computer it is unavailable.	312	6	3.7756	.83396	.992	318	0	3.7756	1.069
The university library has a large selection of materials for the classes.	312	6	2.9776	1.08014	-1.224	318	0	2.9776	-1.189
University staff take a long time to respond to emails	311	7	2.9260	1.10905	-1.245	318	0	2.9260	-1.205

and form requests from the website.									
It is difficult to use to the university website to reach a staff member when I need help.	311	7	3.4116	1.03381	-.752	318	0	3.4116	-.701
I can quickly receive technical help from the university technical staff.	311	7	2.5820	.95319	-.160	318	0	2.5820	-.096
When I contact staff members through the university communication systems (forms, email, mobile) I am always greeted with friendly responses.	313	5	2.1629	.75254	3.247	318	0	2.1629	3.346
The university administrative staff is knowledgeable	309	9	2.2265	.71201	4.819	318	0	2.2265	5.045

about their area of expertise.									
The university technical staff is knowledgeable in their area of expertise.	310	8	2.1516	.81625	2.665	318	0	2.1516	2.810
The university instructors are knowledgeable in their area of expertise.	311	7	2.6109	1.02850	-.845	318	0	2.6109	-.796
The communications provided by the university staff members are courteous and consistent.	312	6	2.5353	.96500	-.409	318	0	2.5353	-.359
The communication from the technical staff is always courteous and consistent.	311	7	2.1158	.69522	3.076	318	0	2.1158	3.212
Administrative staff members are	310	8	2.1258	.69229	5.202	318	0	2.1258	5.412

willing to help students.									
The administrative staff members have the ability to help students solve problems	312	6	2.1506	.76061	3.782	318	0	2.1506	3.912
The administrative staff members help to build confidence in using the online systems at the university.	310	8	2.1710	.75027	2.870	318	0	2.1710	3.021
Some of the staff at the university discourages use of the online systems, such as the website.	311	7	3.3312	1.08789	-.648	318	0	3.3312	-.595
The instructors at the university are interested in helping students become more proficient at using the online functions for the courses.	311	7	2.9646	1.06652	-1.096	318	0	2.9646	-1.053

I feel secure in my relationships with the university.	311	7	2.2540	.75120	3.496	318	0	2.2540	3.641
Administrative staff can help me use the online services to learn about the policies and procedures of the college.	309	9	2.2201	.77509	2.740	318	0	2.2201	2.906
The online access to the website improves my knowledge of the college and administrative processes.	311	7	2.1672	.70780	2.994	318	0	2.1672	3.128
The online access at my university provides me with information on my career and job hunting.	311	7	3.2669	1.09963	-.779	318	0	3.2669	-.728
The career opportunities of my university, available in online services, are	310	8	3.2839	1.03814	-.611	318	0	3.2839	-.549

catered to my individual needs.									
I am able to receive feedback regarding my academic performance using the online services of my university.	310	8	2.3419	.81997	1.480	318	0	2.3419	1.595
The university provides opportunities to use the online services for participation in the learning process of my class.	314	4	2.3185	.78759	1.673	318	0	2.3185	1.733
The staff communicates using the technology and has a positive attitude towards the technology.	311	7	2.9743	1.03143	-1.155	318	0	2.9743	-1.113
The staff is knowledgeable about the use of the	313	5	3.4026	1.07010	-.920	318	0	3.4026	-.887

available technology.									
I receive sufficient and convenient support from the staff regarding the use of the university technology.	311	7	3.7042	.96518	.164	318	0	3.7042	.236
The university has a reputation for excellent online services.	309	9	2.5922	.85017	.123	318	0	2.5922	.214
Overall, I believe my university could improve on the offering of online services	310	8	1.7968	.67358	4.938	318	0	1.7968	5.141
The introduction and explanation of the use of the online services is adequate and necessary for my university experience.	313	5	1.9297	.63158	3.866	318	0	1.9297	3.975

The university online services are easy to access.	314	4	2.4841	.85427	.634	318	0	2.4841	.680
The university online services are reliable.	315	3	2.1365	.63630	6.642	318	0	2.1365	6.732
The university services are easy to locate on the website.	311	7	2.3730	.78849	.708	318	0	2.3730	.791
The access to the university services provides information that I need for attending the university.	313	5	2.1757	.72796	4.501	318	0	2.1757	4.620
The university website does not share enough of the guidelines and information about the university.	313	5	3.0703	1.08966	-1.241	318	0	3.0703	-1.213
Some of the information on the website is not available to be used.	312	6	2.2885	1.16492	-.143	318	0	2.2885	-.088

The library cannot be accessed at all times.	313	5	3.7157	.98660	.499	318	0	3.7157	.555
The university website makes it easy to access my coursework and classroom materials.	312	6	2.2019	.71340	4.445	318	0	2.2019	4.587
There are times when the university website does not have access to support or instructors and causes me to have problems.	315	3	2.6000	.98006	-.399	318	0	2.6000	-.374
The website provides clear information about the content of my courses.	313	5	2.4345	.88598	.062	318	0	2.4345	.111
The website provides convenient access to my course materials.	314	4	2.9204	1.08579	-1.162	318	0	2.9204	-1.139

The website fits the needs of my individual program at the university.	314	4	2.3981	.81762	1.131	318	0	2.3981	1.184
There are times when the website does not provide me with enough information for my daily course needs.	313	5	3.0831	1.06494	-1.073	318	0	3.0831	-1.042
There are excellent resources in the university website for career planning.	314	4	3.4204	1.02448	-.534	318	0	3.4204	-.502
There are excellent resources in the university website for planning to get a job.	312	6	3.6058	.96650	-.221	318	0	3.6058	-.167
The university website provides resources for aspects of my university life, such as health, that are not directly	312	6	2.6667	.97118	-.433	318	0	2.6667	-.384

related to my education.									
The university website supports my emotional stability for my educational experience.	312	6	2.7628	.94622	-.459	318	0	2.7628	-.410
The university administrative online services support my emotional stability for my educational experience.	314	4	2.8471	.93334	-.457	318	0	2.8471	-.424
I have increased self-confidence in my coursework as a result of my access to course materials on the university website.	312	6	2.3429	.78225	1.498	318	0	2.3429	1.584
My development in managing technology to accomplish my	309	9	2.2460	.71466	2.563	318	0	2.2460	2.724

goals has been aided by the university's administrative online services.									
The university administrative online services have many tips for improving critical thinking skills that apply to my courses.	311	7	3.0450	1.00862	-.655	318	0	3.0450	-.601
The university administrative online services have many tips to help with problem solving in my courses or in managing my courses.	313	5	2.4920	.96115	.463	318	0	2.4920	.518
Access to the administrative online services increases my knowledge of the university's	314	4	1.9459	.88307	1.351	318	0	1.9459	1.406

commitment to my education and development of skills.

Appendix D: Total Effects for TAM UTAUT Combined Model

Table 51: Total Effects for TAMUTAUT Combined Model

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Academic -> IntentUse	0.1	0.102	0.029	3.465	0.001
Academic -> Tangibles	0.434	0.437	0.053	8.219	0
Assurance -> Empathy	0.384	0.387	0.081	4.726	0
Assurance -> IntentUse	0.09	0.092	0.033	2.679	0.008
Empathy -> IntentUse	0.233	0.235	0.058	3.997	0
NonAcademic -> Empathy	0.324	0.325	0.073	4.415	0
NonAcademic -> IntentUse	0.076	0.076	0.025	3.031	0.002
Responsiveness -> Assurance	0.462	0.463	0.052	8.96	0
Responsiveness -> Empathy	0.177	0.18	0.045	3.9	0
Responsiveness -> IntentUse	0.041	0.043	0.017	2.471	0.014
Tangibles -> IntentUse	0.23	0.233	0.06	3.854	0
Understanding -> Assurance	0.36	0.361	0.054	6.605	0
Understanding -> Empathy	0.138	0.14	0.038	3.677	0
Understanding -> IntentUse	0.032	0.034	0.014	2.331	0.02

Appendix E: Total Effects for HEdPERF and SERVQUAL Combined

Table 52: Total Effects for HEdPerf and SERVQUAL Combined

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Academic -> IntentUse	0.1	0.102	0.029	3.465	0.001
Academic -> Tangibles	0.434	0.437	0.053	8.219	0
Assurance -> Empathy	0.384	0.387	0.081	4.726	0
Assurance -> IntentUse	0.09	0.092	0.033	2.679	0.008
Empathy -> IntentUse	0.233	0.235	0.058	3.997	0
NonAcademic -> Empathy	0.324	0.325	0.073	4.415	0
NonAcademic -> IntentUse	0.076	0.076	0.025	3.031	0.002
Responsiveness -> Assurance	0.462	0.463	0.052	8.96	0
Responsiveness -> Empathy	0.177	0.18	0.045	3.9	0

Responsiveness -> IntentUse	0.041	0.043	0.017	2.471	0.014
Tangibles -> IntentUse	0.23	0.233	0.06	3.854	0
Understanding -> Assurance	0.36	0.361	0.054	6.605	0
Understanding -> Empathy	0.138	0.14	0.038	3.677	0
Understanding -> IntentUse	0.032	0.034	0.014	2.331	0.02

Appendix F: Regression for Complete Model

Table 53: Regression Weights for Final Model

			Estimate	S.E.	C.R.	P
EffortEX	<---	ExternalVar	0.687	0.151	4.54	***
PercE	<---	EffortEX	0.702	0.105	6.708	***
PercE	<---	PerfEX	0.617	0.095	6.527	***
PercE	<---	VOL	-0.218	0.048	-4.545	***
SocInf	<---	EffortEX	0.507	0.09	5.664	***
SocInf	<---	VOL	-0.364	0.07	-5.234	***
PercUse	<---	PercE	1.015	0.115	8.793	***
IntentUSE	<---	PercUse	0.444	0.062	7.162	***
IntentUSE	<---	SocInf	0.225	0.049	4.59	***
Tangible	<---	IntentUSE	0.466	0.092	5.048	***
Assurance	<---	IntentUSE	0.972	0.12	8.081	***
Empathy	<---	IntentUSE	0.95	0.117	8.098	***
Understand	<---	IntentUSE	0.753	0.113	6.653	***
ProgramIss	<---	IntentUSE	0.811	0.123	6.565	***
Reputation	<---	IntentUSE	0.875	0.125	7.002	***
Academic	<---	IntentUSE	0.85	0.118	7.181	***
NonAcad	<---	IntentUSE	1.043	0.129	8.079	***
TANG1	<---	Tangible	1			
TANG2	<---	Tangible	1.803	0.349	5.166	***

TANG3	<---	Tangible	2.066	0.401	5.147	***
TANG4	<---	Tangible	1.966	0.382	5.151	***
ASSUR1	<---	Assurance	1			
ASSUR2	<---	Assurance	0.984	0.112	8.801	***
ASSUR3	<---	Assurance	0.721	0.123	5.87	***
ASSUR4	<---	Assurance	0.653	0.117	5.579	***
ASSUR5	<---	Assurance	1.093	0.11	9.932	***
EMP1	<---	Empathy	1			
EMP2	<---	Empathy	0.897	0.096	9.292	***
EMP3	<---	Empathy	0.994	0.094	10.514	***
EMP4	<---	Empathy	-0.463	0.11	-4.229	***
UNDER1	<---	Understand	1			
UNDER2	<---	Understand	0.807	0.119	6.762	***
UNDER3	<---	Understand	0.942	0.125	7.544	***
UNDER4	<---	Understand	1.082	0.132	8.167	***
UNDER5	<---	Understand	0.844	0.137	6.176	***
UNDER6	<---	Understand	1.023	0.139	7.346	***
UNDER7	<---	Understand	0.993	0.14	7.074	***
PROG7	<---	ProgramIss	0.777	0.153	5.09	***
PROG3	<---	ProgramIss	1.252	0.171	7.318	***
PROG2	<---	ProgramIss	0.649	0.148	4.392	***

PROG1	<---	ProgramIss	1			
REPU6	<---	Reputation	1.081	0.147	7.331	***
REPU5	<---	Reputation	1.045	0.139	7.505	***
REPU4	<---	Reputation	0.957	0.142	6.725	***
REPU3	<---	Reputation	0.576	0.106	5.459	***
REPU2	<---	Reputation	0.822	0.132	6.237	***
REPU1	<---	Reputation	1			
ACAD3	<---	Academic	0.537	0.12	4.471	***
ACAD2	<---	Academic	1.057	0.129	8.177	***
ACAD1	<---	Academic	1			
NONA5	<---	NonAcad	0.373	0.103	3.625	***
NONA4	<---	NonAcad	0.365	0.109	3.361	***
NONA3	<---	NonAcad	0.872	0.084	10.347	***
NONA2	<---	NonAcad	0.906	0.093	9.788	***
NONA1	<---	NonAcad	1			
FC4	<---	ExternalVar	1			
FC6	<---	ExternalVar	0.892	0.193	4.623	***
FC7	<---	ExternalVar	1.299	0.209	6.219	***
FC8	<---	ExternalVar	1.847	0.318	5.803	***
EE1	<---	EffortEX	1			
EE3	<---	EffortEX	1.004	0.119	8.417	***

EE5	<---	EffortEX	0.906	0.134	6.773	***
EE6	<---	EffortEX	0.897	0.127	7.053	***
EE7	<---	EffortEX	0.863	0.135	6.386	***
EE10	<---	EffortEX	0.792	0.117	6.763	***
PerfE1	<---	PerfEX	1			
PerfE2	<---	PerfEX	1.158	0.133	8.74	***
PerfE3	<---	PerfEX	1.241	0.154	8.081	***
PU1	<---	PercUse	1			
PU2	<---	PercUse	0.851	0.081	10.472	***
PU3	<---	PercUse	0.851	0.09	9.481	***
PU4	<---	PercUse	0.745	0.079	9.437	***
PU5	<---	PercUse	0.845	0.078	10.801	***
PE1	<---	PercE	1			
PE2	<---	PercE	0.684	0.085	8.018	***
PE3	<---	PercE	0.955	0.094	10.15	***
PE4	<---	PercE	0.724	0.093	7.817	***
SI1	<---	SocInf	1			
SI2	<---	SocInf	1.225	0.101	12.074	***
SI3	<---	SocInf	1.228	0.109	11.27	***
SI4	<---	SocInf	1.267	0.104	12.151	***
IU3	<---	IntentUSE	0.992	0.131	7.547	***
IU2	<---	IntentUSE	0.882	0.116	7.586	***
IU1	<---	IntentUSE	1			
USE2	<---	IntentUSE	0.622	0.101	6.164	***

USE1	<---	IntentUSE	0.918	0.124	7.391	***
VOL2	<---	VOL	1.284	0.18	7.148	***
VOL1	<---	VOL	1			

Appendix G: Crosstabulation of Demographic Variables

Table 54: Demographic Variables Significant Correlations

Item	Demographic	P Value
FC3	Education	.000
	Gender	.002
FC4	Age	.022
FC5	Education	.004
FC6	Age	.011
FC8	Age	.046
PerfE1	Gender	.003
PerfE2	Gender	.001
PU1	Education	.005
PU2	Education	.000
	Gender	.001
PU3	Gender	.012
PU4	Gender	.021
PU5	Gender	.020
EE1	Age	.019
EE2	Age	.000
EE3	Age	.000
EE4	Age	.013
PE1	Age	.033
PE2	Education	.005
PE2	Gender	.035
PE3	Education	.026
	Gender	.017
SI1	Education	.006

	Gender	.024
SI2	Education	.015
	Gender	.016
SI3	Gender	.014
SI4	Education	.026
	Gender	.008
Vol1	Gender	.013
Vol2	Education	.002
	Gender	.000
Use1	Education	.001
IU1	Age	.013
	Education	.000
Tang2	Age	.001
Tang3	Education	.000
Tang4	Age	.018
	Gender	.025
Tang5	Age	.001
	Education	.000
	Gender	.000
Rel1	Education	.000
Rel3	Education	.001
	Gender	.001
Rel4	Age	.029
	Education	.001
	Gender	.017
Rel5	Age	.031
	Education	.004
	Gender	.007

Resp1	Age	.028
	Education	.002
Resp3	Age	.012
Resp5	Gender	.029
Assur1	Gender	.032
Assur2	Education	.002
	Gender	.000
Assur4	Education	.005
	Gender	.022
Assur5	Education	.021
Emp2	Education	.023
Emp3	Gender	.001
Emp4	Gender	.006
Nona1	Education	.000
	Gender	.029
Nona2	Gender	.006
Acad1	Age	.022
	Gender	.050
Acad2	Gender	.039
Acad4	Education	.044
Acad5	Age	.018
	Gender	.018
Repu1	Education	.000
	Gender	.036
Repu2	Age	.027
	Education	.000
	Gender	.008
Repu3	Age	.018

Repu4	Age	.000
Repu5	Education	.004
	Gender	.022
Repu6	Age	.039
	Gender	.043
Access1	Age	.040
	Education	.016
Access2	Education	.000
	Gender	.000
Access4	Age	.013
	Education	.003
	Gender	.000
Access6	Education	.015
Prog3	Education	.012
Prog4	Age	.029
	Education	.006
Under4	Gender	.000
Under7	Gender	.005

Appendix H: New Survey Questions

Demographic Questions

1. Please select your current level of education:
    a. First Year
    b. Second Year
    c. Third Year
    d. Fourth Year
    e. More than four years
2. Please select all of the following that you use to access your university
    a. At the campus
    b. Online on computer
    c. On a laptop
    d. Smartphone
    e. Tablet

Satisfaction with University Offerings

1. I am satisfied with the online offerings from my university.
2. I am satisfied with the online access I have to the college administrators at my university.
3. I am satisfied with the online access I have to my courses and instructors at my university.
4. I am satisfied with the online access to meet my educational needs at my university.
5. I am satisfied with the mobile offerings from my university.
6. I am satisfied with the mobile access I have to the college administrators at my university.
7. I am satisfied with the mobile access I have to my courses and instructors at my university.
8. I am satisfied with the mobile access to meet my educational needs at my university.

9. I am satisfied with the methods I have to contact and manage all of my interactions with my university.

TAM/UTAUT Questions

1. **(PerfE)-**The technology offering from my university enables me to accomplish more tasks quickly.
2. **(PerfE)-**The technology offering from my university has improved the quality of my experience at the university.
3. **(PerfE)-**The technology offering from my university makes it easier to communicate with administrative services, such as school counsellors and financial aid.
4. **(PE)-** I have the knowledge to use the university's administrative online services
5. **(PE)-** I have the resources to use the university's administrative online services
6. **(PE)-** I have the ability to use the university's administrative online services
7. **(SI)-** People who influence my behaviour think I should use the university's administrative online services.
8. **(SI)-** People who are important to me think I should use the university's administrative online services
9. **(SI)-** My peers think I should use the university's online administrative online services.
10. **(SI)-** People whose opinions I value prefer that I use the university's administrative online services
11. **(IU)-** I intend to use the university's online accessibility to complete my degree program.
12. **(IU)-** I intend to use the university's online administrative services for accessing my account or reviewing my individualized information.

13. **(IU)-** I intend to frequently use the university's online accessibility to complete my degree program.

Quality Questions

1. **(ASSUR)-** The university administrative staff is knowledgeable about their area of expertise.
2. **(ASSUR)-** The university technical staff is knowledgeable in their area of expertise.
3. **(ASSUR)-** The communication from the technical staff is always courteous and consistent.
4. **(EMP)-** Administrative staff members are willing to help students.
5. **(EMP)-** The administrative staff members have the ability to help students solve problems
6. **(EMP)-** The administrative staff members help to build confidence in using the online systems at the university.
7. **(NonA)-** I feel secure in my relationships with the university.
8. **(NonA)-** Administrative staff can help me use the online services to learn about the policies and procedures of the college.
9. **(NonA)-** The online access to the website improves my knowledge of the college and administrative process.

Curriculum Vitae

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Education

- **Ph.D. Candidate,** Istanbul University
- **Master in Quality Management,** Wollongong University (UOW) (**With Distinction**).
- **B.SC in Electrical Engineering,** Al Najah University.
- **General Secondary School Exam in the Scientific Stream. in Palestine. (93.2%)**

Work Experience

- **Quality Assurance Consultant:** July 2017- present, Istanbul – Turkey.
- **Project Manager:** Sep 2014 - Jun 2017, 4 Link, Istanbul – Turkey.
- **Management Executive:** Jan2009–Feb 2012, HBM e University, Dubai– UAE
- **Administrative Director:** Jan 2007 – Oct 2008, Althuraya, Nablus – Palestine

Personal Information

- Gender: Male.
- Date of Birth: 28/07/1980
- Nationality: Jordanian (Palestinian).
- Marital Status: Married.
- Language: Arabic – Mother Tongue

  : English – Excellent (Speaking, Reading, & Writing) (IELTS 7)

  : Turkish – Very Good (Speaking, Reading, & Writing) (B2)

  : Hebrew – Good (Speaking, Reading, & Writing)