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INVESTIGATING FACTORS AFFECTING
THE ADOPTION INTENTION OF
DIGITAL SIGNATURE SYSTEMS

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INVESTIGATING FACTORS AFFECTING THE ADOPTION INTENTION OF DIGITAL SIGNATURE SYSTEMS

M.Sc. THESIS

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Nicosia

February, 2022

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M.Sc. THESIS

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Approval

We certify that we have read the thesis submitted by Janet Ajamu titled **"Investigating factors affecting the adoption intention of digital signature systems**" and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

JANET AJAMU

18/02/2022

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ABSTRACT

Investigating Factors Affecting the Adoption Intention of Digital Signature Systems

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With the rate at which technology is becoming a crucial part of humans existence it is expected that in this digital world, there would be no need for various organizations to keep using wet-ink to sign documents anymore. Most of all the documents or paper works are meant to be done electronically. The primary goal of this research is to examine the factors (behavioral factors and psychological factors) affecting the users' intention to adopt digital signature technology. To carry out this study, an online-based questionnaire was constructed and shared via different social media platforms to volunteer individuals. The data was collected from individuals across various countries and working environments including students, lecturers, administrative staff, bankers, etc. A total number of 378 responses were analyzed using SPSS. The factors of the extended technology acceptance model and Theory of Planned Behavior were included in the research model of this study. The findings of this research show that 2 out of the 15 hypotheses were not supported. From the analysis result, attitude and perceived risk have no significant effect on users' intention to use digital signature technology. "Subjective-norm" and "Perceived Behavioral Control" are part of the factors affecting users' "intention" to use digital signature technology. It is believed that this study will assist researchers and other organizations in better understanding the factors that can influence their behavior when it comes to adopting the technology.

Keywords: Digital signature, Technology Acceptance Model (TAM), Theory of planned behavior (TPB), adoption intention.

ÖZET

Dijital İmza Sistemlerinin Adaptasyonunu Etkileyen Faktörlerin Araştırılması

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Teknolojinin insanoğlunun hayatının önemli bir parçası haline gelmesiyle birlikte, dijital dünyada, çeşitli kuruluşların artık belgelerini imzalamak için ıslak mürekkep kullanmaya devam etmesine gerek kalmamıştır. Tüm belgelerin veya kağıt işlerinin çoğunun elektronik olarak yapılması amaçlanmıştır. Bu araştırmanın birincil amacı, kullanıcıların dijital imza teknolojisini benimseme niyetini etkileyen faktörleri (davranışsal faktörler ve psikolojik faktörler) belirlemektir. Bu çalışmayı gerçekleştirmek için çevrimiçi tabanlı bir anket oluşturulmuş ve gönüllü bireylerle farklı sosyal medya platformları üzerinden paylaşılmıştır. Veriler, öğrenciler, öğretim görevlileri, idari personel, bankacılar vb. çeşitli ülkelerdeki ve çalışma ortamlarındaki kişilerden toplanmıştır. Toplam 378 anket ile toplanan veriler SPSS kullanılarak analiz edilmiştir. Genişletilmiş Teknoloji Kabul Modeli ve Planlı Davranış Teorisi faktörleri bu çalışmanın araştırma modeline dahil edilmiştir. Bu araştırmanın bulguları, 15 hipotezden 2'sinin desteklenmediğini göstermektedir. Analiz sonucuna göre, tutum ve algılanan risk, kullanıcıların dijital imza teknolojisini kullanma niyetleri üzerinde anlamlı bir etkiye sahip olmadığı buna karşılık "öznel norm" ve "algılanan davranış kontrolü", kullanıcıların dijital imza teknolojisini kullanma "niyetini" etkileyen faktörler olduğu belirlenmiştir. Bu çalışmanın, araştırmacılara ve diğer kuruluşlara, teknolojiyi benimseme konusunda davranışlarını etkileyebilecek faktörleri daha iyi anlamalarında yardımcı olacağına inanılmaktadır.

Anahtar Kelimeler: Dijital imza, Teknoloji Kabul Modeli (TAM), Planlı Davranış Teorisi (TPB), benimseme niyeti.

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LIST OF ABBREVIATIONS

TAM:	Technology Acceptance Model
TPB:	Theory of planned behavior
CPT:	Compatibility
TST:	Trust
ST:	Saving Time
PU:	Perceived Usefulness
PEOU:	Perceived Ease of Use
ATT:	Attitude
SE:	Self-efficacy
FC:	Facilitaing Conditions
PB:	Perceived Behavior
SN:	Subjective Norm
BI:	Behavioral Intention

CHAPTER I

INTRODUCTION

This chapter is the introductory part of this study; it provides an overview of the study, the aim of the study, the importance of this study, possible limitations of the study, and a summary of the chapters contained in this study.

1.1. Overview

Information technology has become an essential part of almost every developing legal sectors like business sectors, banking sectors, educational sectors, and organizations (Elammari & Cavus, 2019; Tabrizi & Cavus, 2015). The ability to transfer, receive, and manipulate digital data effectively is an essential activity of every legal sector (Cavus, Mohammed & Yakubu, 2021) and this act needs to be performed with no worries about the safety/security of the data. For any electronic transaction, validation, repudiation, and verification of electronic data are necessary; therefore, the authentication and secure electronic transaction would remain merely virtual until these goals have been achieved (Pooja & Yadav, 2018).

From $1.83 billion in 2019 to $2.33 billion in 2020, the global digital signatures market is predicted to develop at a compound annual growth rate (CAGR) of 27.69 percent, according to Reportlinker (2020). Due to the global pandemic of COVID-19, individuals are unable to travel long distances, which has resulted in a range of restrictive steps such as lockdown, cessation of transportation systems, and the closing of non-essential services to avoid individuals being close to each other. As a result, individuals, corporations, and businesses increasingly prefer to use electronic signatures instead of conventional wet-ink signatures when signing documents to continue operating remotely. At a CAGR of 28.58%, the digital signature market is forecast to hit $4.95 billion in 2023.

It is important to note that there is a distinguishable difference between a digital signature and an electronic signature. A digital signature is different from a handwritten signature that has been stored electronically. Unlike many other forms of electronic signatures, a digital signature is a reliable communication; contracts, images, letters, and several other types of electronic documents can be signed and submitted to another party in seconds without fear of security being compromised (Lupton, 1999). An electronic signature may be a scan of a handwritten signature or a digitally "written" image on a computer that serves the same function as a handwritten signature while digital signatures are a type of electronic signature that encrypts the signed document and helps to verify its authenticity on subsequent occurrences (Thompson, 2017).

Digital signatures are very useful tools for the implementation of signs that are safe and valid (Nia et al., 2014). A digital signature is a tool that can be attached to a digital document to retain the document's authenticity (Afrianto et al., 2020). Users are concerned about unauthorized access and data theft in some cases, such as receipts, contracts, and similar others. The traditional method of authentication, which is the ink-based signature, cannot change the situation since they are contained in the document as part of the document (Kaur & Kaur, 2012). One of the most effective ways to all of these security concerns to secure and safeguard digital data is through digital signatures. Security is known to be a major concern to the transfer and use of data on the internet (Cavus & Ahmad, 2019) and digital security is one of the techniques for ensuring the security of data used and processed via the internet (Aydin et al., 2018).

Hence, the goal of this study is to analyze and ascertain the possible factors affecting the adoption of the digital signature system by evaluating individual perceived behavioral perspectives towards the attitude and intention to use a digital signature systems. A research model was constructed for this study by combining both the Theory of Planned Behavior (TPB) by Ajzen (1991) and the Technology Acceptance Model (TAM) by Davis (1989). Compatibility, trust, saving of time, and perceived risk are the external factors added to TAM creating an extended TAM. The new research model was assessed to see if the added factors are relevant to the proposed model. In addition, the study tests the hypotheses.

1.2. Problem Statement

Past research (Pereira et al., 2018; Aydin et al., 2018; Tulu et al., 2004) mainly focused on a particular category of individuals that uses the digital signature systems.

In this electronic era, the adoption of digital signature systems should be adopted by sectors that deal with confidential information ranging from government offices, health care sectors, educational sectors, banking, and business sectors.
Electronic signatures are used for a variety of purposes, including performing online transactions, gaining access to a network, PC, or security area, accessing and checking medical records or other personal information, security identification, retail buying, government, and military applications, and so on (Banerjee et al., 2016).
The global Covid-19 pandemic, which technology professionals refer to as a worldwide disruption, can be considered as an opportunity or a challenge to reform company structures or introduce new technology as a business process support (Cavus et al., 2021; Gregurec et al., 2021). Due to the pandemic, so many sectors had to shut down there physical operations and had to utilize the use of technology from the comfort of their home (Cavus & Sekyere-Asiedu, 2021). In this situation, the use of wet-ink to sign documents was futile (Sancar & Cavus, 2021). Because there are factors that influence the adoption of digital signature systems in specific industries, the scope of this study is not limited to a specific group of people in order to better understand the factors that influence digital signature system adoption. The survey was distributed to individuals represented in different categories ranging from students, business personnel, technologist, institution administrative workers, lecturers, and so on. The information obtained from this study will be helpful to sectors dealing with confidential information.

1.3. Aim of the Study

This study aims to analyze the possible factors such as “compatibility”, “trust”, “saving time”, “perceived usefulness”, “perceived ease of use”, “attitude”, “self-efficacy”, “facilitating conditions”, “perceived behavioral control”, “perceived risk”, “subjective norm”, and “intention” affecting the adoption intention of the digital signature systems using Technology acceptance model (TAM) and Theory of planned behavior (TPB) to determine the factors.

1.4. Importance of the Study

The use of the digital signature system is becoming significant due to the fast-rising of the digital environment. The adoption and use of digital signature systems vary between countries because the rate at which the internet and technology are used in developed countries varies from the way they are used in developing countries. The significance and result of this research will be beneficial to the following categories, as indicated below:

- **Researchers:** The result of this study will help researchers interested in researching this subject area. The survey used in this research can be useful to researchers willing to consider similar factors for research.
- **Organizations:** Because this study focuses on factors influencing the adoption of digital signature systems, the findings may be useful to both financial and non-financial organizations in understanding the importance of digital signature systems adoption.
- **Educational sectors:** The adoption of digital signature systems by the educational sectors, will not only help the lecturers and administrative personnel but also help the students. The study will help educational sectors realize how the adoption of digital signature systems can help their work effectiveness.

1.5. Limitations of the Study

The following are the limitations relating to this study:

- *Limited access to data:* Getting the required number of participants for this study took much time due to the COVID-19 pandemic because only an online survey method could be used to distribute the questionnaires.
- *Time:* This research was completed in a small space of time; nevertheless, it is predicted that more time would have improved the outcome; hence, more time is advised for future research.
- *The research models of this study are technology acceptance model (TAM) and theory of planned behavior (TPB).* More factors can be added to the models to

give a better clarity in understanding the factors affecting the adoption intention of the digital signature systems.

- *This study focused mainly on factors affecting the adoption intention of digital signature systems.* Future research can focus more on other areas of digital signature systems such as the impact of digital signature systems, types of digital signature systems, and recommendation of digital signature systems to be used by different sectors.

1.6. Overview of the Thesis

This study consist of six (6) chapters and this section gives a summary of each chapter.

- **Chapter one:** This chapter is the introductory part of this study; it provides an overview of the study, the aim of the study, the importance of this study, possible limitations of the study, and a summary of the chapters contained in this study.
- **Chapter two:** This chapter delves deeper into the subject at hand, focusing on previous research and what other researchers discovered through their investigations. This chapter is the study's backbone and is essential for understanding the study's ideas
- **Chapter three:** This chapter explains in detail the overall overview of the digital signature systems. It gives a broad explanation of the concept of cryptography and the different types of cryptography. It also explains in detail some of the algorithms of symmetric and asymmetric cryptography
- **Chapter four:** The chapter gives a detailed explanation regarding the study's research model, formation of the hypotheses, survey participants, data collection tools, the method used in analyzing the data, and the procedure in carrying out this research.
- **Chapter five:** This chapter describes the study findings that were acquired following data analysis with references to earlier research. Each research item presented in the research model is thoroughly examined, and the findings are presented.

- **Chapter six**: This section of the study tends to summarize the entire study with a focus on the findings and future research recommendations. The researcher discusses observations made during the research and how some of the study's limitations could be addressed in future research.

CHAPTER II

RELATED RESEARCH

This chapter delves deeper into the subject at hand, focusing on previous research and what other researchers discovered through their investigations. This chapter is the study's backbone and is essential for understanding the study's ideas.

2.1 Digital Signature Systems

Rahim et al. (2018) defined digital signatures as an authentication method that allows the message creator to add code that serves as its signature and enables the receiver of the message to verify the validity and integrity of the message.

According to Afrianto et al. (2020), the three basic reasons to attach the digital signature process are the creation of signatory authenticity, document authentication, and digital signature verification. In the process of using a digital signature, it guarantees confidentiality, authentication, integrity, security, non-repudiation, and non-reusability of data (Kaur & Kaur, 2012; Aydin et al., 2018).

Finandhita and Afrianto (2018) stated that digital signature is one of the technologies used to enhance network security and it operates as a marker on data to ensure that the data is intact and has not been modified.

According to Thompson (2017), when discussing the key characteristics of a digital signature dissimilar to a written signature, the digital signature does not provide the identity of the signatory but rather provides the authentication of the document sent as the sender has encrypted the data with a public key and receiver decrypt with a private key.

2.2. Security Functionality Of Digital Signature Systems

Hoa (2010) highlighted that digital signature systems are applied in the fields of e-commerce, digital certificates, and as well used as an identity card. Developed country dwellers do integrate their Identity numbers into chip cards in credit cards, identity cards for safety, to limit fraud (Thoi, 2021).

According to Subramanya and Byung (2006), digital signatures are used to secure e-mail, such as privacy and Secure/Multipurpose Internet Mail Extension, as well as online credit card transactions. RSA signatures, as well as DSS-based signatures, are fully supported for secure e-mails. Secure Electronic Transactions is the most extensively utilized technique for credit card transactions over the Internet. It's a set of security protocols and standards that make it possible to use existing credit card payment infrastructure over the Internet (Subramanya & Byung, 2006).

Digital signature systems according to Nia et al. (2014) are cryptographic primitive-based processes for computerized marking of electronic documents to confer authority, preserve authenticity, wholeness or integrity, and non-repudiative qualities that a sealed and signed paper document possesses for communication, business transaction evidence, and others.

2.3. The Technology Acceptance Theories

2.3.1. Technology Acceptance Model

According to Davis (1985) and Ahmad (2018), TAM is a model in which system features and functionalities enhance user motivation, which then becomes the driving force behind using the system.

Reports such as that of Wann-Yih & Ching-Ching (2015) submitted that Technology Acceptance Model is a useful tool in measuring the attitude of information technology consumers' to its acceptance. Also, Mortenson and Vidgen (2016) confirmed that Technology Acceptance Model is a viable tool to predict user acceptance of cloud computing (Nassif, 2019).

In a study to test and authenticate TAM as a predictive model, based on consistency and validity of PEOU and PU for five digital applications- Harvard Graphics, Lotus 123, word perfect, email and voice mail were tested in the open and closed environment among MBA students (Adams et al., 1992), according to the researcher, the TAM model's prediction reliability was demonstrated to be accurate in explaining system usage and adoption,. (Ahmad, 2018).

Studies of Wixom and Todd (2005), Abdullah et al. (2016) emphasized the flexibility of the technology acceptance model, pointing out that independent variables of choice can be added to the theoretical framework to investigate some external factors and fully comprehend how and why they influence the adoption decision of some technology users.

2.4. Understanding Adoption Intention

Adoption Factors: *Perceived Use and Perceived Ease of Use*

On users' perceptions of mobile banking adoption, AlSoufi and Ali (2014) investigated the influencing role of TAM factors such as "quality of service, customer services and self-efficacy, efficient transaction, alternatives, compatibility, perceived cost, perceived risk, perceived ease of use, perceived usefulness, and intention to use". The researchers discovered that perceived risk and perceived cost had no effect on consumers' behavioral intentions. PU and PEOU, on the other hand, are still influencing factors that influence the user's intention.

Perceived Enjoyment, Risk, and Cost

In e-commerce and e-shopping, perceived enjoyment and perceived risk are two external constructs that are reported to impact consumers' intention to adopt e-shopping; while the formal positively impacts, the latter's impact is negative (Mandilasa et al., 2013). Among the perceived risks, these three- financial, information, and product risks are importantly common to impact the intention of customers to engaging online shopping (Bhatnagar et al., 2000; Antony et al., 2006; Mandilasa et al., 2013). Integration of independent variables – perceived cost and perceived risk, in a research (Ofori and Appiah-Nimo, 2019:1) to investigate determinants of consumers of online shopping products, it was discovered that perceived cost had a significant effect on actual use while perceived risk effect on perceived intention was significant.

Added Factors - *Compatibility and Subjective Norms, Time Saving, and Trust*

Another group of constructs widely accepted in testing the acceptability of e-commerce is subjective norms (Mandilasa et al., 2013) and compatibility. In research Phonthanukitithaworn et al. (2016) conducted, the impact of influencing factors- "perceived use", "perceived ease of use", "perceived risk", "perceived trust", "perceived cost", "compatibility", and "subjective norms" were tested on the behavioral intention of current users and potential users. Current and prospective users' behavioral intentions to adopt mobile payment facilities were found to be influenced by compatibility; this finding confirmed Yang et al. (2012) earlier submission that a significant relation exists between compatibility, potential and existing users' behavioral intentions to adopt m-payment services.

The Subjective Norm, as revealed by Phonthanukitithaworn et al. (2016), is another major aspect that has influenced the acceptance of mobile payment services among present and prospective users. However, the influence is more effective among potential users. Subjective norms work well with referral which helps to explain why people who have never used technology before are more likely to have strong behavioral intentions since they rely extensively on other people's recommendations to assist them in making decisions (Fishbein & Ajzen, 1975; Taylor & Todd, 1995a; Phonthanukitithaworn et al*.,* 2016).

In a study conducted by Susanto and Goodwin (2010) citizens' perceptions of time efficiency influence their decision to use an SMS-based e-government service.

In their study on the determinants of internet banking adoption, Alwan and Al-Zu'bi (2016) found that all variables had a significant impact on adoption, however website quality and consumer trust were shown to be the most important predictors of consumer acceptance.

Compatibility construct

Compatibility as defined by Rogers (2003), is the "degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15).

According to Tornatzky and Klein (1982), there are two forms of compatibility: normative or cognitive compatibility, which is concerned with people's attitudes or perspectives on innovation; practical or operational compatibility, which is concerned with people's compatibility with what they do. Compatibility with the needs of potential adopters: this is a relative advantage component because innovation cannot be considered beneficial if it does not meet the needs of users (Moore & Benbasat, 1991).

In predicting technology adoption outcomes, empirical works on Information System studies (Brancheau and Wetherbe, 1990; Taylor and Todd, 1995b; Chin and Gopal 1995; Agarwal and Prasad 1997; Karahanna and Straub, 1999), compatibility construct has been consistently prominent. For instance, of 10 innovation attributes identified in a meta-analysis of over 100 innovation studies, only relative advantage (Perceived Use), compatibility, and complexity (Ease of Use) were consistently related to adoption and/or utilization decisions (Tornatzky & Klein, 1982; Karahanna et al., 2006). Karahanna et al. (2006) presented four unique dimensions of compatibility based on the theoretical definition of compatibility: "Compatibility with prior experience, compatibility with preferred work style, compatibility with existing work practices, and compatibility with values" (p. 787).

Perceived Risk

In the aspect of e-shopping, Kim and Han (2008) described customers' perceived risk as their knowledge of the likelihood of unpredictable unfavorable effects from online purchases; Zhang and Yu (2020) defined risk as the uncertainty consumers confront when they are unable to forecast the impact of their purchasing decisions. Product risk, financial risk, and privacy risk are all common kind of risk among e-shoppers (Dai et al., 2014).

2.3.2. Theory of Planned Behavior

The Theory of Planned Behavior evolved from the Theory of Reasoned Action as a result of the previous model's limitations in dealing with behaviors over which people have only limited volitional control (Ajzen, 1991). The Theory of Reasoned Action was developed by Ajzen and Fishbein (1980) with three variables, "behavioral intention" (BI), "attitude" (A), and "subjective norm" (SN) (Banger & Yadav, 2015). The addition of a fourth variable perceived behavioral control by Ajzen modified this theory to the Theory of Planned Behaviour (TPB).

This theory proposes that behavior is determined by the formation of intent, and that intentions are defined as measures of a person's likelihood of engaging in a particular behavior (Giampietri et al., 2018). Behavior is shown in the TPB as a function of behavioral intentions and perceived behavioral control (PBC) (Conner & Armitage, 1998).

CHAPTER III

CONCEPTUAL FRAMEWORK

This chapter explains in detail the overall overview of the digital signature systems. It gives a broad explanation of the concept of cryptography and the different types of cryptography. It also explains in detail some of the algorithms of symmetric and asymmetric cryptography.

3.1. Digital Signature Systems

Digital signatures are solution mechanisms that can be incorporated into digital documents to guarantee the authenticity of electronic documents (Afrianto et al., 2020). An electronic representation of a written signature is known as digital signature; it can be used to verify that the information has been signed by the alleged signatory (Varshney et al., 2020). A digital signature is an electronic signature that is created by converting data messages using an asymmetric encryption method and a message summarizing function; the digital signature, in other words, is the digital attribute applied to the data message (Aydin et al., 2018).

Engagement of digital signature offer advantages such as signing important documents with ease, time efficiency, and digital signature has a huge cost benefit with little or no cost. It is also backed up with legal validity and this cannot be compromised so, it helps for future reference. Documents stamped digitally can easily be tracked in the future and digital signature is accepted globally. A digital signature uses a unique identity function which gives strength to its security (Sharma & Mittal, 2019).

Nurhaida et al. (2017) listed the components of a digital signature as integrity, authentication, non-repudiation, and confidentiality of data which is simply information security. The term privacy of data refers to the protection of data against illegal access and manipulation. This means that a third party cannot tamper with a transaction between an organization (Kaur & Kaur, 2012; Banerjee et al., 2016). Authentication refers to the system's and the information's identification and recognition. Two parties who converse must introduce themselves to one another. The authenticity of the information communicated across the channel, the substance of the data, and the delivery time must all be verified (Nurhaida et al., 2017). Integrity is the ability to secure information, data, or transmissions from unauthorized, uncontrolled, or inadvertent alterations (Kaur & Kaur, 2012). Non-repudiation prevents the signer from denial about sending or signing the paper (Boudrez, 2007).

According to Nia et al. (2014), digital signature systems are categorized into four schemes within their implementation algorithms namely, batch scheme, forward-secure scheme, blind scheme, and proxy scheme. Critical comparison of digital signature systems as in Nia et al. (2014), the systems are differentiated based on qualities such as security, verification, difficulty, and efficiency. According to what Kaur and Goyal (2014) and Buchman et al. (2006) independently submitted that these stated qualities are rooted in their respective algorithms- mathematics problems such as RSA, Elliptic curve digital signature algorithms, and Merkle signature scheme (Imem, 2015).

3.2. Cryptography

Cryptography is a method of storing and transmitting data or information in such a way that only authorized individuals can access or process it. One of the goals of utilizing cryptographic techniques is to keep information hidden from unauthorized individuals who might want to know what it contains (Nurhaida et al., 2017). Cryptography ensures the secret data's integrity, confidentiality, non-repudiation, and authenticity. Plain text and ciphertext are the two main terminologies used in cryptography. The original message or information is reffered to as the plain text whereas an encrypted form of the message is the ciphertext. The cipher is decoded to reveal the original message (Chandra et al., 2014). The process of transforming plain text into ciphertext is known as encryption; this process requires the use of an encryption algorithm as well as a key. The process of transforming ciphertext into plain text is known as decryption. It involves the use of a decryption algorithm as well as a key (Bali, 2014). Figure 3.1 represents the process of encryption and decryption. Symmetric (private key) and asymmetric (public key) are two types of encryption keys (Yassein et al., 2017). However, cryptography- the art of encryption and decryption is not always symmetrical or asymmetrical; it could also be based on the hash function (Thangavel, 2014). Thus, when data are encrypted and decrypted with a secret key, the cryptography is said to be symmetrical; when it is two keys-public and private keys, that encrypts and decrypts data respectively, that is asymmetrical; when digital signature that uses no secret keys rather engages one-way encryption method are said to be built on hash functions (Thangavel, 2014).

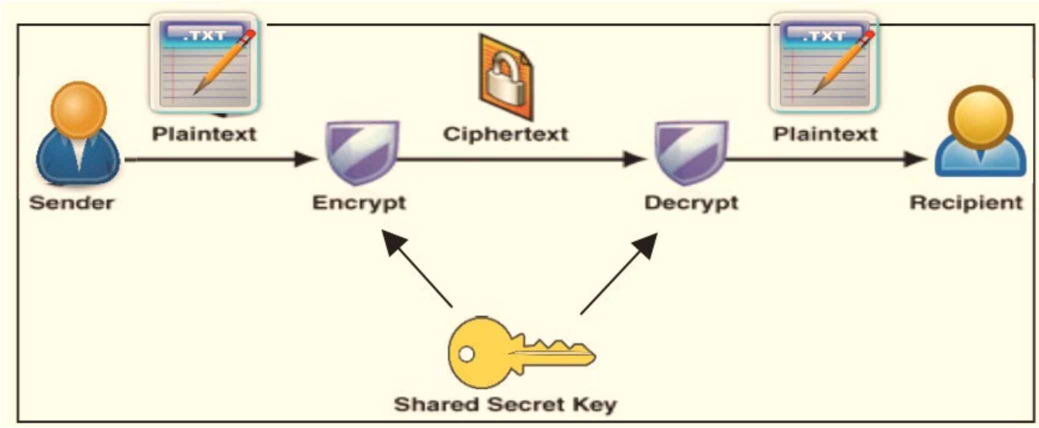


Figure 3.1: Encryption and decryption process (Halim et al., 2017)

3.3. Cryptography Algorithms

An attacker can have access to a digital signature by creating a forged digital signature for a particular message (public key cryptographic algorithm attack) or by generating a new message from an existing digital signature (a cryptographic hash function attack). As a result, the digital signature's security is determined by the cryptographic hash function and the public key cryptographic algorithm (Warasart & Kuacharoen, 2012).

3.3.1. Symmetric encryption (private key algorithms)

Block ciphers and stream ciphers are two types of symmetric algorithms. A single bit of the plaintext is encrypted by Stream ciphers at a time, whereas a group of bits (usually 64) is encrypted by the block ciphers as a single unit (Masram et al., 2014). Examples of symmetric encryption techniques (algorithms) include Data encryption standard (DES), Tripple DES (3DES), RC2, RC6, Blowfish, Advanced encryption standard (AES), RC4, multiphase encryption (Suguna et al., 2016; Kumar et al., 2011).

a) Data encryption standard

The data encryption standard (DES) cryptographic system is one of the most extensively used and publicly available cryptographic systems. IBM created it in the 1970s, but the National Institute of Standards and Technology (NIST) later adopted it. DES takes a 64-bit long plaintext and a 56-bit key length as input and produces a 64-bit block output. In DES, two permutations are involved (initial and final permutation) with 16 processing rounds; each round includes bit-shuffling, non-linear substitutions (S-boxes), and exclusive OR operations (Marwaha et al., 2013). DES has different modes of operations: cipher block chaining (CBC), electronic code book (ECB), cipher feedback (CFB), and output feedback (OFB) (Alenezi et al., 2020; Wahid et al., 2018). Disadvantages of DES involve its small size, it is also currently considered vulnerable, and a brute force approach is possible (Aleisa, 2015; Wahid et al., 2018).

b) Tripple Data encryption standard

The triple data encryption data (3DES) is an enhancement of DES, the encryption process in this standard is similar to that of the original DES, except it is applied three times to raise the encryption or security level (Marwaha et al., 2013). The original plain text is first encrypted with one key, then the resulting ciphertext is encrypted again with another key, and finally with a third key (Alenezi et al., 2020). Although 3DES has advantages over previous algorithms in terms of ease of implementation and security, it is not guaranteed to be completely secure. It's also widely used in financial systems and for securing biometric data in electronic passports (Aleisa, 2015). However, 3DES takes a longer time to complete compared to other block cipher methods (Kumar et al., 2011).

c) Blowfish

Blowfish is a symmetric key block cipher with a key length range of 32 to 448 bits and a 64-bit block size which can be used as an alternative to DES in some situations (Wahid et al., 2018). Blowfish is license-free and its provided to all users for free (Suguna et al., 2016). The Blowfish algorithm is more efficient in terms of energy usage and security, which helps to reduce battery power use (Riman & Abi-Char, 2015). It does not support weak keys; no known attack has been successful against it.

d) Advanced encryption standard

Advanced encryption standard (AES) is also known as the Rijndael algorithm; it combines a secure algorithm with a strong key. Different block and key lengths, such as 128, 192, and 256 bits, can be used in the Rijndael block cipher (Aleisa, 2015). In AES, the larger the key, the greater the cryptographic strength; the number of encryption and decryption cycle to be completed is determined by the key length, which can be 10, 12, or 14 rounds for 128, 192, and 256-bit keys (Abikoye et al., 2019). Figure 3.2 shows the algorithm process of AES. The decryption algorithm follows the same steps as the encryption algorithm, but in reverse.

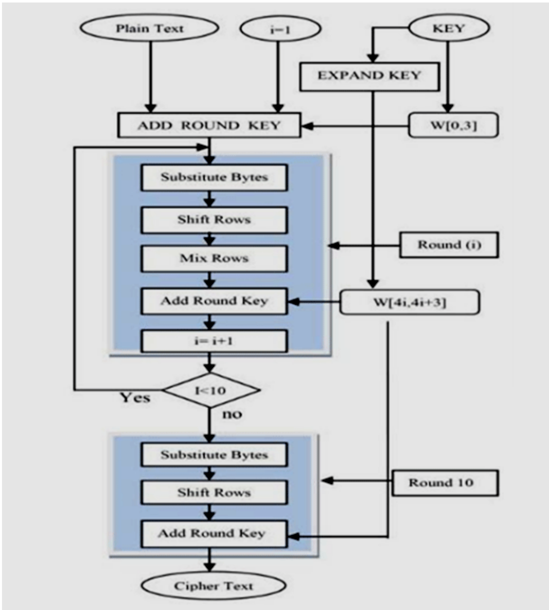


Figure 3.2: AES algorithm process (Yassein et al., 2017)

3.3.2. Asymmetric encryption (public key algorithm)

In Asymmetric encryption techniques, a pair of keys are deployed, one of which is used to encrypt the plaintext and is known as the public key, while the other is known as the private key and is used to decrypt the encrypted plaintext (Alia, 2016). Asymmetric key cryptography uses mathematical functions for both encryption and decryption, while symmetric key cryptography employs symbol substitution and permutation. For authentication, digital signatures, and secret key exchanges, asymmetric key cryptography is applied (Suguna et al., 2016). Examples of asymmetric encryption algorithms are RSA (Rivest-Shamir-Adleman), Diffie-hellman algorithm, Digital signature algorithm, Elliptic curve cryptography (ECC) (Yassein et al., 2017), Elgamal algorithm (Maqsood et al., 2017).

a) Rivest-Shamir-Adleman

Ron Rivest, Adi Shamir, and Leonard Adleman developed the Rivest-Shamir-Adleman (RSA) algorithm in 1977. RSA is a block cipher that's used in a digital signature or key exchange algorithms (Yassein et al., 2017). When sending keys over an insecure channel, RSA is commonly utilized. The technique uses two keys based on asymmetric structure. The public key is the first, while the private key is the second. The public key is accessible to everyone in the cryptosystem, but the private key is kept secret by an authorized person. (Maqsood et al., 2017). The RSA concept is built on the factorization of large numbers, which implies the greater the number sequence, the more secure you are (Imem, 2015). The key size is 1024 to 4096 bits. The first phase of the RSA method is key generation, which is used to generate public and private keys; the second step is encryption; and the third step is decryption (Bali, 2014). Figure 3.3, illustrates the algorithmic process of RSA. The major flaw in RSA is exploited in the following ways: Brute-Force Attacks, Mathematical Attacks, Timing Attacks, and Chosen Ciphertext Attacks are all types of possible attacks on RSA (Yassein et al., 2017). RSA guarantees the protection of data by ensuring its confidentiality, integrity, authenticity, and non-repudiation (Maqsood et al., 2017).

RSA Algorithm:

Stage 1: Begin

Stage 2: Choose two numbers

x = 3 and y = 11

Stage 3: Calculate the value for 'z'

z = x * y = 3 * 11 = 33

Stage 4: Compute the value for φ (z)

φ (z) = (x - 1) * (y -1) = 2 * 10 = 20

Stage 5: Choose e such that 1 < e < φ (z) and e and z.

Let e = 7

Stage 6: Compute a value for d such that (d * e) %? (z) =

1. d = 3

Public key is (e, z) => (7, 33)

Private key is (d, z) => (3, 33)

Stage 7: Stop.

Let T, is plain text (message), T= 2.

Encryption of M is: C = Me % n.

Cipher text is, C = 27 % 33.

C = 29.

Decryption of C is: M = Cd % n.

Plain text (message), M= 293 % 33.

M= 2

Figure 3.3: RSA algorithm process (Marqas et al., 2020)

b) Diffie-hellman algorithm

The Diffie-Hellman algorithm employs mathematics, mainly the modular arithmetic and discrete logarithm, to generate a key which is shared for both sender and receiver across a communication medium, a common prime number b and e is selected by the sender and receiver as its primitive root, where e<b (Kumar & Vincent, 2017). When the recipient receives a message encrypted with the Diffie hellman algorithm, he decrypts it using his private key and the sender's public key (Yassein et al., 2017). The Diffie-helman algorithm process is shown in Figure 3.4.

1. Sender and Receiver agree on a prime number p, q as it's primitive root.
2. Sender and Receiver choose their so called private key 'a' and 'b' which is known to themselves only respectively.
3. Sender's public key A= q^a mod p.
4. Receiver's public key B= q^b mod p.
5. Sender and Receiver exchange their public key. Now Sender has B and Receiver has A.
6. Sender calculates B^a mod p= q^{ba} mod = S.
7. The receiver calculates A^b mod p= q^{ba} mod p= S.
8. Hence, the sender and receiver get 'S' as their shared secret key.

Figure 3.4: Diffie-hellman algorithm process (Kumar & Vincent, 2017)

c) Digital signature algorithm

DSA is incorporated into the Digital Signature Standard (DSS), which was first introduced in 1991, modified in 1993, and then revised with minor adjustments in 1996 as the Federal Information Processing Standard by the National Institute of Standards and Technology (Varshney et al., 2020). The DSA protocol is a reliable digital signature method. It is based on the discrete logarithm issue, which is a difficult mathematical problem (Zahhafi & Khadir, 2018). There are three (3) main processes involved in the DSA algorithm: Generating of key, signing, and verifying. In the process of signing, the signer and verifier have to decide to use the same hash function (m) and to retrieve the digital signature the signer will have to generate a digital signature by using m and inputting a message b, private key, and public key. In the process of verifying, verifiers use a verification algorithm to validate the digital signature after receiving the message and digital signature (Aufa & Affandi, 2018).

d) Elliptic curve cryptography

Elliptic curve cryptography (ECC) is a type of asymmetric technique based on elliptic curves. Encryption, digital signatures, and pseudo-random generators are examples of ECC (Maqsood et al., 2017). ECC is a type of public-key cryptography that generates public keys using difficult algebraic and geometric formulas (Yassein et al., 2017). With a 164-bit key, ECC is sufficient to provide security; to provide security, that system requires a 1024-bit key. With the same bit sizes, ECC provides the highest level of security and it's also useful for battery backup because it uses a lesser amount of energy(Al-Shabi, 2019). ECC can be used to improve the performance of other encryption algorithms such as ECC-Diffie-Hellman and ECC-DSA (Yassein et al., 2017).

e) Elliptic Curve Digital Signature Algorithms

Elliptic Curve Digital Signature Algorithms (ECDSA) was first offered in 1992 in response to a DSS proposal by the National Institute of Standards and Technology (NIST). It became an ISO standard in 1998, an ANSI standard in 1999, an IEEE standard, and a NIST standard in 2000 (Sarath et al., 2014). Important security qualities are provided by this algorithm because it offers integrity, authentication, and non-repudiation. It also utilizes small keys, therefore it has been shown to be more efficient than other public-key cryptography algorithms such as Rivest Shamir Adleman (RSA), digital signature algorithm (DSA), and ElGamal (Al-Zubaidie et al., 2019).

ECDSA schemes perform the same functions as RSA schemes, such as signing and/or verifying signed data. In some situations, 1024-bit RSA isn't possible to construct, while 192-bit ECDSA is. As a result, the strength-per-key-bit in a method that uses elliptic curves is significantly higher. The three processes of the elliptic curve digital signature algorithm are, Creating a key, Creating a signature, and Verifying the signature (Imem, 2015).

3.4. Possible Factors Affecting the Adoption Intention of Digital Signature Systems

Adoption intention of digital signature are grouped into four based on the *technology* itself- the simplicity, relative advantage, perceived security, and compatibility; based on the *organization*- collaboration, management support, innovation; based on *environment*- pressure, government support, and facilitation condition; based on *economic characteristics*- expected profitability and uncertainty (Chong et al., 2021). Pakowska et al. (2020) investigated factors that influence users' adoption of sustainable cloud computing solutions using the Technology Acceptance Model, the investigation led to the conclusion that perceived availability and security influence perceived usability and system service quality, and that both variables influence attitudes and usage. Using the Technology Acceptance Model, Park and Kim (2014) found that perceived mobility, usability, connectivity, security, service, and system quality are the most important factors influencing the intention to accept mobile cloud services.

CHAPTER IV

RESEARCH METHODOLOGY

In this section, a detailed explanation is given regarding this study's research model, formation of the hypotheses, survey participants, data collection tools, the method used in analyzing the data, and the procedure in carrying out this research.

4.1. Research model

In the process of conducting this research, a survey method was used in collecting data from participants. The research model is based on the Theory of planned behavior (TPB) and the Technology acceptance model (TAM). Based on scientific studies, the framework of TPB and TAM is suitable for the purpose of this study. The variables of the research model are based on two different studies: Aydin et al., (2018) and Kapadia and Vaghela (2016). Figure 4.1 shows the research model for investigating factors affecting the adoption intention of digital signature systems. The factors considered in the research model are: "Compatibility", "trust", "saving of time", "perceived ease of use", "perceived usefulness", "attitude", "self-efficacy", "facilitating conditions", "perceived behavioral control", "perceived risk", "subjective norm", and "intention" to use digital signature systems.

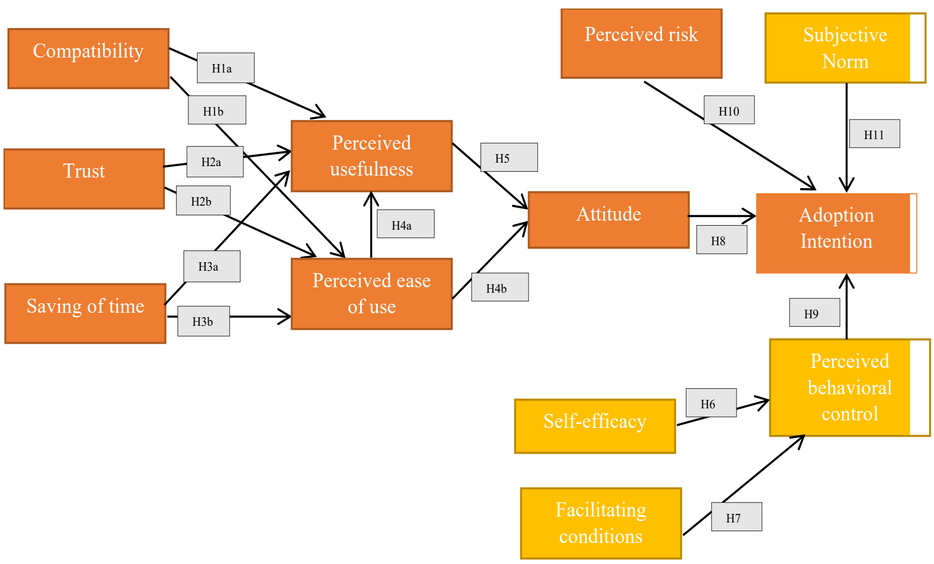


Figure 4.1: The theoretical model

4.2. Hypotheses

The hypotheses of this study show the relationship between the dependent and independent variables. The proposed research model of this study is a combination of both TAM and TPB. Additional factors were included in the TAM, making it an extended TAM. Mainly, the factors are combined to determine the behavioral intent towards the adoption of digital signature systems. The factors are "compatibility", "trust", "saving of time", "perceived ease of use", "perceived usefulness", "attitude", "self-efficacy", "facilitating conditions", "perceived behavioral control", "perceived risk", "subjective norm", and "intention".

Compatibility

When a person or other unit of adoption perceives a concept, practice, or object to be new it's regarded as an innovation; the extent to which an innovation is adopted is determined by its characteristics. Compatibility is one of the attributes of innovation (Rogers, 2003). Compatibility refers to the degree to which an invention is thought to be compatible with the potential user's previous experiences, values, and needs (Moti, & Walia, 2020). A higher level of compatibility, in general, leads to a better level of system acceptability (Rahmi et al, 2018). Compatibility refers to a person's awareness of how new technology is practical and helpful to their job – that is, the understanding of the compatibility between work value, demands, and technical capabilities (Mijin et al., 2019). Since this study focuses on the adoption of digital signature systems, which can also be regarded as an innovation, these hypotheses are proposed:

- **H1a:** "Compatibility" has significant effect on "perceived usefulness" in adopting digital signature systems.
- **H1b:** "Compatibility" has significant effect on "perceived ease of use" in adopting digital signature systems

Trust

Trust is a distinguishable characteristic in most social and economic dealings where uncertainty exists (Pavlou, 2003). The notion that the other party would act in a socially responsible manner, meeting the trusting party's expectations while avoiding exploiting its vulnerabilities, is described as trust (Al-Gahtani, 2011). Trust is derived from the sense of security that one has regarding a situation as a result of such structural assurances. It's crucial to recognize the value of external variables in TAM, and trust has since been identified according to researchers as a major component affecting or being influenced by "perceived usefulness" and "perceived ease of use" (Wu et al., 2011). In uncertain situations, trust reduces vulnerability and increases human confidence in engaging in activities (Thanabordeekij et al., 2020). As a result, the following hypothesis has been proposed for this study:

- **H2a:** “Trust” has a effect on “perceived usefulness” in the adoption of digital signature systems.
- **H2b:** “Trust” has significant effect on “perceived ease of use” in the adoption of digital signature systems.

Saving of time

According to Susanto and Goodwin (2010), time is characterized by a person's assumption that the service they are about to utilize will save them time. Time is a bounded resource in individuals’ lives, and a rising number of people believe that managing their time well is critical to improving their performance and quality of life (Belanche et al., 2012). Adopting digital signature services can be perceived by users to save time, therefore this study proposes the following hypotheses:

- **H3a:** The perceived level of “saving of time” has significant influence on “perceived usefulness” in the adoption of digital signature systems.
- **H3b:** The perceived level of “saving of time” has an effect on “perceived ease of use” in the adoption of digital signature systems.

Perceived ease of use and perceived usefulness

The purpose of TAM was to demonstrate and forecast an individual's adoption and use of new information technology. It claims that two ideas influence people's decisions to adopt technology: "perceived usefulness" and "perceived ease of use" (Venkatesh & Bala, 2008). Davis (1989) defined "Perceived ease of use" as the "degree to which a person believes that using a particular system would be free of effort" (p. 320). If a system is reasonably straightforward to use, people will be more likely to learn about its features and eventually desire to continue using it (Hamid et al., 2016). "Perceived ease of use" and "perceived usefulness" are the factors that reflect the motive of an individual to use a system and thereafter adopt the system (Lai, 2017; Sugandini et al., 2018). Therefore, this study tests the relationship between "perceived ease of use" and "perceived usefulness".

- **H4a:** The "Perceived ease of use" of the digital signature systems has an influence on the "perceived usefulness".

Davis (1989), defined "Perceived usefulness" as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Davis (1989) definition of "perceived usefulness" is supported by the meaning of the term "useful": Capable of being put to good use. "Perceived usefulness" determines the degree of perceived performance, productivity, efficacy, and usefulness of a technology (Holden & Rada, 2011). Users' decision to adopt information technology is determined by the "perceived usefulness" and "perceived ease of use" which thereafter influences users' response (attitude) towards using the technology (Hamid et al., 2016; Holden & Rada, 2011; Ke et al., 2012). Therefore, the following hypotheses are tested in this study:

- **H4b:** The "perceived ease of use" has a significant influence on individuals' "attitude" to adopt digital signature systems.
- **H5:** The level of "perceived usefulness" has a significant influence on individuals' "attitude" to adopt digital signature systems.

Self-efficacy

Bandura (1994) defines perceived self-efficacy as people's perceptions of their capacities to achieve specific levels of performance that influence events in their life. Self-efficacy beliefs have an impact on how people feel, think, motivate themselves, and act (Bandura, 1994). A situation where the user belief in his or her capacity to perform a task, achieve a certain goal, or produce the desired results, by using an innovative system or equipment appropriately is referred to as self-efficacy (Castiblanco Jimenez et al., 2021; Nuryyev et al., 2020). Low self-efficacy is described as a lack of confidence in one's ability to perform a task independently, whereas high self-efficacy refers to a strong belief in one's ability to complete a task independently; as a result, someone with a high level of self-efficacy believes they have a better chance of succeeding with technology or software (Lai, 2008). Both perceived behavioral control and self-efficacy are concerned with one's judgement regarding their ability to accomplish a behavior (or series of behaviors) (Ajzen, 2002). Therefore, this research hypothesizes the following:

- **H6:** "Self-efficacy" has effects on "perceived behavioral control" in the adoption of digital signature systems.

Facilitating conditions

Factors that are claimed to have a direct impact on system use, such as economic resources like time and money or social surroundings, are referred to as facilitating conditions (Choi & Park, 2020). Facilitating conditions refer to an individual's belief that the technological and organizational infrastructure required to use the planned system is available (Ghalandari, 2012). On the other hand, Perceived behavioral control, compatibility, and facilitating conditions are three similar constructs (Zahid & Haji Din, 2019). Therefore, the following hypothesis is constructed:

- **H7:** The "Facilitating condition" affects "perceived behavioral condition" in the adoption of digital signature systems.

Attitude

According to TAM, a person's attitude is founded on the key ideas he or she holds about the consequences of a certain act, as well as his or her assessment of those effects (Jahangir & Begum, 2008). According to the Theory of planned behavior (TPB), attitude is one of the related independent factors of intention. Attitude according to Ajzen (1991), is the "degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question" (p. 188). Attitudes are personal qualities that show either positive or negative behavior and reflect sentiments and understanding about a certain concept or subject (Hussein, 2017). The attitude of a person influences his or her behavior when it comes to accepting or rejecting technology. Therefore, the following hypothesis is tested in this study.

- **H8:** The effect of "attitude" has influence on user "intention" to use digital signature systems.

Perceived behavioral control

The significance of the real behavioral control is self-evident. It is self-evident in the sense that a person's resources and opportunities must influence his or her chances of behavioral success to some extent (Ajzen, 1991). Theory of planned behavior (TPB) claims that Perceived behavioral control (PBC) influences intention. The intention to accept new technology is influenced by one's perception of behavioral control. Furthermore, self-efficacy and facilitating conditions influence perceived behavioral control (Ho et al., 2020). Therefore, this research hypothesizes that:

- **H9:** PBC influences the "intention" to adopt digital signature systems

Perceived risk

Perceived risk in the context of risk technologies refers to the individual expectancy of a loss as a result of utilizing the risky technology (Gupta & Xu, 2010). Perceived Risk creates uncertainties, which has an impact on people's decisions based on their confidence. Risky scenarios are those in which the probability of outcomes are unknown and the outcome afterward turns out to be either positive as predicted or negative (Im et al., 2008). Most users are concerned that if an application requests too many personal details, the information will be shared with external parties, because anyone may access any information on the internet nowadays, the public is anxious about who will have access to their data information. Customers' behavior is influenced by their perception of the risk of adopting new technologies. When consumers consider adopting new technology, they are faced with conflict (uncertainty and confusion) between the benefits and drawbacks, and they must take a risk decision (Yi et al., 2020). Therefore, the following hypothesis is proposed,

- **H10:** "Perceived risk" affects the "intention" of adopting the digital signature systems.

Subjective norm

According to Ajzen (1991), subjective norm refers to the "perceived social pressure to perform or not to perform the behavior" (p.188). Human behavior is frequently influenced by the beliefs that friends, colleagues, parents, or others hold about a certain behavior (Hong, 2019). A user is likely to adopt the digital signature systems, as long as the user believes that digital signature is useful and he is familiar with individuals who are positive about using the system. Therefore the following hypothesis is established,

- **H11:** "Subjective norm" has a significant impact on individuals' "intention" to adopt digital signature systems.

4.3. Research Participants

The participants of this study were selected from various disciplines. It was not limited to students but also individuals who deal or work in an IT-related workspace. An online survey was used to distribute the questionnaire to the participants through email and different social media platforms. A total number of 379 participants filled the survey voluntarily. The RAOSOFT sample size calculator as shown in Figure 4.2 was used to determine the minimum number of responses suitable for this study. The estimated population size of 20000 was used to calculate the required responses. With a sample size of 200, a confidence level (amount of uncertainty that can be tolerated) of 95% the sample size calculated by the RAOSOFT calculator is 377. The estimated minimum response as suggested by the application is 377, the response received for this study in total is 379 but 378 of the responses were considered valid for this research.

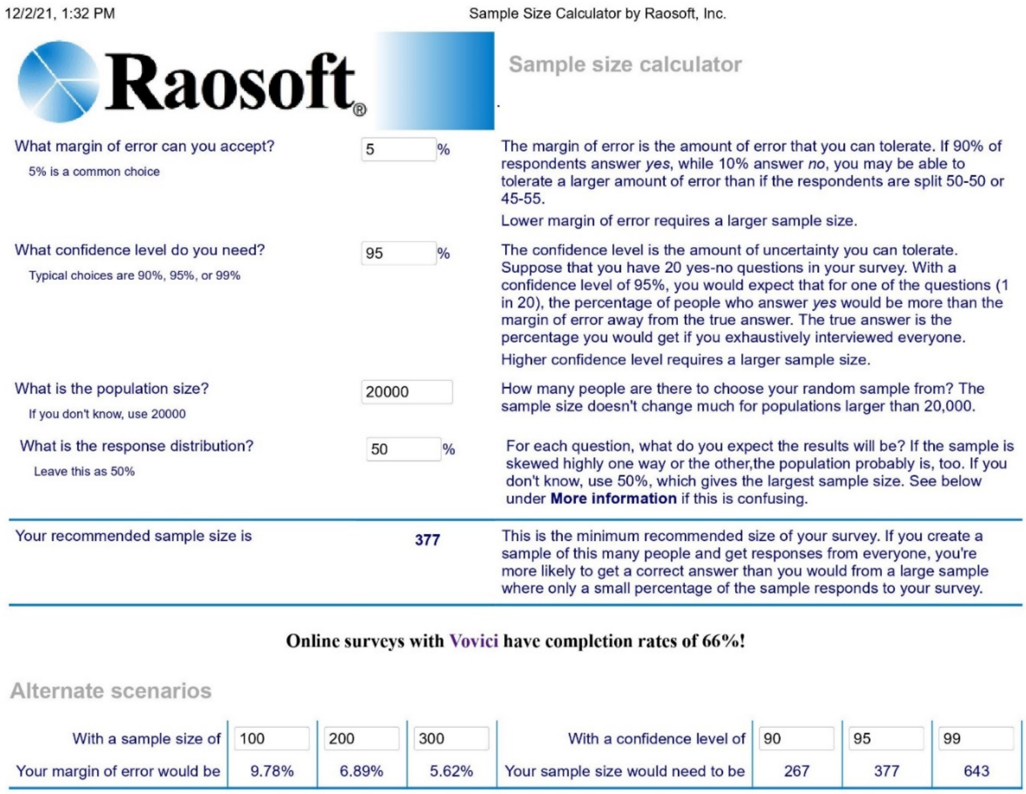


Figure 4.2: The RAOSOFT calculator

4.3.1 Demographic information

The demographic information of the participants is represented in Table 4.1. As seen from the table, the percentage of the female participants is 42.1% whereas, 57.9% of the participants were male. The age group of participants within the age of 20-30 was 57.4%, 31-40 was 23%, 41-50 was 15.1%, 51-60 was 3.7%, and 60 years and above was 0.8%. Based on the participant's maximum educational level, 43.9% of the participants were undergraduate, 36.3% were master students, 17.2% were postgraduate students while 2.6% fall into other categories.

Table 4.1: Demographic information of research participants (378 participants)

Demographic characterization		Number	Percent (%)
Gender	Female	159	42.1
	Male	219	57.9
Age	20-30	217	57.4
	31-40	87	23
	41-50	57	15.1
	51-60	14	3.7
	60- above	3	0.8
Nationality	Nigerian	271	71.7
	Cypriot	27	7.1
	Turkish	12	3.2
	Zimbabwean	28	7.4
	Iraqi	8	2.1
	Others	32	8.5
Education level	Undergraduate	166	43.9
	Master	137	36.3
	Postgraduate	65	17.2
	Others	10	2.6
Job	Student	190	50.3
	Lecturer	66	17.5
	Administrative staff	43	11.4
	Banker	7	1.9
	IT specialist	8	2.4
	Others	64	16.5

The frequency at which participants of this study use the Internet and computer daily is shown in Table 4.2. The study shows that 65.3% of the participants use the internet for more than 5 hours a day and 46.5% spend more than 5 hours using the computer in a day.

Table 4.2: Participants daily usage of internet and computer information (378 participants)

Variable		Number	Percent (%)
How many hours do you use the internet per day?	< 2 hours	18	4.8
	2-3 hours	46	12.2
	4-5 hours	67	17.7
	>5 hours	247	65.3
How many hours do you use the computer in a day?	< 2 hours	72	19
	2-3 hours	55	14.6
	4-5 hours	76	20.1
	>5 hours	175	46.3

4.4. Data Collection Tools

An online-based questionnaire was used to collect data. There were 3 sections in the survey: Demographic information, Internet and computer usage, and 46 assessment items. Session 1 is the demographic information and this section provides background information about the participants such as gender, age, nationality, educational level, and also the participants' jobs. Session 2 is Internet and computer usage; the study helps to understand the level at which the Internet and computer are being used by individuals who participated in this study. The session consists of questions like: "How many hours do you use the internet per day?", "How many hours do you use the computer in a day?". Session 3 of this study contains a total of 46 items of factors affecting the adoption intention of the digital signature systems. The items were coined from both theories of TAM and TPB. A total of 379 responses was obtained and 378 of the responses were used during the analysis stage of this study. The study was analyzed using the statistical package for the social sciences (SPSS). A detailed representation of the questioonaire structure is represented in Figure 4.3.

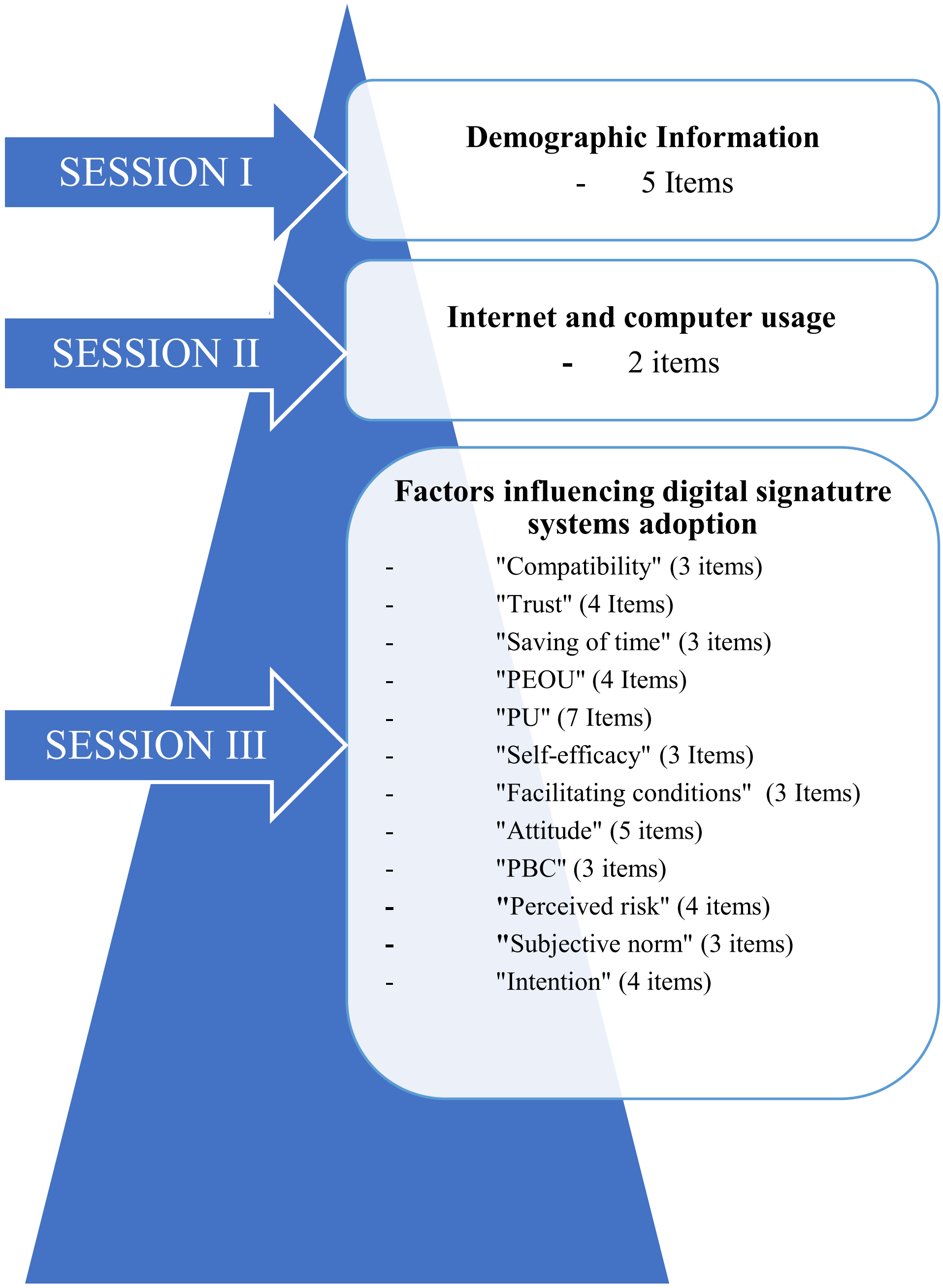


Figure 4.3: Representation of the questionnaire structure

4.4.1. Reliability

To obtain the Cronbach alpha, a reliability test was performed on each of the items stated in the research model of this study. “Perceived usefulness” has the highest Cronbach alpha value of 0.858, followed by “perceived risk”: 0.846, “Intention”: 0.825, “Compatibility”: 0.812, “Saving of time”: 0.794, “PEOU”: 0.773, “Subjective norm”: 0.761, “Attitude”: 0.731, “Trust”: 0.724, “PBC”: 0.721, “Facilitating condition”: 0.719, “Self-efficacy”: 0.666. The overall Cronbach alpha for the study is 0.762. Following the guidelines outlined by Robinson et al. (2013), a Cronbach’s Alpha value must be at least 0.6 to be regarded adequate. The results in Table 4.3, show that the reliability test carried out on the questionnaire is good.

Table 4.3: Questionnaire dimensions and reliability test

Dimensions	References	Number of items	Cronbach alpha
Compatibility	Aydin et al. (2018)	3	.812
Trust	Aydin et al. (2018)	4	.724
Saving of time	Aydin et al. (2018)	3	.794
Perceived usefulness	Aydin et al. (2018)	7	.858
PEOU	Aydin et al. (2018)	4	.773
Attitude	Aydin et al. (2018)	5	.731
Self-efficacy	Aydin et al. (2018)	3	.666
Facilitating condition	Aydin et al. (2018)	3	.719
PBC	Aydin et al. (2018)	3	.721
Perceived risk	Kapadia and Vaghela (2016)	4	.846
Subjective norm	Aydin et al. (2018)	3	.761
Intention	Aydin et al. (2018)	4	.825
TOTAL		**46**	**.762**

4.5. Data Analysis Methods

The relevant statistical analysis was performed using the Statistical Package for Social Sciences (SPSS). The descriptive analysis was used to examine the demographic data. To evaluate the link between the constructs employed in the study, the correlation matrix was carried out using bivariate correlation. Hypotheses were tested using single linear regression analysis.

4.6. Ethical Consideration

Before conducting this research, ethical approval was requested from the university ethical committee. The proposal and questionnaire were examined by the Ethical Committee for Scientific Research of Applied Sciences at Near East University, which provided the researcher an ethical approval letter, which is attached to the appendix part of this study. The respondents' participation in this study was voluntary and the confidentiality of the data acquired is kept confidential.

4.7. Research Procedure

In the cause of this research as shown in Figure 4.4, the following procedures were taken:

1. *Literature review:* The literature of articles related to this research were reviewed from the beginning till the end of this research. The literature helped to understand the evolution and the current state of digital signature systems. It helped to understand various researches that have been carried out relating to the factors affecting individuals from adopting the technology.
2. *Thesis proposal:* A thesis proposal was submitted to the Computer Information Systems department for review and approval to continue with the research.
3. *Ethical committee:* An ethics application form was submitted to the university ethical committee for review and to also permit the distribution of the questionnaire and carry out the research.
4. *Questionnaire distribution:* The survey questionnaire was distributed via online platforms using the google form function.

5. *Data analysis:* The data was collected and analyzed using the IBM SPSS statistics 26 program. Proper documentation about the result was made.

During the process of this research, the supervisor was duly informed about each phase; corrections and feedbacks made were put into consideration and necessary actions were taken.

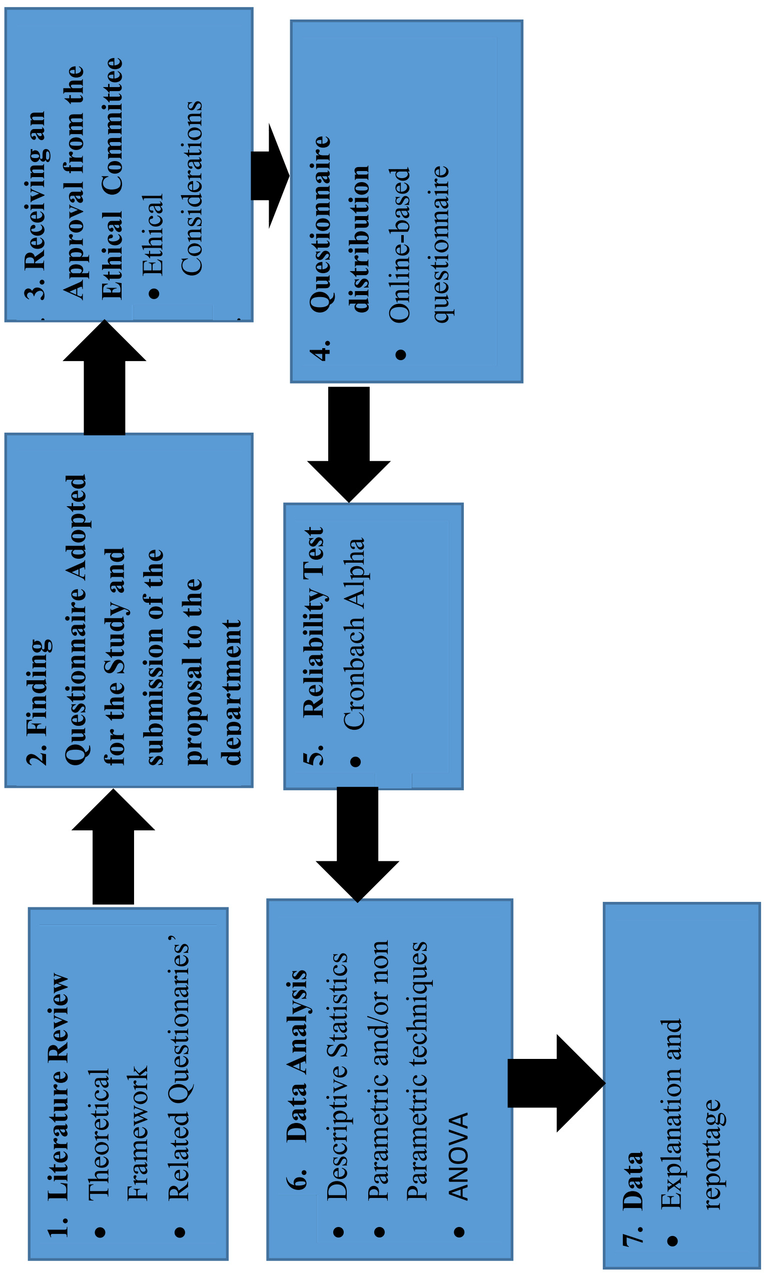


Figure 4.4: Research process or procedure

CHAPTER V

RESULTS AND DISCUSSION

To completely comprehend the study, this chapter describes the study findings that were acquired following data analysis with references to earlier research. Each research item presented in the research model is thoroughly examined, and the findings are presented.

5.1. Constructs Correlation

A correlation matrix is a straightforward approach to summarize all of the variables in a datase's correlations. The correlation matrix as represented in Table 5.1 is symmetrical and summarizes the linear dependence between various pairs of dimensions. The relationship between "perceived ease of use" and "perceived usefulness" 0.764 shows that they are strongly positively correlated while the relationship between "perceived risk" and "compatibility, trust, saving of time, perceived usefulness, perceived ease of use" shows they are weekly negatively correlated. A value of 0.55 shows that there's little association between intention to adopt the technology and the user's "perceived risk". Overall, the majority of the constructs proved to be significantly correlated to each other.

Table 5. 1: Correlation matrix

Correlations

	CPT	TST	ST	PU	PEOU	ATT	SE	FC	PB	PR	SN	BI
CPT	1											
TST	.481**	1										
ST	.537**	.488**	1									
PU	.634**	.628**	.731**	1								
PEOU	.507**	.556**	.713**	.764**	1							
ATT	-.311**	-.155**	-.283**	-.291**	-.201**	1						
SE	.344**	.417**	.450**	.485**	.548**	-.091	1					
FC	.284**	.296**	.355**	.414**	.452**	.133**	.365**	1				
PB	.347**	.503**	.519**	.571**	.595**	-.033	.576**	.444**	1			
PR	-.320**	-.261**	-.275**	-.356**	-.283**	.729**	-.186**	.088	-.177**	1		
SN	.438**	.550**	.465**	.606**	.557**	-.079	.458**	.465**	.564**	-.152**	1	
BI	.191**	.341**	.297**	.289**	.329**	.057	.240**	.223**	.265**	.055	.339**	1

of 0.01 (2-tailed) shows that correlation is significant

5.2. Hypothesis Testing

The model outcomes were estimated using Linear Regression Analysis, as shown in Table 5.2. A total of 15 hypotheses were formulated for this research and the result of the regression test shows that 13 of the hypotheses were significantly supported, while 2 of the hypotheses were not supported. Based on the findings, it can be concluded that "perceived risk" and "attitude" have no significant effect on user intention to adopt the digital signature systems. Based on the formulated or proposed hypotheses, as compared to the result of the hypotheses of this research, the effect of attitude on intention gave a contrary result while the effect of "perceived risk" on "intention" supported the proposed hypothesis.

Table 5.2: Testing hypothesis

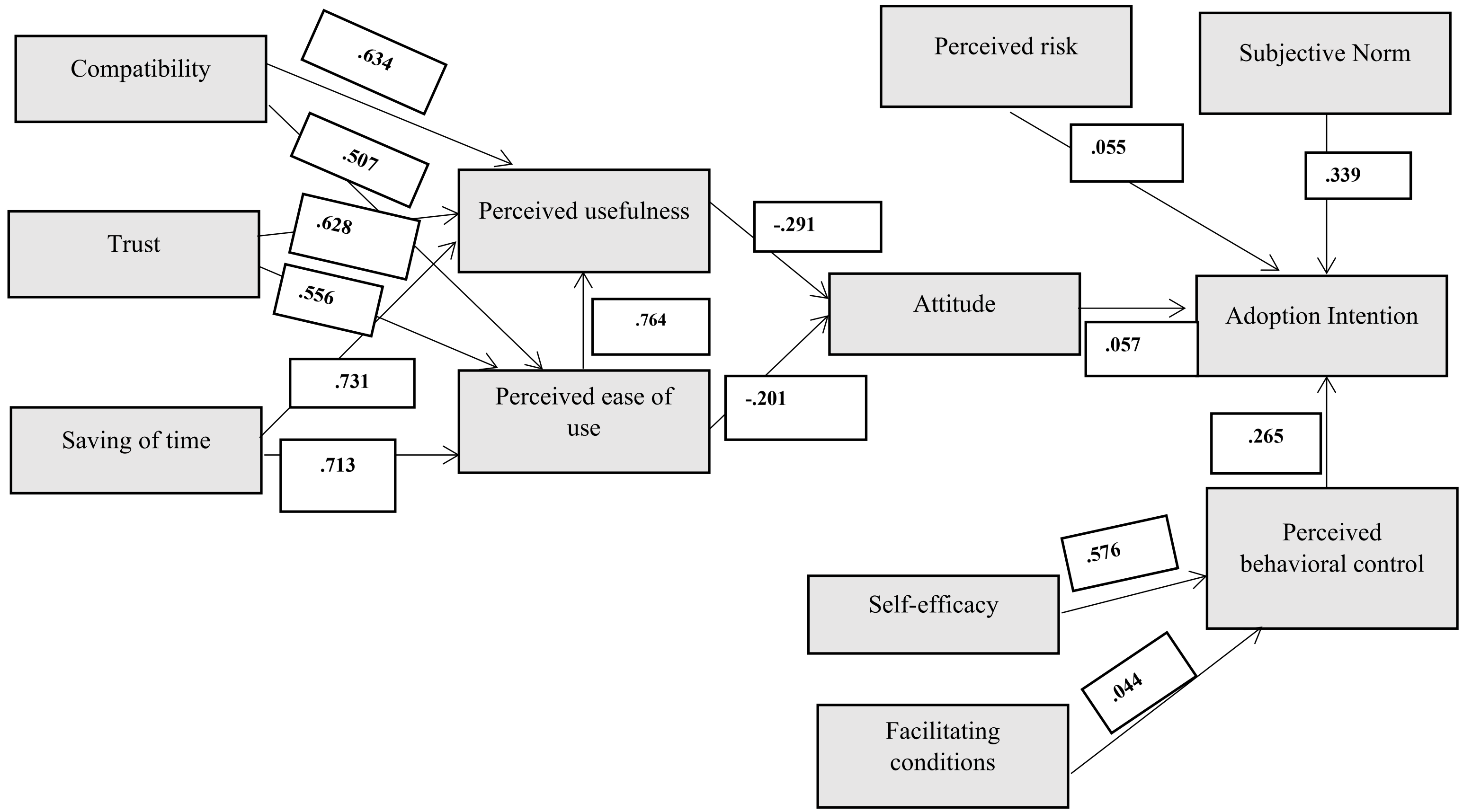
Hypothesis		Unstandardized Coefficients		Standardized Coefficients			
		B	**Std. Error**	**B**	***t***	**p**	**Decision**
H1a	CPT→PU	1.505	.095	.634	15.912	.000	Supported
H1b	CPT→PEOU	.717	.063	.507	11.415	.000	Supported
H2 a	TST→PU	1.000	.064	.628	15.650	.000	Supported
H2b	TST→PEOU	.528	.041	.556	12.981	.000	Supported
H3a	ST→PU	1.541	.074	.731	20.754	.000	Supported
H3b	ST→PEOU	.897	.045	.713	19.744	.000	Supported
H4a	PEOU→PU	1.282	.056	.764	22.968	.000	Supported
H4b	PEOU→AT	-.291	.073	-.201	-3.986	.000	Supported
H5	PU→AT	-.250	.042	-.291	-5.891	.000	Supported
H6	SE→PBC	.632	.046	.576	13.661	.000	Supported
H7	FC→PBC	.443	.046	.444	9.600	.000	Supported
H8	AT→IT	.044	.040	.057	1.106	.269	Unsupported
H9	PBC→IT	.373	.070	.265	5.322	.000	Supported
H10	PR→IT	.044	.042	.055	1.059	.290	Unsupported
H11	SN→IT	.457	.065	.339	6.990	.000	Supported

Independent → dependent

CPT- "Compatibility", PU- "Perceived usefulness", PEOU- "Perceived ease of use", TST- "Trust", ST- "Saving of time", AT- "Attitude", SE- "Self-efficacy", PBC- "Perceived behavioral control", IT- "Intention", PR-"perceived risk", SN- "Subjective norm".

The inter-relationships between the variables in the model are shown in Figure 5.1, using standard regression coefficients.

Figure 5.1: Standard coefficients showing the inter-relationship between the variables



5.2.1 Effects of compatibility on perceived usefulness

From the analysis, the value of p=0.000, β= .634, t=15.912. The co-efficient value $p<0.05$ signifies that "compatibility" has a significant positive effect on the "perceived usefulness" of the digital signature systems. "compatibility" accounts for 63.4% of the variance in the "perceived usefulness" of the technology. Therefore, hypothesis H1a is supported. In the study of Kanchanatanee et al. (2014), Ali et al. (2014), and Mijin et al. (2019) similar results were recorded.

5.2.2 Effects of compatibility on perceived ease of use

Based on the value p=0.000, β=.507, t=11.415, the co-efficient value p is <0.05 which shows that the effect of "compatibility" is positively significant on the "perceived usefulness" of the adoption of the digital signature service. "Compatibility" accounted for 50.7% of the variance in "perceived usefulness". This indicates that compatibility positively affects perceived usefulness. Therefore, Hypothesis H1b is supported. Isaac et al. (2016) and Aydin et al. (2018) found a similar result in their study.

5.2.3 Effects of trust on perceived usefulness

p=0.000, β=.628, and t=15.650. The coefficient value of $p<0.05$ indicates that the effect of users' "trust" is positively significant towards the "perceived usefulness" as part of the factors affecting the "intention" to adopt digital signature systems. "Trust" accounted for 62.8% of the variance in "perceived usefulness". Therefore, Hypotheses H2a is supported and similar results were recorded in the study of Al-Gahtani (2011) and Dhagarra et al. (2020).

5.2.4 Effects of trust on perceived ease of use

With the result showing that p=0.000, β=.556, t= 12.981, it can be concluded that the result is significant. $P<0.05$ signifies that the effect "trust" has on the "perceived ease of use" is positively significant and "trust" accounted for 55.6% of the variance in "perceived ease of use". So, Hypothesis H2b was supported. A contrary result was recorded in the study of Dhagarra et al. (2020).

5.2.5 Effects of saving of time on perceived usefulness

Considering the value $p=0.000$, $\beta=.731$, $t=20.754$. The coefficient value of $p<0.05$ implies that the effect that "saving of time" has on "perceived usefulness" is positively significant in users' "intention" to adopt the digital signature systems. The difference in "perceived usefulness" was explained by 73.1% of the variance in "saving of time". Therefore, hypothesis H3a is supported. Aydin et al. (2018) had a similar result.

5.2.6 Effects of saving of time on perceived ease of use

$p=0.000$, $\beta=.713$, $t=19.744$. The coefficient value of $p<0.05$ indicates the way users feel "saving of time" towards the use of digital signature systems would positively affect their "perceived ease of use" towards adopting digital signature. The difference in "perceived ease of use" was explained by 71.3% of the variance in "saving of time". Therefore, hypothesis H3b is positively significant and is supported. A similar outcome was recorded in a study conducted by Alrowili et al. (2015).

5.2.7 Effects of perceived ease of use on perceived usefulness

$p=0.000$, $\beta=.764$, $t=22.968$. In considering the factors that can influence individuals to adopt the digital signature system, the co-efficient value indicated that "perceived ease of use" of the system has a positive and significant effect on its "perceived usefulness". "Perceived ease of use" accounted for 76.4% of the perceived usefulness. Therefore, hypothesis 4a is supported. The study of Ke et al. (2012) and Sugandini et al. (2018) also showed that the influence of "perceived ease of use" towards "perceived usefulness" is also significant.

5.2.8 Effects of perceived ease of use on attitude

The value of p=0.000, β= -.201, t= -3.986. The result indicates that the coefficient value of p is <0.05 which means “perceived ease of use” has a significant influence on individual “attitude” to adopt the digital signature system. “Perceived ease of use” accounted for 20.1% of the variance in attitude. “Perceived ease of use” had a significant negative effect on “attitude”. Hypothesis H4b is supported but in the opposite direction. In Buabeng-Andoh (2018) study, “perceived ease of use” had a significant but positive effect on “attitude”.

5.2.9 Effects of perceived usefulness on attitude

p=0.00, β= -.291, t= -5.891. From the result, it is indicated that the coefficient value of p is < 0.05 which means “perceived usefulness” has a significant influence on individual “attitude” to adopt the digital signature system. “Perceived usefulness” accounted for 29.1% of the variance in attitude. “Perceived usefulness” had a significant negative effect on “attitude”. Therefore, hypothesis 5a is supported but in the opposite direction. “perceive usefulness” has little or no influence on attitude to adopt the digital signature systems. This is contrary to the findings recorded in Aydin et al., (2018).

5.2.10 Effects of self-efficacy on perceived behavioral control

p=0.00, β=.576, t=13.661. The values of the result signify that the coefficient value is p<0.05 which means that “self-efficacy” has a significant influence on the “perceived behavioral control” in adopting the digital signature systems. ”Self-efficacy” accounted for 57.6% of the variance in “perceived behavioral control”. Hypothesis H6 is positively significant; Therefore, the hypothesis is supported. A similar result was recorded in Ho et al. (2020).

5.2.11 Effects of facilitating condition on perceived behavioral control

The result showed that p=0.000, β=.444, t=9.600. The co-efficient value of $p<0.05$ signifies that "facilitating condition" has a significant effect on "perceived behavioral control". The value β=.444 indicates that "facilitating condition" accounted for 44.4% of the variance in "perceived behavioral control". Therefore, Hypothesis H7 is supported and a similar result was recorded in the study of Choi and Park (2020).

5.2.12 Effects of attitude on intention

p=0.269, β=0.057, t=1.106. The coefficient value of $p>0.05$ indicates that individual "attitude" had an insignificant influence on "intention" to adopt the digital signature systems. "Attitude" accounted for 5.7% of the variance in "intention" to adopt digital signature systems. Therefore, "attitude" had an insignificant and positive influence on "intention" to use the system. Hence, hypothesis H8 is not supported. A contrary result was recorded by Zahid and Haji Din (2019).

5.2.13 Effects of Perceived Behavioral Control on Intention

The value p=0.000, β=.265, t=5.322. It can be derived from the result that the coefficient value of $p<0.05$ connotes that "perceived behavioral control" had a positive and significant effect on the "intention" to adopt the digital signature systems. "Perceived behavioral control" accounted for 26.5% of the variance in "intention" to use the system. Hypothesis H9 is supported. Ho et al. (2020) and Zahid and Haji Din (2019) recorded a similar result in their findings.

5.2.14 Effects of Perceived Risk on Intention

p=.290, β=.055, t=1.059. From the result, the coefficient value of $p>0.05$ signifies that "perceived risk" has a positive insignificant effect on "intention" to adopt the digital signature systems. "Perceived risk" accounted for 5.5% of the variance in "intention" to adopt the system. Therefore, hypothesis H10 is not supported. A dissimilar result was found in the study of Habib and Hamadneh (2021), and Xie et al. (2021).

5.2.15 Effects of subjective norm on intention

$p=0.000$, $\beta=.339$, $t=6.990$. The coefficient value of $p<0.05$ implies that the effect of "subjective norm" on the "intention" to adopt the digital signature systems is positively significant. The difference in "intention" was explained by 33.9% of the variance in the "subjective norm". Therefore, hypothesis H11 is supported. A contrary result was found in the study of Peña-García et al. (2020).

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

This section of the study tends to summarize the entire study with a focus on the findings and future research recommendations. The researcher discusses observations made during the research and how some of the study's limitations could be addressed in future research.

6.1. Conclusion

The daily use of documents and stamps by individuals, organizations, and institutions is unavoidable. The usual manual method of stamping documents takes time, energy, and resources. The development and essence of information technologies (IT) are to bring ease and allow the individual to carry out their tasks conveniently and promptly. In this area, IT has helped with digital signature technology. It is safe (security), fast, reliable, and reduces transaction costs. Therefore, it is expected of individuals, institutions, organizations to adopt digital signature technology. The possible factors affecting the adoption intention of digital signature systems were investigated in this study. 15 hypotheses were tested in this research and 2 of the hypotheses were not supported. The analysis result shows that "compatibility", "trust", "saving of time" has a positive and significant effect on "perceived ease of use" and "perceived usefulness". "perceived ease of use" also has a positive and significant effect on "perceived usefulness" of the digital signature technology. The result indicates that the effect of "attitude" on "perceived ease of use" and "perceived usefulness" is supported in the opposite direction i.e there is a decrease in the "attitude", for a unit change in the "perceived usefulness" and "perceived ease of use" variable. "Self-efficacy" and "facilitating condition" shows a positive and significant effect on "perceived behavioral control". Users' "attitude" to adopt and "perceived risk" doesn't have a significant effect on "intention" to adopt the digital signature technology. The result also shows that "perceived behavioral control" and "subjective norm" have a positive and significant effect on the users' intention to adopt the digital signature technology.

It can be concluded based on the analysis result that in determining the factors affecting the adoption intention of digital signature technology, "saving of time" has the most significant influence on "perceived usefulness" with a rate of 73.1%, while "perceived usefulness" has the most important influence on "perceived ease of use" with a rate of 76.4%. "self-efficacy" is the most important factor that influence "perceived behavioral control" with a rate of 57.6% and also, "subjective norm" is the most important factor that determines users' intention" to adopt the digital signature technology.

6.2 Recommendations

There are some limitations to this study that needs to be considered by future researchers. Therefore, the following are recommended for future researches:

- The factors of this research did not consider the actual use of the digital signature systems, so it is recommended for future researchers to include a factor that can help to investigate factors affecting the actual usage of the system and by doing this, a reliable result can be obtained by acquiring the research data from people who have used the system.
- It is also recommended for future researchers to consider more participants for the study survey. It is hoped that having more participants who have at least a little knowledge of digital signature technology, would help to improve the result of the study.
- More external factors can also be added to the extended model in the future for a better understanding of factors that affects the adoption intention or actual use of the consumers' use of the digital signature systems.

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APPENDICES

APPENDIX A
ETHICAL APPROVAL LETTER

YAKIN DOĞU ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMALAR ETİK KURULU

28.07.2020

Dear Ajamu Janet

Your application titled **"Analysing the benefits and factors affecting the adoption of digital signature system with the technology acceptance model"** with the application number YDÜ/FB/2020/99 has been evaluated by the Scientific Research Ethics Committee and granted approval. You can start your research on the condition that you will abide by the information provided in your application form.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of theScientificResearchEthicsCommittee

Direnc Kanol

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.

APPENDIX B
THESIS QUESTIONNAIRE

INVESTIGATING FACTORS AFFECTING THE ADOPTION INTENTION OF DIGITAL SIGNATURE SYSTEM

Dear Participant,

This scale is part of a research study that is being carried out in order to figure out the benefits and factors affecting the adoption and the use of digital signatures by universities and different organizations. Necessary data needed will be collected through this scale. By filling in the following scale, you agree to participate in this study.

Please note that your participation in the study is voluntary and whether you agree to participate or not will have no impact on your privacy. Your identity will not be revealed in any case to third parties. The data collected during the course of this study will be used for academic research purposes only and may be presented at national/international academic meetings and/or publications. You may quit participating in this study at any time by contacting us. If you opt-out of the study, your data will be deleted from our database and will not be included in any further steps of the study. In case you have any questions or concerns, please contact us using the information below.

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Online survey form

A simple definition of Digital signature: Digital Signature is a process that guarantees that the contents of a message have not been altered in transit. When you, the server, digitally sign a document, you add a one-way hash (encryption) of the message content using your public and private key pair.

* Required

DEMOGRAPHICS INFORMATION

1. Gender *

Mark only one oval.

- Female
- Male

2. Age *

Mark only one oval.

- 20 - 30 years
- 31 - 40 years
- 41 - 50 years
- 51 - 60 years
- 61 and above

3. Nationality *

Mark only one oval.

- Nigeria
- Cyprus
- Turkey
- Zimbabwe
- Iraq
- Other: ____________________

4. Education Level *

Mark only one oval.

- Undergraduate
- Master
- PhD
- Other: ____________________

5. Job *

Mark only one oval.

- ( ) Student
- ( ) Lecturer
- ( ) Administrative staff
- ( ) Other: ____________________

INTERNET AND COMPUTER USAGE

6. How many hours do you use the internet in a day? *

Mark only one oval.

- ( ) Less than 2 hours
- ( ) 2 hours - 3 hours
- ( ) 4 hours - 5 hours
- ( ) More than 5 hours

7. How many hours do you use the computer in a day? *

Mark only one oval.

- ( ) Less than 2 hours
- ( ) 2 hours - 3 hours
- ( ) 4 hours - 5 hours
- ( ) More than 5 hours

Assessment Information

8. Using the digital signature system will fit well with the way I work. *

Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

9. Using the digital signature system will fit into my work style. *

Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

10. The setup of the digital signature system will be compatible with the way I work. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

11. I feel comfortable as my data is protected by more professional people in the Digital Signature System *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

12. I do not think the Digital Signature System still has gaps in security and privacy. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

13. Although the Digital Signature system is a new technology, I think my data will be safe. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

14. I fully trust the Digital Signature System. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

15. Using digital signature systems are saving time. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

16. Using Digital signature system allows users to perform the service without the need to fill the paper documents. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

17. Using digital signature system allows organizations and university sectors to organize the work and serve the users in a short time. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

18. Using the Digital Signature System will be useful in my life. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

19. The Digital Signature System will make my work practical. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

20. Using digital signature system would improve my effectiveness. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

21. Using digital signature system would improve my performance. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

22. Using the Digital Signature System will make my work easier. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

23. Using the Digital Signature System will reduce my costs. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

24. The Digital Signature System will provide more data security *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

25. Learning to use digital signature system would be easy for me. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

26. It would be easy for me to become skillful at using digital signature system. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

27. I find that the process of using the digital siganture system was clear, understandable and straight forward *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

28. Using the Digital Signature System does not require great effort. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

29. I am undecided about using the Digital Signature System because I do not find it safe. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

30. Using the Digital Signature System will be a pleasant experience. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

31. I find the Digital Signature System unnecessary. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

32. Using the Digital Signature System is a bad idea. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

33. Using the Digital Signature System will make me uneasy *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

34. I would feel comfortable using a digital signature system on my own. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

35. I would be able to use digital signature system reasonably well on my own. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

36. I would be able to use a digital signature system even if there was no one around to help me. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

37. Resources required to use a digital signature system were available to me. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

38. I had access to hardware, software, and services needed to use a digital signature system. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

39. I was constrained by the lack of resources needed to use the digital signature system. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

40. I would be able to use the digital signature system well. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

41. Using the digital signature system was entirely within my control. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

42. I had the resources, knowledge, and ability to use the digital signature systems. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

43. It is probable that the digital signature system would not be worth its cost. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

44. It is probable that the digital signature system would frustrate me because of its poor performance. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

45. Comparing with other technologies, using digital signature has more uncertainties. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

46. It is uncertain whether the digital signature system would be as effective as I think. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

47. People (peers and experts) who are important to me support my use of the digital signature system. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

48. People who influenced my behavior wanted me to use digital signature system instead of any alternative means. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

49. People whose opinions I valued preferred that I use digital signature system. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

50. I intend to use the Digital Signature System in the future *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

51. I think the Digital Signature System will be used by all staff in the future *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

52. I recommend the use of the Digital Signature System to all my colleagues *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

53. I don't think I will use the Digital Signature System. *

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Thank you for your time and contribution.

APPENDIX C
SIMILARITY REPORT

JANET AJAMU-THESIS

ORIGINALITY REPORT

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