CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter places ISs in a historical context, then defines an IS after which it introduces SISs. The chapter introduces those factors essential for ensuring the IS provides a high quality service and output. It then presents a review of user satisfaction and intention to use which includes the effect of Islamic features. Then models and various theories related to ISs in current use are presented and evaluated after which key gaps in present knowledge of ISs are identified. The chapter ends with a summary.

2.2 Information Systems (IS)

This section covers the various concepts regarding ISs that have been discussed in the literature. Historically, after World War II, the advancements in computer networks led to the emergence of information science as a discipline in its own right (Manoj et al. 2008). Knowledge and the communication of knowledge have always existed. However, the key difference between historic conditions and today is the advances in technology. Pauwels et al. (2017) and Ali et al. (2015) reported that information is obviously key for economic development, together with capital, labor, and raw materials, but the ability to represent information digitally is what makes it significant.

The information technology revolution is a current strength and enabling power for all nations. The introduction of the Internet as a modern communication network ignited the revolution of information creation and use, which is today a key success factor in the economy of most countries.

Nowadays, large corporations depend on analyzing vast amounts of data before making decisions. Big companies do not make random decisions but rely on acquiring and analyzing vast amounts of appropriate information before taking a decision (Atta, 2017).

Information plays an important part in many fields and processes associated with human life particularly through its various applications in business, social and educational organizations (Ali et al., 2018). So-called electronic and virtual universities rely mainly on ISs and modern means of communication. There are many definitions of information. Amongst them is data that has been classified and organized to enable users to take advantage of it (Luciano 2010). Salah (2009) defined information as data that have been processed to allow its utilization for future operations, and decision-making. Comprehensible knowledge is information collected, arranged and introduced in a coherent and useful form. Thus, data are the raw materials for information production, which corresponds with the concept of system (Fayoumi (2017)). Information is the basis of ISs, and most existing systems provide information for their users based on user needs. The following section covers the basics of ISs.

2.2.1 Definitions of Information Systems

Jessup (2008) defines an IS as the collaboration of corresponding networks of hardware and software that system users use to collect, distribute, filter, process, and

create data. Young et al. (2018) defined IS as the total of all the methods, tools, procedures and techniques used by an organization for processing data. Organizations introduce ISs into their procedures to enhance competitiveness and facilitate business development and success (Berisha-Shaqiri (2015)).

Göhre (2018) mentioned that ISs are a part of organizations and are the result of standard operating tasks, workflows, policies, structures, and organizational culture. Alter (2013) showed that an IS may include a variety of domains, such as design and analysis, information security, database management computer networks, and decision support systems.

In the literature, some researchers differentiate ISs from computer systems and business processes. ISs focus on the end users of the information and may include an information and communications technology (ICT) side. Computer systems are totally concerned with ICT.

Business processes are different because they control the performance of the business (Moisescu and Sacala 2016). Alter and Bork, (2019) classify information systems as special types of work system. A work system is a system that is operated by humans or machines to provide services or products for customers using the resources available. An IS is a work system the main focus of which is to capture, transmit, store, retrieve, manipulate, and display information (Alter, 2017).

According to Kroenke (2015), six key components are vital to any information system:

1. Hardware: Computers including the processing, input, and output units.
2. Software: The computer program that processes data to produce information.

3. Data: Digitally represented facts that are used to generate information.
4. Procedures: Sets of policies that govern the flow of the system.
5. People: Groups of system users and operators. Usually, this component is the most neglected, although it is the most significant to the system's success or failure (David, 2015).
6. Feedback: An additional component of the system. However, it is not essential for the success of the system.

2.2.2 Structure of Information Systems

Traditional ISs were based on the hierarchy of the organization, in which basic transactions were conducted at the base of the managerial pyramid. Management information systems came next followed by decision support systems and, finally, the executive information system at the top of the pyramid (Göhre, 2018). However, Rainer et al. (2012) reported that modern ISs no longer fit into the pyramid model, examples of such are:

- Data warehouses.
- Enterprise resource planning.
- Enterprise systems.
- Expert systems.
- Search engines.
- Geographic information systems.
- Global information systems.
- Office automation.

According to Polack (2009), ISs use computers, are computer driven information systems that carry out digitally based tasks. Polack presented a detailed view of the IS components:

1. Hardware: these are the devices like the monitor, processor, printer, and keyboard, all of which work together to accept, process, and show data and information.
2. Software: the programs that allow the hardware to process the data.
3. Databases: the gathering of the associated files containing relevant data.
4. Networks: connecting systems that allow diverse computers to distribute resources.
5. Procedures: the commands for combining the above components to process information and produce the required output.

Brust et al. (2017) suggested that any information system should consist of the following:

1. Environment: the system's environment is a set of factors and components, including relationships and factors that are not part of the system, it consists of all the variables and subsystems that are not part of the system, but which are affected by and affect the system.
2. Boundary: represents the scope of the work that is required. For instance, the system may contain new information about sales and customers, but without including the stock.
3. Inputs: basic facts that need further processing in the system. The system's users or sub-systems outside the system may carry out these processes.

4. Processes: are a set of operations that specify and govern the tasks in the system and the order in which they are carried out.
5. Subsystem: is a system that plays a complementary role to the larger system.
6. Relationships: the set of links that defines the connections of the system to external sub-systems and environment.
7. Outputs: the information that results from the processing of data in the system, which can be represented in the form of reports, tables, and queries.
8. Feedback: a system control method that improves the system's performance by recycling all or part of the system's output as input. Systems can take advantage of the feedback to revise or clarify the user's requirements.

Most ISs in today's market consist of three layers (see Figure 2.1):

1. Operational support: this layer includes different transaction processing systems for designing, producing, marketing, and delivering outputs and services. The base layer of the IS is the operational support layer.
2. Support of knowledge work: this is the middle layer. It includes subsystems for sharing information inside the organization.
3. Management support: this layer consists of subsystems to manage and evaluate the resources and goals of the organization (Encyclopædia Britannica Inc, 2010).

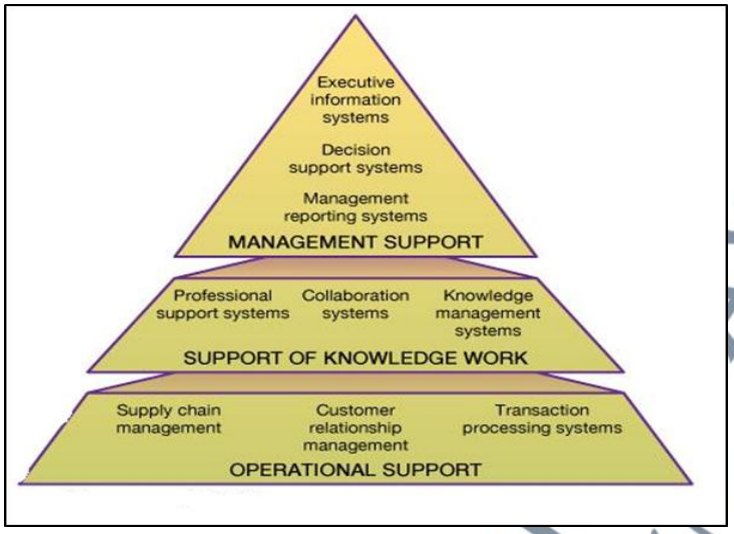


Figure 2.1: Structure of Information System: Encyclopedia Britannica Inc., 2010.

In summary, data are the raw facts that are used to produce information, and a database is an organized set of correlated data that covers a major aspect of the organization's operations. ISs use data from inside and outside the organization.

IS research can be in a variety of fields and may influence the behavior of individuals, groups, and organizations (Galliers et al., 2006). According to Hevner (2008), the research on ISs can be classified into two main categories, namely, (1) the scientific paradigms including behavioral science that focus on formulating and validating theories that predict and justify human and organizational behavior, and (2) design science, which attempts to improve and extend the potential of humans and the organization by generating new innovations.

IS as a field has been evolving over the last 30 years and is a viable and important area for research. The debates amongst IS researchers mainly concern: (1) the influence of IT artefacts, (2) attempts to balance the IT artefacts and IT context, and (3) the interaction between the social and technical aspects of an IS. This research investigates the introduction of Islamic aspects into ISs and so falls into the final category.

2.2.3 Student Information Systems

This research focuses on SISs, which are defined as systems in which data are represented and processed to operate, facilitate, govern, develop, and support decision-making regarding student matters in higher education institutions. SISs include a variety of fields, such as the design and analysis of systems, information security, computer networking, decision support systems, and database management (Gürkut and Nat 2017). Moreover, experts in education have indicated that the use of SISs enables them to achieve better decision-making.

McIntire, (2004) found that the increasing demand for accurate, timely data means educational institutions are relying heavily on IS technologies with data collection, analysis and processing the most important steps. Harsasi and Sutawijaya (2018) believed that universities that gather, analysis, and use information about their organizations make better decisions, not only about what to improve, but also how to institutionalize systematic improvement.

The use of SISs in universities appears to have a positive impact on educational outcomes. However, reporting on the effects of introducing SISs has been patchy. In 2006, the Ateneo faculty of Manilla University launched its SIS, namely the Ateneo Integrated Student Information System (AISIS) which serves as an integrated system for students and staff. Students are able to view their class schedules, exam grades, research programmers and even register for classes, while staff are able to view schedules, student lists, and submit students' marks.

Sousa, (2012) after a survey based on five EU cities defined four main benefits of web-based systems:

1. Compatibility: web-based systems are compatible across all platforms.
2. Efficiency: services and information are made available for any computer connected to the web.
3. Live data security: "web-based applications that provide additional safety by eliminating the need for users to have access to data and back-end servers."
4. Cost-Efficient: low-cost services can reduce the requirements of end users.

Bayangan-Cosidon (2016) reported that, worldwide, the use of computer based SISs "has become very important for the management of educational institutions. In the United States, a number of SIS have been implemented with varying levels of success.

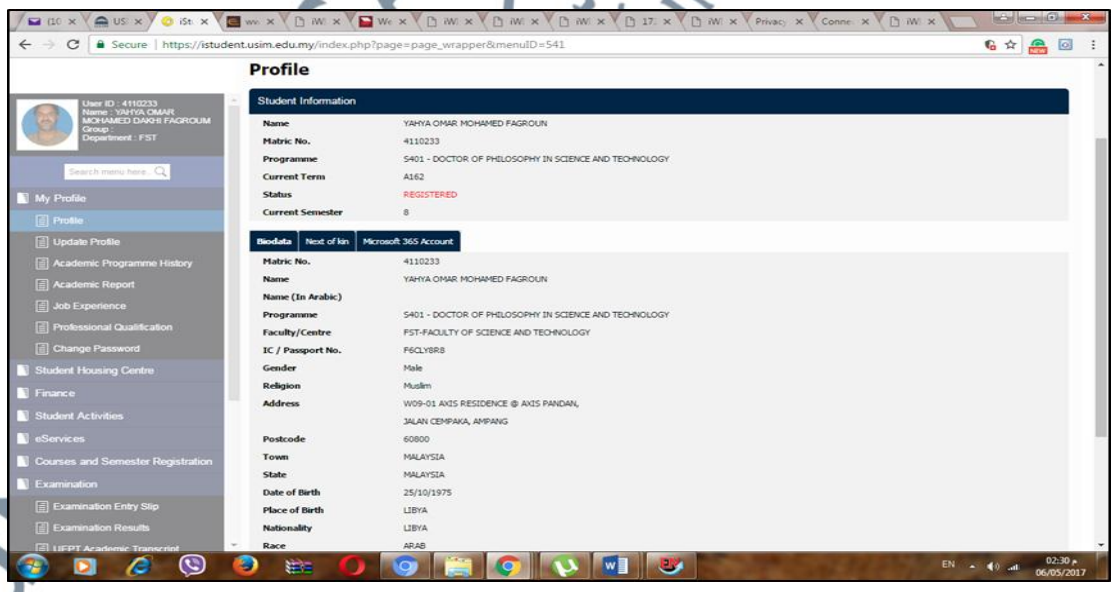
Gürkut and Nat (2017) in their paper entitled: "Important Factors Affecting Student Information System Quality and Satisfaction", highlighted the role of ISs and defined SISs as "an academic field that deals with the generation, collection, organization, storage, retrieval, and dissemination of recorded knowledge." Based on their survey, Demirkol and Seneler (2018) reported that four factors influence SIS usability, namely: useful information, timely access, interface design, and error recovery with the absence of any of these factors causing user inconvenience.

The quality of an IS is a critical matter for system developers as well as IS vendors. Today, the system quality of a SIS is key to the success of educational institutions, as the quality of SIS allows universities to keep up with ever more demanding quality level requirements, and to attain a satisfactory level of user satisfaction Gürkut (2017); Kroemer (2017).

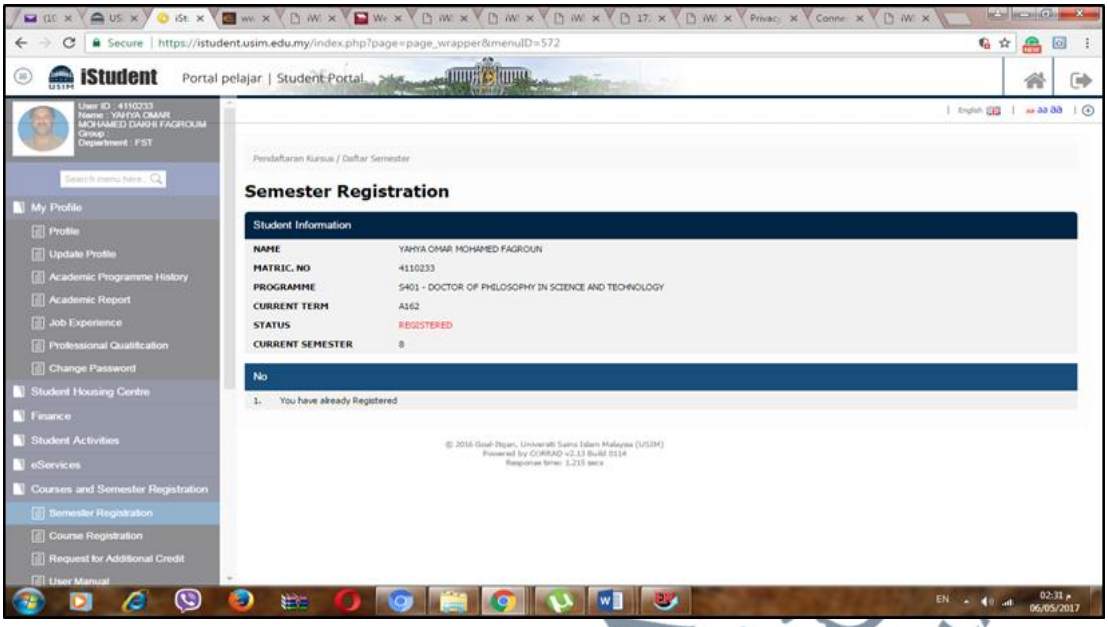
2.2.4 Student Information System at USIM

SISs are intended to provide a simple interface for the easy collection and preservation of student data and for the establishment, management, and provision of reliable, up-to-date information. A SIS deals with all kinds of data from admission to graduation, including subject area plans, attendance records, fee payments, and test results, to name only a few. All this information must be made available through a secure online portal incorporated into the IS for easy access to these data where and when needed. At USIM University the university authorities established a student database as an integrated system via an online web-based SIS system named 'istudent'.

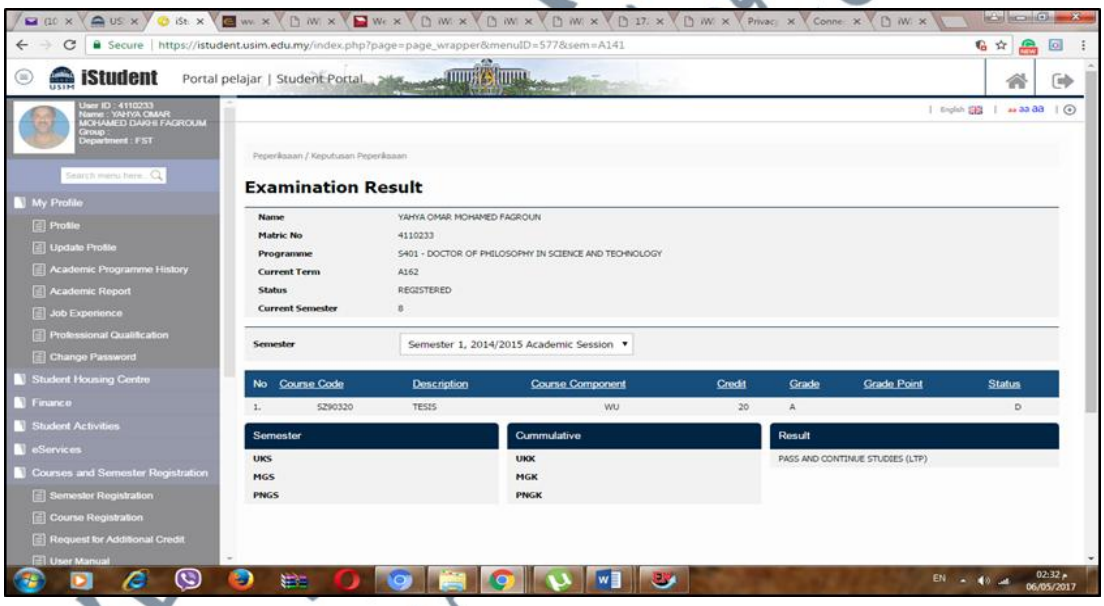
The Centre for Graduate Studies (CGS) manages and monitors academic programs as well as the academic progress of students. The center develops academic research to create knowledgeable, competent, and professional graduates in various fields. Here are some examples of the system interface being used, Figure 2.2 to Figure 2.9.



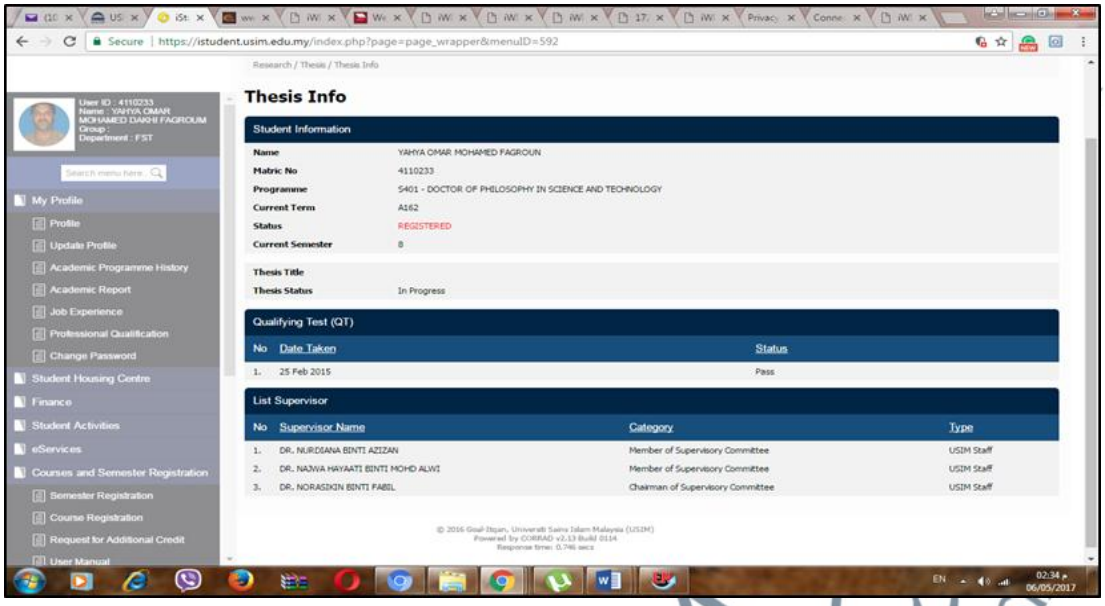
- **Figure 2.2**: Home Page: this interface provides the student with detailed information.



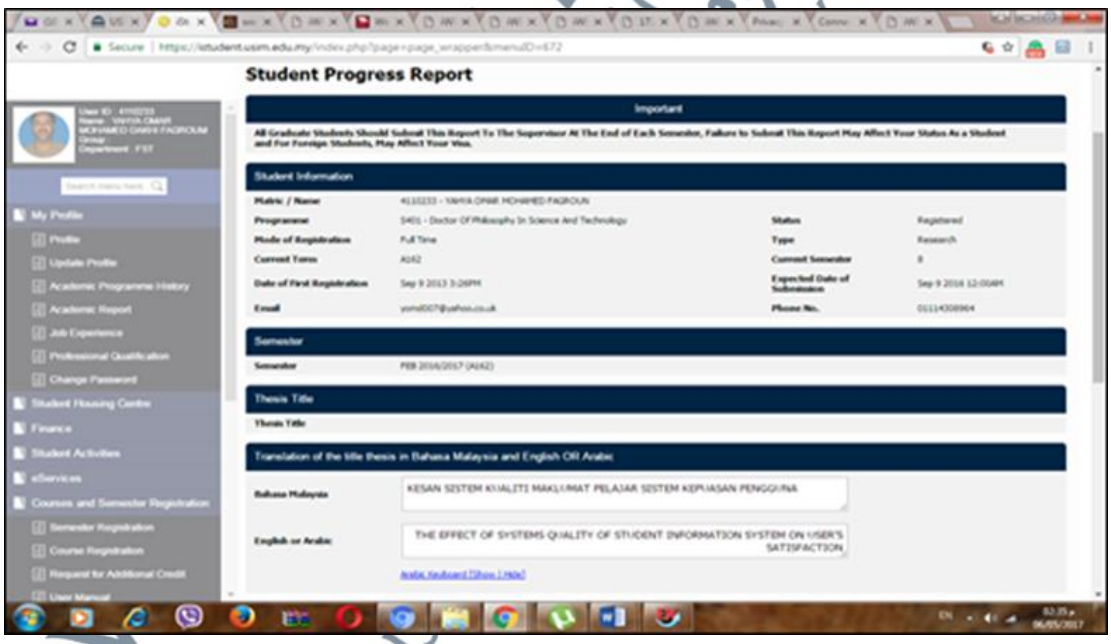
- **Figure 2.3**: Semester Registration: using this interface, the student can review a semester by clicking on the Status button.



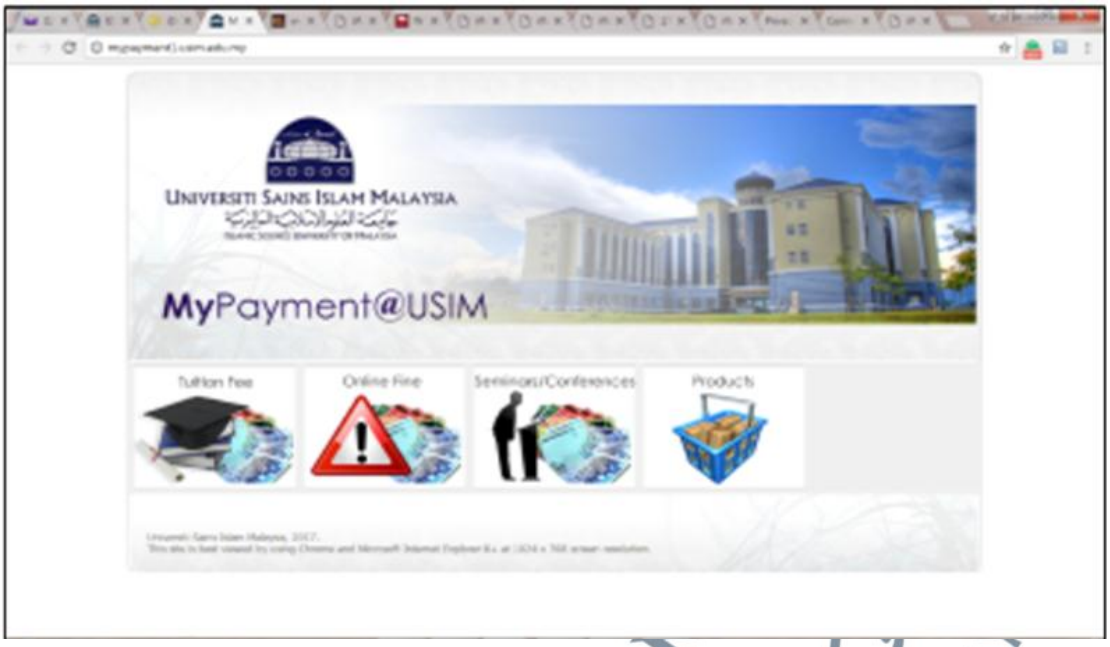
- **Figure 2.4**: Examination Results: using this interface, the student can see their assessment results for every semester.



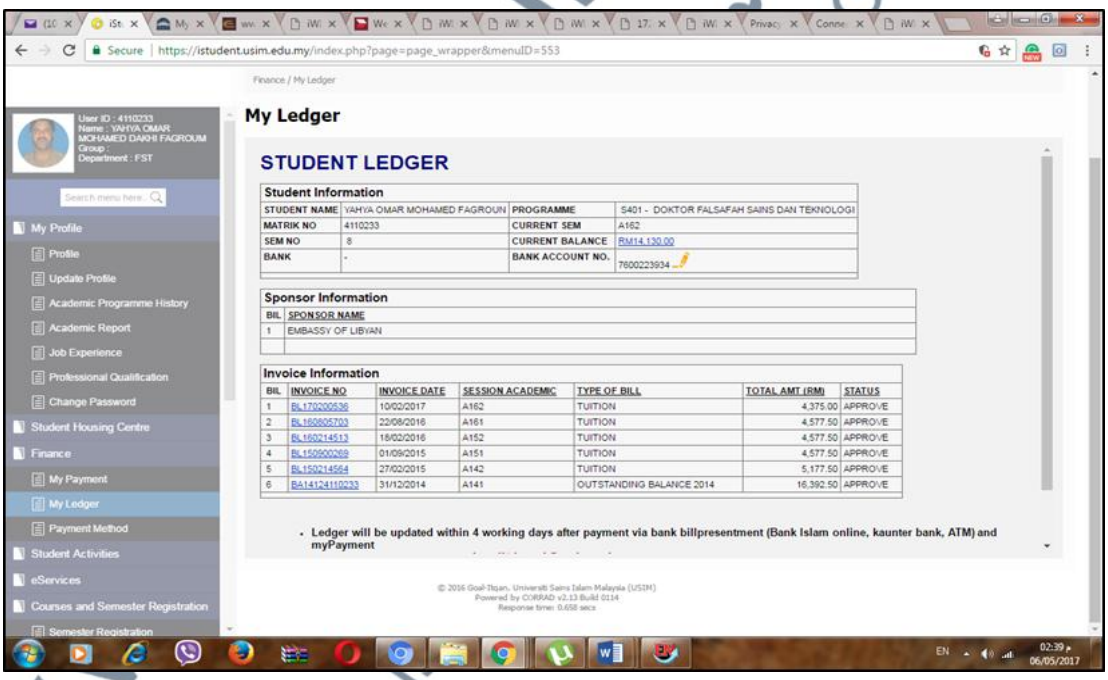
- **Figure 2.5**: Thesis Information: using this interface, the students can find out information about their thesis and supervisors.



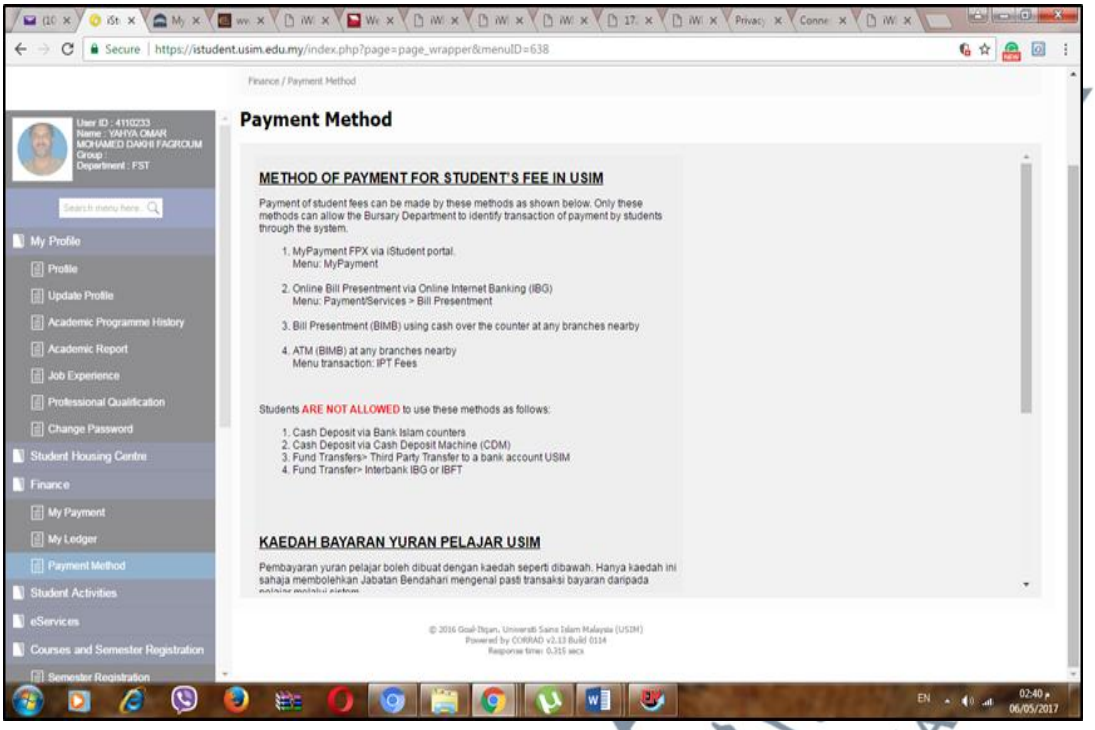
- **Figure 2.6**: Student Progress Report: through this interface, the student can submit their quarterly report and send it to their supervisor.



- **Figure 2.7**: My Payment: using this interface, the student can pay tuition fees.



- **Figure 2.8**: My Leger: this interface contains details of the payment process.



- **Figure 2.9**: Payment Method: this interface shows how the tuition is paid.

2.3 System Quality of IS

System quality is characterized by the quality of information processing. It is usually achieved by employing state-of-the-art technology that contributes significant services and characteristics to IS excellence. Gorla and Lin (2010) after a survey of IS managers found that the software quality of ISs was determined by how easy it was to master and maintain, and how user-friendly and reliable it was. They also showed that technical factors were less important than organizational factors in determining perceptions of software quality.

DeLone and McLean (2003) proposed a model to experimentally validate the success of ISs in several areas, a model that is now widely accepted in the scientific community. Petter et al. (2013) conducted an extensive literature review of more than 600 articles in which they assessed IS success using the D&M model. Several other

studies employed the D&M model to determine IS success in various contexts. According to this model, information quality and system quality are considered the main variables when examining the success of ISs (Ramírez-Correa et al. 2017).

Zuama et al. (2017) assessed factors impacting on the successful use of accounting ISs using the D&M IS success model. They found the model was an acceptable fit to the data and certain features, namely: information quality, satisfaction, system quality, and service quality, were significant predictors of the success of the IS.

System quality refers to the necessary IS features and includes its performance factors. However, if the features that comprise IS quality are not readily usable, they will detract from the users' overall experience. Examples of poor usability are difficulty in understanding functionality, inconsistency in navigating configurations, and poor content and product-based navigation menus. The overall quality of the user experience is usually enhanced by the inclusion of effective usability features. However, the measurement of user satisfaction remains the subject of investigation both by commercial organizations and research teams.

Zuama et al. (2017) stated that accessing information systems needs to be easy and without difficulty to the user in order for them to continue using the system, and that it is valuable if this is accompanied by explicit programs for promoting meaningful use and social appropriation of the information and technology resources.

Jitnupong and Jirachiefpattana (2018) suggested that the interface design of ISs is very important and reported that the most significant and common usability problems were found to lie within the boundaries of the heuristics 'User Control and Freedom' and 'Help and Documentation'. For example, regarding 'User Control and Freedom',

they found that where users were not able to reschedule their own tasks they showed high resistance to continuing to use the system because of low satisfaction with the quality of the IS.

This researcher argues that providing easy access alone is insufficient for ensuring users continue using a particular IS, and that it is important to understand all the factors that enhance the system's quality, such as usability, responsiveness, information quality, and timing of getting the output from the system. In addition, user satisfaction is found to be a critical factor and not easy to attain without understanding the success factors relating to ISs.

2.4 IS Quality Factors

The success of any organization potentially depends on the quality of the products or services offered by their operational systems. Therefore, the quality of the IS is a significant factor in meeting user requirements and giving customer satisfaction (Gürkut, and Nat, 2017; Solikah and Kusumaningtyas 2017). In the field of ISs, there are many common factors that affect IS quality, regardless of the apparent uniqueness of the IS. The following sections cover the most common IS quality factors.

2.4.1 Usability

The ISO/IEC 9126-1 definition of usability concerns the attributes of the product/system that make it understandable, learnable, easy to use, and attractive. In addition, it is defined by ISO as "the extent to which a software or documentation product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (ISO/IEC 25062:2006).

Karjaluoto et al. (2011) reported that the Finnish and Swedish liked systems with clean and simple designs. In more detail, they liked text-based systems because they were rich with information, and without advertisements or animated banners thereby making the navigation quick and responsive. The authors also reported that users specifically mentioned that the left bar was useful and easy to use. A study on the relationship between consumers and online systems by Vila and Kuster (2011) discovered that user satisfaction can be improved by improving (1) information, (2) system usability, and (3) customer service.

Alanazi, (2015) defined usability as the ease of use and learnability of a human-made object. In their research, Laranjeiro et al. (2015) investigated usability in the context of online stores and purchasing decisions. They reported that systems with poor usability constrain consumers during the purchasing operation. Specifically, they highlighted the negative role of inconsistent navigation and poor presentation of content.

Usability is one of the main factors determining system quality and is often referred to as ease of use (Atta, 2017). Elegance and clarity are usually studied to measure usability in Human-Computer-Interaction (HCI) studies. Kroemer (2017). highlighted the difference between usability, user satisfaction, and user experience. He explained that usability includes usefulness and, therefore, is different from the other two. The main usability issues are in the domains of 'User Control and Freedom' and 'Help and Documentation'. Jitnupong and Jirachiefpattana (2018) give an example regarding the user control and freedom, in which users' tasks were not modifiable or scheduled by the users.

Based on the views presented above, the usability factor includes the set of factors presented in Table 2.1.

Table 2.1: Usability Factors

Authors	Usability Factors
Bayangan-Cosidon (2016).	Ease of use
Nordaliela et al. (2013)	Timely access, interface design, error recovery
Kroemer (2017).	Usefulness, simplicity, ad-free
Jitnupong and Jirachiefpattana (2018)	Interface design
Doll and Torkzadeh (1988), McKinney et al. (2002)	Ease of learning
ISO/IEC 9126-1 (2006)	Understandable, ease of learning, easy to use, attractive
Rochimah et al. (2015)	Understandable, learnability operability, attractiveness, compliance
McKinney et al. (2002), Tong, (2011)	Navigation

2.4.2 Functionality

Functionality refers to the degree to which the designed system will perform to meet its intended purpose and it can be captured clearly by the set of portals and services that are offered by the current technology giants, such as Google, Yahoo, and Microsoft (Ord, 2005). It is also understood as the set of features necessary to describe the requirements of a future system. Functionality is one of the most important characteristics of the internal quality of ISs (Wilson et al. 2016).

Parihar, and Bhar (2017) have stressed the importance of functionality and defined it as the capability of the system to deliver the services as expected. Bourgeois, (2018) indicated that an IS should cover the needs of the system users using the core

system components or external modules. Davis, (2021) argued that functionality is the system's ability to fulfil tasks properly. Users facing a complicated functionality may not use the system again due to the complexity and difficulty of obtaining the required output from the system. Davis also highlighted that any delay in adding new functionalities will cause a reluctance to use that IS.

Based on the above discussion, this researcher suggests that the functionality of ISs, in general, and SISs, in particular, is important in ensuring that students use the system frequently, and for them to accept and be satisfied with the overall system. It is concluded that most scholars emphasize the importance of functionality in measuring the quality of ISs. Based on the views presented above, the functionality factors includes a set of factors as presented in Table 2.2.

Table 2.2: Functionality Factors

Authors	Functionality Factors
Davis, (2021).	System ability to fulfil tasks properly
Parihar, and Bhar(2017)	Capability of the system to deliver the service to the user as expected
Čaplinskas and Gasperovič (2005)	Features necessary to describe the requirements of a future system

2.4.3 Flexibility

Nelson et al. (2010) defined system flexibility as "the ability to adapt (IS) to both incremental and revolutionary changes." He also indicated that such factors are not easy to measure and investigate in casual runtime scenarios. Flexibility is usually

considered as a latent construct, which indicates that it cannot be directly measured or observed under normal circumstances. However, insufficient flexibility of ISs clearly restrains users and can even halt system utilization, while excessive flexibility may increase the system complexity, restrain usability, and raise costs Wilson et al. (2016); Nelson et al.(2010). More recently Villar et al. (2018), have described IS flexibility as a high level of time-criticality. Shalender and Yadav (2019) described it as high process variability.

In the context of this research, flexibility is defined as the ability to get information out of the system when the user wants, and in the form that she or he wants. Today, the managers of ISs pay great attention to the flexibility of their ISs but despite that it is rarely considered explicitly as a priority in the design and development of ISs.

In summary, effective ISs should be flexible, that is the IS must be able to accommodate a certain amount of variation regarding the requirements of the supported process and fulfil the demands of users. Moreover, the implemented level of flexibility can affect the performance and the life span of the system. Table 2.3 presents the flexibility factors observed in the literature.

Table 2.3: Flexibility Factors

Authors	Flexibility factors
Nelson et al. (2010)	Ability to adapt (IS)
Judith and Franz (2006)	High process variability
Boh et al. (2003)	High level of time-criticality

2.4.4 Data Quality

Scholars generally agree on the importance of information content and its impact on the perception of users and their impression of the whole IS. Information quality has been defined as an "evaluation dimension and standard of overall usability and quality of application information systems" (Katerattanakul and Siau 1999; Liu and Arnett, 2000; Loiacono, 2000; McKinney et al. 2002; Hahn et al. 2017). Data quality or "information quality" denotes the quality of the IS content. It commonly refers to the level of fitness-to-use maintained by the IS information (Tong, 2007; Abdullah and Arshah 2018). Moreover, data quality reflects the ability of the system to communicate with users in an understandable fashion. On a wider scale, data quality includes the clarity, completeness, and accuracy of the information fed to users.

Others have defined information quality as an aspect of a system and a measure of the IS outputs (DeLone and McLean 2003). Kondolf (2001), however, has argued that information quality can be expressed in terms of the quality of the media transmission, interface design, and richness of content, and that these dimensions could be used as factors to encourage users to repeat their visit to the information system. This view is shared by Sharkey et al. (2006) who established an important relationship between the quality of information and the quality of the system, which enhances the relationship with the users of the IS. The three successful dimensions identified were: user satisfaction, intention to use, and intention to transact. The study of Sharkey et al. (2006) found that the quality of the system and information are the most essential factors in determining software success, ease of understanding, personalization, and reliability. Liao et al. (2008), defined 'information content' as the key factor in the success of an application, and were among the first to include this aspect, adding that the IS should

serve as a decision-support system by providing detailed information about transaction support and product. They confirmed that adding information value to products will maximize the consumers' mental experience, and that it is essential to reduce consumers' mental effort. The information presented should be compatible with the consumers' mental models of business transactions and products.

Zhang et al. (2015) reported that the perceived relationship quality is related to the quality of information provided, and that any intermediary should use an IS, or IS and associated services, that maintained a good quality relationship with its users. Such an arrangement would, subsequently, improve business productivity. Zhang et al. (2015) referred to three factors for evaluating an application: intermediary information quality, service quality, and system quality, see Figure 2.10.

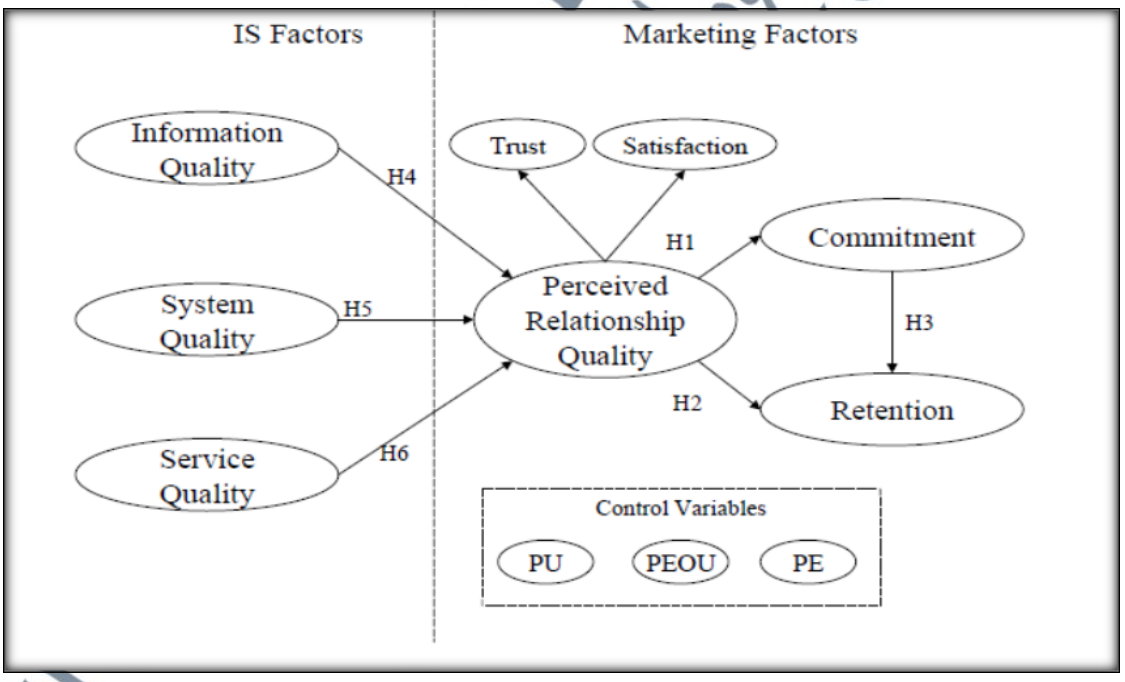


Figure 2.10: Factors Affecting the Relationship with Users of Information Systems (Zhang & Sun, 2009)

Hahn et al. (2017) concluded that the data quality of ISs is an important factor, because it could significantly affect online user satisfaction as well as increase the

system usage and utilization. Billaiya et al. (2017) stated that to achieve the full potential of ISs, the users should adopt the IS tools and use them daily and to their full potential.

Information quality is also identified as a measure of the added value that the information provides to the user who seeks information from a source, such as the database of the IS. It is frequently argued that "quality" is subjective and, hence, information quality could differ between users and between different uses for the information (Bai et al. 2018).

Ghasemaghaei and Hassanein (2019) defined information quality as the proportion of users that think the information is good, useful, accurate, and current, and the extent to which the information can be trusted.

The importance of high scale information quality raises its objectivity and then increases user satisfaction. Although accuracy could be listed as just one factor affecting data quality it would depend on how it was defined, and could encompass many other aspects of quality.

The analysis also referred to the strong differences in the quality of the information from different manufacturers and brands. Best performing organizations have scores of 90% or above for top information systems, and scores of 20% and lower for the worst performing organizations even with the best information systems.

Based on the discussions above, the factors for data quality are summarized in Table 2.4.

Table 2.4: Data Quality Factors

Authors	Data Quality Factors
McKinney et al. (2002)	Reputation
Gable et al. (2008), Sedera and Gable (2004b)	Availability
Gable et al. (2008), Rainer and Watson (1995), Sedera and Gable (2004b)	Completeness
Gable et al. (2008), Sedera and Gable (2004b)	Accuracy
Bailey and Pearson, (1983), McKinney et al., (2002)	Reliability
Bailey and Pearson (1983), Gable et al. (2008),	Relevance
Gable et al. (2008), McKinney et al. (2002), Sedera and Gable (2004b)	Objectivity

2.4.5 Responsiveness

Responsiveness is defined as the capability of the system or functioning part to complete assigned tasks in a given time. For instance, the system must understand and carry out its tasks in a timely manner, which refers to the capabilities of the artificial intelligence of the system. A fast response application is a proven system for dealing with ever-changing user requirements and requests, and a valuable IS is one of the prerequisites for having a successful program (Setaputra et al. 2010).

It is one of the criteria below the validity principle (from a principle of usability). The three are recoverability, task conformance, and observability (Sembiring, 2015). Responsiveness is considered a critical subject for HCI. The system should be able to deliver outcomes to tasks set by its users in an organized and timely way, which is the rationale behind the responsiveness principle. This researcher argues that delays in data delivery by the SIS may cause a negative impression of the SIS on the end user. It is suggested that the lack of responsiveness of the SIS could be a major, possibly the main, reason for user frustration and the cause of low user satisfaction. It might also lead the

end user to consider that the information system is not working well or has a malfunction.

Weik and Colletier (2010) concluded that the bases of high quality information systems contain many factors that can be considered as essential. The responsiveness of a SIS is among the most important factors that determine information system quality. It is recommended, for the academic environment, to use a responsive online system to satisfy the user and avoid long delays that may reduce user satisfaction. Responsiveness contributes positively to system quality. Based on the discussions above, responsiveness factors are presented in Table 2.5.

Table 2.5: Responsiveness Factors

Authors	Responsiveness Factors
Weik and Colletier (2010)	Completing assigned tasks in a given time
Singh (2010)	Recoverability, task conformance, and observability
Setaputra et al. (2010)	Fast response application

2.4.6 Accessibility

Within the context of information technology, companies are looking for ways to increase their revenue by developing their ISs and ensuring that their systems are easily accessible by users regardless of any previous experience with ISs. It has been found that companies can increase the number of possible customers or users to their online applications by making their website more accessible (Akgül, 2019).

Robert Sinclair the Chief Accessibility Officer, Microsoft (2013), reported that the digital world has become more complex and overwhelming, and that the

advancement of accessibility is still very limited. Moreover, he reported that while improving accessibility is very important it is also very challenging.

Raymaker et al. (2001) recommended the implementation of dynamic databases and multiple file formats to improve accessibility. They also stressed that web developers should reassess system requirements in order to make the system accessible for a wider range of users. Furthermore, they suggested that the huge advancements in technologies and applications had sacrificed accessibility. Accessibility also includes the quality of the webpages that some IS use as an interface. Bai et al. (2019) proposed a broader definition of accessibility in which they highlighted that users with disabilities, slow computers, and limited download bandwidth should be included when assessing the accessibility of ISs.

In the context of online based ISs, the quality of the webpages determines the accessibility. The important Web Content Accessibility Guidelines (WCAG), including the W3C Web Accessibility Initiative (WAI), should be followed to ensure a high level of accessibility. Moreover, any IS should be accessible for users with disabilities and, therefore, Assistive Technologies (ATs), such as a screen reader, should be to hand. According to some scholars the lack of training of web developers might be the reason for the low levels of accessibility and IS quality not as expected by users, in particular online ISs (Lazar et al. 2004; Gil and Hernández 2018; Lopes et al. 2010).

Kuzma (2010) has promoted the enforcement of accessibility standards when creating webpages and Andrés and Lorca (2012) have highlighted that the accessibility of webpages should be a part of the developer's social responsibility. In the same context, Idrees and Mudassir (2015) showed that most university SISs, at some point,

failed to meet guidelines for the accessibility of information systems. They found that two-thirds of respondents did not know how to access some topics in their SIS.

Hackett and Parmanto (2005) reported that between 1997 and 2002 the ISs used in higher education had become progressively more complex, and as complexity increased so had inaccessibility. They calculated what they called a "web accessibility barrier score" (WAB) based on the analysis of 25 information checkpoints. The score was calculated by weighting the priority level in a reverse fashion. They found that users showed a high reluctance to use ISs with high WAB scores. Hackett and Parmanto, (2005) used the Wayback Machine, a digital website archive to compare university websites against government websites. Their study found that, the accessibility of university websites has decreased. Surprisingly, governmental websites were not affected. The same result was reported in the study of Idrees and Mudassir (2015) who showed that web developers would increase website complexity by including the latest design features.

Lourdes and Paloma (2013) showed that IS users may include many different levels in terms of technological skills and potential, but that efforts should be made to make information systems accessible for everyone. Similarly, Hassouna et al. (2017) highlighted the low accessibility issue and mentioned the ISs in libraries as an example.

In summary, most researchers have urged web developers to reduce website complexity and to comply with the accessibility standards to make sure that all types of users can access a website and use it to its full extent. Table 2.6 presents the factors affecting accessibility.

Table 2.6: Accessibility Factors

Authors	Accessibility Factors
Nizami (2019).	Access for users with disabilities, slow computers, limited download bandwidth
Poole (2001)	Faster downloads, better compatibility
Kuzma (2010)	Compliance with web pages accessibility standards
Hackett and Parmanto (2005)	Fewer barriers per page
Idrees and Mudassir (2015	Less system complexity

2.4.7 Timeliness

Timeliness in ISs refers to whether the information requested by the user is up-to-date and available to the user within an acceptable time (Robinson et al. 2010). Timeliness includes the system's speed of response, and minimal waiting or queuing time. Timeliness is contained in the majority of models for information quality (Prestipino, 2007). Different terms and definitions for timeliness have been used in various studies of this concept. For example, Zhang et al. (2017) used the term "timeliness" for ISs as a measure for the rate of exchange of information. Lawpoolsri et al. (2018) used the term "timeliness" to represent the system's ability to deliver valuable information in a timely manner to the information seeker or the end user in a form that is readily usage.

The term "currency" was presented by Zhang et al. (2017) as being equal to the ratio between outdated and uptodate information. The timeliness and freshness of information systems are the dimensions of currency; i.e., the degree to which recorded data is up to date (Bogatyrev et al. 2018). In many cases, existing applications that provide information for users also evaluate the currency of the information. Examining the timeliness of an item is important to avoid operational problems that reduce the

efficiency of the IS and is essential for applications that provide up-to-date information for users (Prestipino, 2007).

Sultana and Khan (2019) mentioned that the factors containing user satisfaction with the system include the output information in terms of content, accuracy, and timeliness. On the other hand, users may be satisfied if the output of the system is appropriate, correct, and in a desirable format.

Felix-Robinson et al. (2011) proposed three major factors that influence the timeliness item of information sources, as listed below:

1. The initial up-to-dateness at the time of requesting the information and making it ready and available for the user.
2. The speed of change of information in a specific field (volatility).
3. The revision cycle of the information.

It is argued that these three factors must be inherent in the SIS because the data provided by the system should be up-to-date, and should also update the users if there is any revision to the information because of delays in fleet movement or break downs during or before operations.

The overall up-to-dateness of information, as defined by Felix-Robinson et al. (2011), could be illustrated by a zigzag curve. With every amendment phase that happens, the information's up-to-dateness begins with a height specified by the primary up to-dateness, then degrades with the dispersal of the field. The primary up-to-dateness is a task for the quality of the information making method at the time the information is made accessible to the user.

As found by Felix-Robinson et al. (2011), it is essential for a SIS that the initial information is up-to-date. This will be influenced by the following:

1. The observation quality of the information source.
2. The publication speed.
3. The externalization of the information speed.

It follows that the timeliness of ISs means having the necessary information available immediately, or at the time when the information requester needs it. However, the quality of the IS could be affected by any delay that happens after the user requests the information. It is evident that timeliness is an essential measure of user satisfaction and the quality of a SIS. In summary, timeliness factors are presented in Table 2.7.

Table 2.7: Timeliness Factors

Authors	Timeliness Factors
Felix-Robinson et al. (2011)	Information accepted in time, minimal queuing time for information
Zhang et al. (2017)	Frequency of change of information,
Lawpoolsri et al. (2018)	System's ability to deliver valuable information on time
Prestipino, (2007)	Providing updated information
Robinson et al. (2010)	Externalization of the information speed

2.4.8 Convenience

In ISs, convenience is related to the time and effort required to use the IS (Ulhas et al. 2016). In general, systems that are more convenient require less effort and time for users to purchase, access, search, transact, benefit, post, and use the system. It is worth adding that, in a way, convenience is related to timeliness. However, convenience is more general since it includes both time and effort values. Examples for the

implementation of convenience are the SISs in universities that are constructed so that users spend less time and effort using the system, which is an important aspect of system quality (Jebarajakirthy and Shankar 2021).

2.4.9 Completeness

Completeness is a measurement of information quality, and is a major dimension for assessing the success of ISs. Completeness means that information is complete, covers the needs of the target task, and includes all the required values for user needs (Helfert et al. 2009). Kang and Malmgren (2017) defined completeness as the degree to which information required for a task is not omitted. Azeroual et al. (2018) defined completeness as the extent to which data are adequate for the required task.

2.4.10 Security

Security aims to protect information from abuse and damage during a certain activity (Stvilia et al. 2007). Kang and Malmgren (2017) defined security as the degree to which information is only accessible to authorized users. Liu and Kim (2019) defined security as the degree to which access to data is limited to maintain its security.

2.4.11 Maintainability

Maintainability is one of the most important attributes of IS quality. Maintainability can be defined as the extent to which the IS is understood, repaired, or enhanced (Hanandeh et al. 2017). According to Bogner et al. (2017) maintainability is the ability of an IS to be modified to correct errors or enhance its performance, or adapt to a change in the environment. The effects of the IS on organizations are often influenced by various factors – human, organizational, and environmental.

2.4.12 Reusability

Reusability is the probability of an IS being reused by adding new functionalities with minor or no alterations. Reusability decreases implementation time, increases the probability that previous tests and use have removed bugs, and limits the reforms necessary when a change is required in implementation (Singh et al. 2010). Reusability can be defined as the ease of use of the data produced for one scientific research group by another research group, and refers to the reusing of an existing IS in different contexts (Thanos, 2017). Mendonça et al. (2018) defined reusability as the IS's ability to be reused without requiring substantial effort from system developers.

2.4.13 Summarization and Analysis of IS Quality Factors

In general, researchers used different IS quality factors based on their research field. The following Table 2.8 introduces several researchers that used different factors.

Table 2.8: System Quality Factors

No	Authors	IS		Factors											
		Others	SIS	Usability	Functionality	Flexibility	Data quality	Responsivenes	Accessibility	Timeliness	Convenience	Completeness	Maintainabilit	Security	Reusability
1	Musa et al. (2018)	√		√		√		√	√		√				
2	Abdullah and Arshah (2018).	√					√								
3	Zuama et al. (2017)	√				√		√			√				
4	Gürkut and Nat (2017).		√	√											
5	Inoco and Hernandez (2017)		√	√					√						
6	Noh and Park (2017)	√								√	√				
7	Dreheeb, Basir and Fabil (2016)	√		√	√	√			√						
8	Nam, (2016).	√						√	√	√	√		√	√	
9	Bayangan-Cosidon, (2016).		√	√										√	√

Table 2.8 continued

10	Mir and Mehmood (2016)		√	√			√			√	√				
11	Fehrenbacher (2016)	√					√								
12	Almaiah and Man (2016).	√			√			√	√						
13	Montesdioca and Maçada (2015)	√			√	√		√		√					
14	Sembiring (2015).	√						√							
15	Laranjeiro (2015)	√					√	√							
16	Laranjeiro et al. (2015)	√		√											
17	Rochimah et al. (2015)	√		√											
18	Sherifi (2015)		√					√							
19	Orbán (2014)	√		√	√	√	√	√	√					√	
20	Awoke et al. 2017	√						√							
21	Ismailov and Kimsanova (2017)	√		√					√						
22	Nordaliela et al. (2013)		√	√		√		√							
23	Jalal and Al-Debei (2012)		√	√		√			√					√	
24	Alanazi (2015)	√		√											
25	Rodriguez et al. (2017)	√		√					√						
26	Kang and Malmgren (2017)	√									√				
27	Baye and Hasnas (2017).	√				√	√								
28	Kroemer (2017).	√				√									
29	Owlia, (2010).	√		√	√	√			√			√			√
30	Trapitsin et al. (2020)	√		√						√					
31	Nelson and Nelson (2010)	√		√		√									
32	Felix-Robinson et al. (2010)	√								√					
33	Robinson et al. (2010)	√								√					
34	Jebarajakirthy and Hankar (2021)	√									√				
35	Taylor and Francis (2010)	√						√							
36	Kuzma (2010)	√							√	√					
37	Weik and Colletier (2010)	√						√							
38	Robert, (2010)	√						√							
39	Wilson et al. (2016)	√			√										
40	Chang et al. (2017)	√			√			√							
41	Günther et al. (2019)	√					√								
42	Saluvan and Ozonoff (2018).	√			√										
43	Costley, (2019)	√			√										
44	Raymaker et al. (2019)	√							√						

Table 2.8 continued

45	Okyere and Aminatou (2017).	√				√		√	√						
46	Gable et al. (2008)	√		√			√								
47	Prestipino (2007)	√								√					
48	Petter, DeLone, and McLean (2008)	√		√		√		√							
49	Davis, (2021).	√			√										
50	Judith and Franz (2006)	√				√									
51	Atta (2017)	√		√											
52	Wilson et al. (2016)	√			√										
53	Nizami (2019)	√							√						
54	Demirkol and Seneler (2018)	√			√										
55	Bai (2019)	√							√						
56	Vardon et al. (2018)	√					√								
57	Clunes et al. (2021)	√			√										
58	Zhang et al. (2017)	√								√					
59	Arabmazar et al. (2017)	√				√									
60	Lawpoolsri et al. (2018)	√								√					
61	Villar et al. (2018)	√				√									
62	McKinney et al. (2002)	√					√								
63	ISO/IEC 25000 (2014)	√		√	√								√	√	
64	ISO/IEC 9126 (2001)	√		√	√										
Overall		**57**	**7**	**22**	**15**	**16**	**10**	**17**	**15**	**11**	**7**	**1**	**2**	**4**	**2**

Based on the above comparison matrix, eight factors were clearly found to be the most common in the 64 articles, indicating that they are the most important factors. Because this study is concerned with the factors that are important for influencing students to use SIS, it investigates only those with a frequency of occurrence above 11% in the comparison matrix. The factors are: usability 22 entries, responsiveness 17, flexibility 16, functionality 15, accessibility 15, timeliness 11, data quality10, and convenience 7.

2.5 User Satisfaction

User satisfaction with ISs was measured by the ease of use and usefulness of the system, via the user's opinion, and acceptance of the information system (Larcker and Lessig 1980). Ives et al. (1983) argued that user information satisfaction could be defined as "the extent to which the users believe the information system available to them meets their information needs." Doll and Torkzadeh (1988) introduced a new term, "end user", which represents the users who use and inter-act with a computer application interface only. This was different from the previous definition of users' interaction with other staff and customers before the invention of computer systems.

Doll and Torkzadeh (1988) defined user satisfaction as the user's perspective and attitude regarding an IS, including the use of the computer applications for different purposes.They determined five major factors (see Figure 2.11) that affect the satisfaction of IS users. User satisfaction with ISs was also determined through the evaluation by the end-user of the relative advantages of the IS.

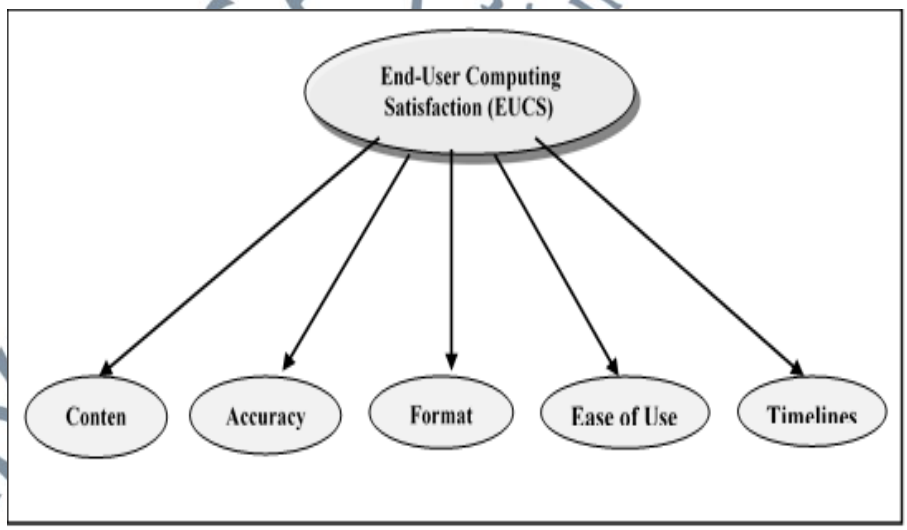


Figure 2.11: End-User Computing Satisfaction (Doll and Torkzadeh, 1988) .

DeLone and McLean (2003) proposed that after using an IS, a user would feel completely satisfied if he/she found certain quality factors, such as a high level of usability and IQ, which were correlated with the variable termed by them as "user satisfaction".

Prestipino et al. (2007) referred to user satisfaction as 'User Information Satisfaction' as representing "the extent to which users believe the information system available to them meets their information requirements". Gürsel (2015) defined user satisfaction as "a subjective measure of system success and its usefulness to the user," which suggests that users' views and opinions may vary from one measure to another.

In fact, many researchers, such as Weill and Baroudi (1990), Delone and Mclean, (1992), and Caldeira and Suryawan (2019) agree that the satisfaction of the information system user is the most common and decisive factor in measuring the success of the system due to its high correlation with the system's performance.

The measure of user satisfaction has a critical role in informing service improvement and quality. It allows the organization to appreciate what their users want, need and expect, and to what extent the system is effective. From these findings the organization can take actions to improve service delivery because a higher-quality service leads to more satisfied users. Satisfaction is considered to be based on the expectations of the users and their opinions concerning service quality (Turay et al., 2017). Aziz and Utami (2019). defined user satisfaction as a subjective measure of system success and its usefulness to the user. This means that user satisfaction with an IS will differ in meaning and interpretation from one individual to another.

Reports in the literature by researchers such as Thong, Yap and Raman, (1993), Marangunić and Granić (2015), and Gopikrishnan and Paul (2017) have long established that user satisfaction with the ICT tools is only possible when the users are satisfied with the tool's operations and the benefits attached. Davis et al. (1989) pointed out that one of the adaptations of the theory of reasoned action (TRA) has, amongst its strong behavioural factors, perceived usefulness as most important. It is thus arguable that with the inclusion of this factor in the TRA, the technology acceptance model (TAM) should be extended to characterize user satisfaction as a measure of effective use.

Satisfaction with the IS has been termed an emotional construct that requires experience in the use of the interface that represents the front end of IS. As such it can easily change according to circumstances. It can remain in the mind of the user and is different from product selection, complaining, and repurchasing. Generally, user satisfaction is between two thresholds levels – a lower level (under-fulfilment) and an upper level (over-fulfilment). This explains why users' satisfaction can drop if they get too much of a good thing. Many individuals focus on the lower threshold and ignore the possibility of an upper one (Oliver 1997).

Scholars have suggest that the users' experience is the key to gaining satisfaction from using information systems (Wynne and Matthew 2010). In their research on new factors for evaluating interactive information retrieval, Cheng et al. (2010) argued that user effectiveness is a function of user satisfaction and found that user satisfaction could be safely expressed as user effectiveness. Thus, it was considered justifiable to conceptualize user satisfaction as a construct for the effective use of ISs. It was further described as the level of a consumers' enjoyment of a product, system, or service features provided, including under-fulfilment or over-fulfilment.

This researcher argues that an important part of user satisfaction measurement involves understanding and identifying the key drivers that cause user (dis)satisfaction. Thus, organizations should provide an analysis of satisfaction factors as part of their user satisfaction reporting and developing. If possible, they should assess user priorities first, determine the factors of user satisfaction, and then develop a user satisfaction survey around those factors. There are many different ways to identify the satisfaction factors: typical methods include focus groups and user surveys.

ISs' user satisfaction is considered to be a key construct to evaluate system performance (Isaac et al. 2018). Because of the applications of ISs to real environments, vendors of special information systems, such SISs, depend on user satisfaction to evaluate the performance of a specific IS application.

Table 2.9 summarizes the main factors involved in user satisfaction.

Table 2.9: User Satisfaction Factors

Authors	User Satisfaction Factors
Doll and Torkzadeh, (1988)	Content, accuracy, format, ease of use, timelines
Prestipino et al. (2007)	Extent of users' belief
Wynne (2010)	Usefulness to the user, measure of system success
Ang and Koh (1997)	Usefulness to the user, system success
DeLone and McLean, (1992)	Measurement of IS success
Ali, (2016).	Easy use of the system
Ekinci (2004)	Expectations of user, perception of system quality
Cheng et al. (2010)	Users' effectiveness, effective usage of IS
Isaac (2018)	Performance assessment of system
Ives et al.(1983)	System requirement

Not all factors related to user satisfaction are addressed in this chapter because, after investigation, this study discovered that other, new factors regarding user satisfaction, which are discussed in Chapter 4.

2.6 Intention to Use

DeLone and McLean (2003) confirm that the dimension "intention to use" has successfully represented how users use an IS. This dimension is based on the notion that before a user decides to use an IS, his/her attitude showed a certain level of intention for using it.

Cheng (2014) suggested that users' intention can be changed depending on certain factors. It was found that the intention to use an IS is a significant factor that determines the usage level, and is highly correlated with the quality factors of IS, such as IQ. It was suggested that any source of digital information should have a quality feature to enhance the users' levels of satisfaction with the source (e.g., an IS), which, in turn, would increases the user's intention to use the system. Atmaja and Puspitawati (2020) also found that an individual's reason for using a particlar IS is a strong factor that significantly influences his/her expectation of the IS.

In their study, Mahmud et al. (2017), investigated the factors that affect the intention-to-use the SISs in the technical universities of Malaysia. The results revealed that the factors of usefulness, information quality, system quality, and learning interaction were the most significant. Moreover, according to their study, the usefulness and the learning interaction have a positive impact on the intention-to-use.

2.6.1 The Utility of Information Systems

Yasin and Quigley (1994) conducted a study on the use of ISs, investigating the gap between company CEOs and those responsible for implementing the systems, regarding the perceived effectiveness of the systems. The study concluded that improving the system's utility could achieve a strategic competitive advantage which would improve the intention to use and user satisfaction.

A survey of American Technology Managers into the use of ISs found they needed to adequately address the questions of who (possession), what (form), where (place), when (time), how (actualization), and why (goal) (Pressman (ed.), 2002). These correspond to answers to the questions of who, what, where, when, and why in order to evaluate an IS system's utilities, which could also serve as a checklist for a system under development (Faisal et al. 2013).

According to Tsuma et al. (2015), manual and less effective systems are the result of incomplete component integration within the IS. Effective systems are more automatic and allow users to start processes and finish, or at least keep them on the system level, without any further manual interaction. The importance of utility integration in ISs is that it improves the ease of use, and, therefore, improves user satisfaction, and the system's overall quality. Almazán et al. (2017) confirmed that the utility of an IS is very important to ensure a high efficiency.

Tsuma et al. (2015) also found that intention to use information systems is influenced by multiple individual utilities of the system. In the same context, Livari, (2005) suggested that further investigations should be undertaken to measure the effect of the utilities of an IS on the intention to use (use-utility), and user satisfaction. Thus,

this research will attempt to fill the gap with regard to the influence of the utility factor on the intention to use an SIS.

The model developed by Almazán et al. (2017) shows that the quality of the IS is linked to its utilities, and that when the utility of the system satisfies the users their intention to use will be increased due to their user satisfaction. The model proposed that an improvement in the system information or services will improve the use-utility and the user satisfaction.

2.6.2 Advantages of SISs

Nowadays, organizations are exposed to large amounts of information due to technologies, intent, and the various tools designed to obtain and process information. The availability of information, as well as globalization of the business environment, has caused organizations to find out how to obtain relevant information and provide an advantage for their clients. They have to find out what their customers prefer, what they require, how to obtain new customers and penetrate new markets (Pomffyová and Bartková 2016). Organizations also have to maintain a competitive advantage and protect it from imitation, duplication, or elimination by competitors (Lopez, 2005). Therefore, processes in marketing, business intelligence, and competitive intelligence are the most effective tools in terms of how to obtain relevant information and use it to achieve a competitive advantage (Pomffyová and Bartková 2016). Large firms are highly competitive regarding the effectiveness of their information systems, that store, retrieve, manipulate, post, and track information (Baltzan and Phillips 2010).

For management, ISs are a vital component in organizations. Thus, managers invest in high quality systems for their advantages and competitive edge. However, such

an investment is never justified by its contribution to the organization's performance. In the enhanced D&M IS success model (2003) a new construct (Net benefits) was added to reflect the final advantages of the system to the users or the organization.

The net benefit of the IS, as presented by DeLone and McLean (2003), is the advantage to the user that it could increase the intention to use. They reported that such an advantage could raise the value of the whole system significantly. Moreover, they reported that system benefits are affected by user satisfaction and system usage. In their own right, system benefits are posited to influence both user satisfaction and a user's intention to use the system. System benefits is a dependent variable in the latest model of DeLone and McLean (2003), but it has not been examined as an influential factor concerning the intention to use a SIS. In this chapter, the factors that influence the intention to use are not discussed because the influence of system advantages on the intention to use is an issue to be investiged in this research, and a more in-depth analysis is presented in Chapter Four.

2.6.3 Islamic Features

In this research, the SIS in the Universiti Sains Islam Malaysia (USIM) is used as the case study. Considering that USIM is an Islamic University, many Islamic features would be expected in the design and development of the SIS. Moreover, some researchers have highlighted that enforcing Islamic features can be very significant in any evaluation of the SIS (Hameed 2009; Mehad et al. 2010). Many researchers have shown Islamic factors to be present in ISs, such as Internet banking, credit/debit cards, and Islamic websites, since these factors are likely to influence the perception of the user. Thus, in the context of this research, Islamic features as a factor influencing both the intention to use and user satisfaction will be investigated.

Islamic features include Tawheed, Sunnah, intention, ethics, identity, symbols and software (Saidin, 2012). However, based on previous research, it has been theoretically shown that use of Islamic features has a big affect on the use of the Internet and increases user satisfaction. There may be other features that have a significant impact on the use of I-webs and user satisfaction and it would be interesting for future research to examine the effects of other types of influence that can be used on I-webs. (Aliyu et al. 2012).

According Musbahtiti and Muhammad (2013) there is a need for tools, applications and further research for a comprehensive eLearning system based on Islamic principles.

Thus, this research aims to identify the influence of Islamic features on the intention to use, and the user satisfaction, if any. Consequently, this factor and its measurement of will be reflected in the survey questionnaire. It is worth highlighting that the investigation concerning the significance of Islamic features can be considered a contribution irrespective of the significance of the result.

2.7 Model of Information System

According to Galliers et al. (2006) research on ISs is targeted to study the effects of ISs on individuals, organizations, and groups. While Henver et al. (2008) classified IS research into two main categories: (1) scientific paradigms that investigate and develop theories that justify and predict the behavior of humans or organizations, and (2) design science, which creates innovations to engage new human and organizational capabilities by creating innovative artefacts.

Various theories are related to the Information System Model including the "Theories of Reasoned Action" (TRA), "Unified Theory of Acceptance and Use of Technology" (UTAUT), "Technology Acceptance Model" (TAM), D&M IS Success Model (1992), and D&M IS Success Model (2003).

2.7.1 Theories of Reasoned Action (TRA)

TRA is a model for predicting behaviour-related attitudes. It was developed by Ajzen (1985; 1990) as a social-psychological theory. Later, researchers in economics, especially marketing and technology acceptance research took advantage of the model to, for example, assess the efficacy of recruitment advertising. In this context, the Fishbein model of reasoned action is the foundation of the TRA model. It is understood here as a determinant of buying behavior; accordingly, in this context, the theory describes a partial model.

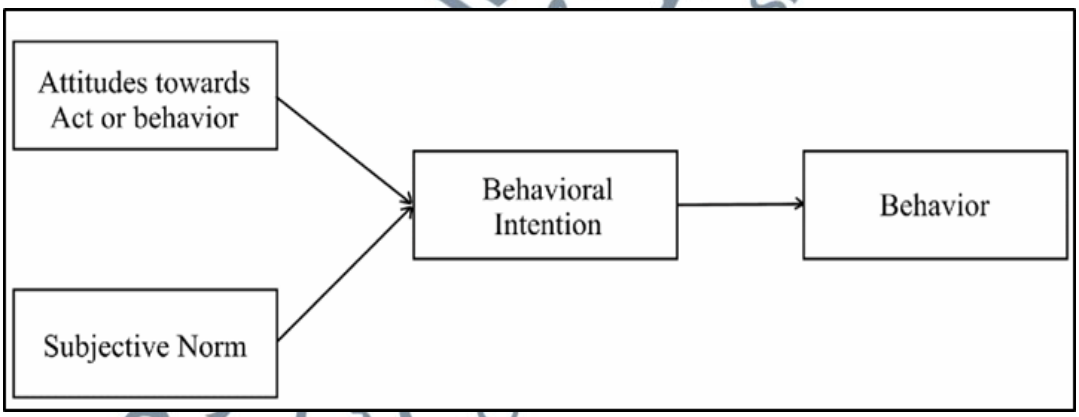


Figure 2.12: Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1986)

The theory of reasoned action provides a basis for understanding the behavior of individuals (Ali and Soar 2016; 2018). The ideas reported in the TRA conclude that the reasoned action was dependent on the initial individual motivation. Ajzen revised and extended his theory, which is now called the Theory of Planned Behaviour.

This theory is not adopted in this research since it considers that the intention to use guides the individual's behavior towards an action without considering its effect on user satisfaction. Besides, it does not take into account the influence of quality on the intention to use. In other words, the students, based on their intention to use, could use the SIS regardless of its quality and its ability to fulfil their needs.

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

UTAUT is a model of how an individual accepts and uses technology. It was first formulated by Venkatesh and others: "User acceptance of information technology: Toward a unified view" (Venkatesh et al. 2003; Ali and Soar, 2016; 2018). UTAUT is a theory that aims to explain the users' intention-to-use and their consequent behavior. According to the theory, four main factors have significant impact, namely: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions; as shown in Figure 2.13.

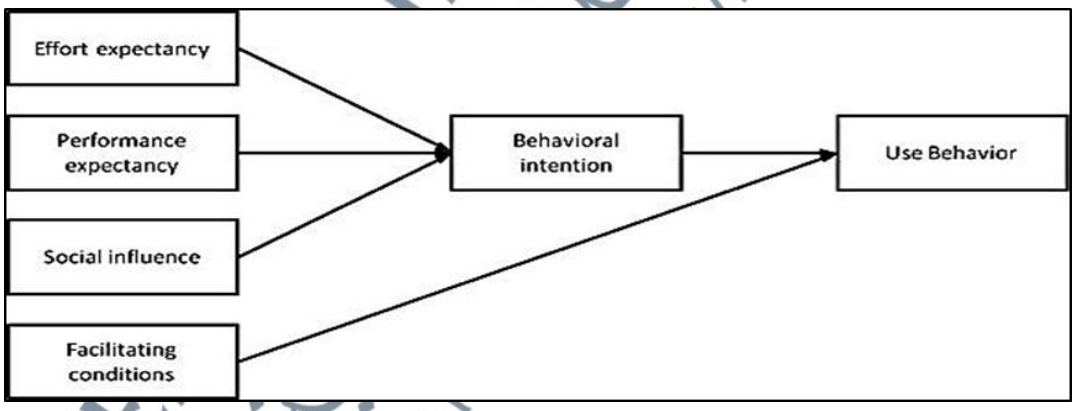


Figure 2.13: The framework of the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003)

Both the intention-to-use and user behavior are affected directly by the first three factors, while the fourth factor feeds directly into user behavior exclusively. It has been reported that gender, age, experience, and voluntariness of use also have an influence

making eight factors in total. These eight main factors were reviewed and merged to explain the intention-to-use and user behavior. Venkatesh et al. (2003) conducted a longitudinal validation study for the UTAUT. The study reported that 70% of the variance accounts for the intention-to-use, and 50% of the variance in the actual use (Koivimäki et al. 2008).

UTAUT is not used to support this research because most of its constructs are determinants of the intention to use and behavior. It does not include any constructs to measure the system quality and, most importantly, the theory does not consider the intention to use as a factor that affects user satisfaction, that acts as a determinant for user satisfaction.

2.7.3 Technology Acceptance Model (TAM)

TAM is one of the most common models used to study the human intention-to-use and technology usage behavior. TAM is based on the more general model of the TRA. It was first developed by Davis (1986), and validated by Davis et al. (1989). TAM's theoretical basis includes factors that affect the usage behavior, and are directly generic from the TRA (Fishbein and Ajzen 1975; Ali and Soar 2016; 2018).

According to TAM, system usefulness reflects the degree that users think it improves their performance, while ease-of-use reflects the degree to which users believe that using the system to carry out jobs reduces the overall effort required. TAM indicates that system usefulness and ease-of-use affect the user's intention-to-use and their usage behavior, which is presented in Figure 2.14.

According to TAM, the perceived usefulness is the user's perspective concerning the degree that a certain system can improve their performance in a given

job. While, the perceived ease of use is the user's perspective concerning the degree that using a system is convenient and effort free. Davis and Venkatesh (1996), updated TAM and suggested that the usefulness and the ease of use significantly affect the intention to use. Figure 2.14 shows the TAM model, where the Attitude (A) affects the intention-to-use (BI), and sequentially affects the actual use (AU). The ease of use (E) and the usefulness (U) affect the user attitude (A). The ease of use (E) affects the usefulness (U) which, in turn, affects the intention to use (BI).

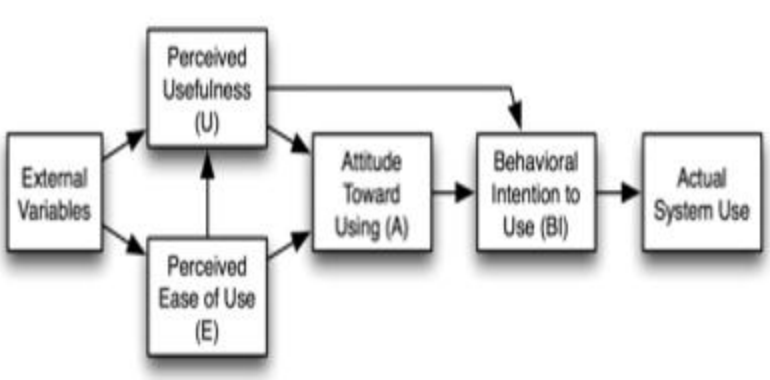


Figure 2.14: The Technology Acceptance Model (TAM) (Davis et al., 1989)

TAM is described as "proficient" in explaining users' behavior regarding computer-based technologies (Davis et al. 1989). According to many researchers, TAM is "the most influential and commonly employed theory in IS" (Lee et al. 2003; Lau and Woods 2008). Stickney et al. (2019) argued that TAM provides a robust explanation of the acceptance and usage behavior of many technological innovations and web-based applications. However, the TAM Model is not used in this research project because it is not principally designed for business context applications or for use in assessing learning in electronic platforms. Moreover, it is not robust enough to explain users' behavior, such as buying, rejecting, or accepting to use technology although it may be beneficial for the individual's personal use of technology.

2.7.4 DeLone and McLean IS Success Model (1992)

This researcher has selected the model presented by DeLone and McLean in 2003, developed from their model initally presented in 1992. The reason for selecting this model is mainly because it associates system quality with the perspective of the user, i.e., satisfaction with the system with the users' intention. The literature on ISs indicates that the factors can be overwhelming, which reflects its importance. However, the success model proposed by DeLone and McLean is often described as brilliant, special and a great contribution to the whole area of ISs.

In 1992, the original model proposed the most important entity in the IS as the user since the success of the model reflects the user's perspective. The main issue with user perspective is the variability in user views, since each user establishes their own view concerning the part of the system that they use to carry out their tasks. As a result, DeLone and McLean's model measures only quality in the use of ISs, with the critical evaluation being the dependence of system quality on two variables (intention and satisfaction), both related to the user's perspective.

The primary goal of the original DeLone and McLean IS success model was to bring to researchers attention the issues and the factors necessary for the success of ISs. The DeLone and McLean model was originally developed on the basis of Shannon and Weaver's 1949 communication model, which included three information levels, namely, (1) technical, (2) semantic, and (3) effectiveness. A later model developed by Mason (1978) divided the effectiveness level into three different levels, namely, (1) receipt of information, (2) influence on the recipient, and (3) influence on the system.

Although the suggestion from the communication model is that the flow of information is linear, it was suggested that these different factors for success are independent, with interdependency among them.DeLone and McLean (1992) highlighted that the model usage should be conducted in a predictive fashion, and stressed that to ensure a complete understanding of the IS success factors, each variable must be measured and properly controlled.

In 1992, DeLone and McLean proposed six variables that affect the system's success, namely, (1) system quality, (2) information quality, (3) use, (4) user satisfaction, (5) individual impact, and (6) organizational impact. The model is presented in Figure 2.15, and shows that the system quality is considered at the same level as the technical level of communication. The model also shows the information quality is at the same level as the semantic level of communication. Four of the six variables are mapped directly to the information levels proposed by Mason (1978). "Use" is mapped with the receipt of information, "Organizational impact" is mapped with the information effect on the system, and both "User satisfaction" and "Individual impact" are mapped with the information effect on the individual.

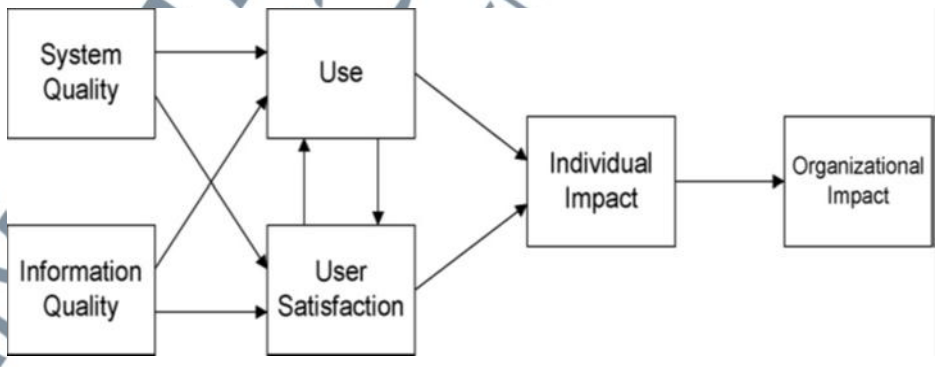


Figure 2.15: DeLone and McLean IS Success Model (DeLone and McLean, 1992)

In their 1992 work, DeLone and McLean proposed interrelationships among the dimensions of the model, but had yet to test them empirically. However, since then,

many empirical investigations of the multidimensional relationships among the factors for IS success have been undertaken.

Among the successful studies to validate and empirically test the D&M IS success model were those conducted by Seddon and Kiew (1994), Rai et al. (2002), and Urbach and Müller (2012). Seddon and Kiew (1994) surveyed 104 university accounting system users, and reported a significant relationship between the system quality and the user satisfaction, between individual impact and information quality, as well as between user satisfaction and individual impact. Rai et al. (2002) conducted a test for the goodness-of-fit on the whole D&M IS success model with survey responses gathered from 274 IS users who were university accounting system students. The results showed that the goodness-of-fit tests indicated significant relationships while others did not. It was shown that the scores of the coefficients among the five dimensions used for assessing the D&M IS model ((1) system quality, (2) information quality, (3) use, (4) user satisfaction, and (5) perceived usefulness) were found to be significant.

2.7.5 DeLone and McLean IS Success Model (2003)

Many models have been proposed to uncover the success factors of an IS. The argument being as whether to consider "acceptance" as a prominent success factor (Petter et al., 2008). Many researchers criticised the first DeLone and McLean success model (1992), such as Pitt et al. (1995), Seddon and Kiew (1996), and Seddon (1997) on the grounds that the model was associated with the variables: "individual impact", "organizational impact", and "use". Much related research was published between the first and the second models of DeLone and McLean. In 2003, in response to the criticisms, DeLone and McLean, (2003) introduced new constructs, namely, (1) the

service quality, (2) intention to use, and (3) net benefits, and removed the constructs of individual impact and organizational impact.

The enhancement was to clarify the "use" construct. Even though the construct "use" must precede user satisfaction in a process sense, a positive experience with "use" will lead to greater "user satisfaction" in a causal sense. Due to the variability of ISs and their contexts, it may sometimes be appropriate to measure the "intention to use" (an attitude) rather than "use" (a behavior). It was further stated that if "intention to use" was a measure, then increased "user satisfaction" should lead to a higher "intention to use", which would subsequently affect "use". This resulted in the addition of "intention to use" in the updated model (Delone, 2003; Petter et al. 2009).

The updated model is featured in Figure 2.15. The model highlights three unrelated constructs, namely, (1) information quality, (2) system quality, and (3) service quality. These influence two intermediate constructs, namely, (4) intention to use and (5) user satisfaction, and these directly influence (6) overall benefits. It is worth adding that (4) intention to use and (5) user satisfaction influence each other. In summary, the IS can be evaluated using the first three constructs, namely, quality of the system, information, and service.

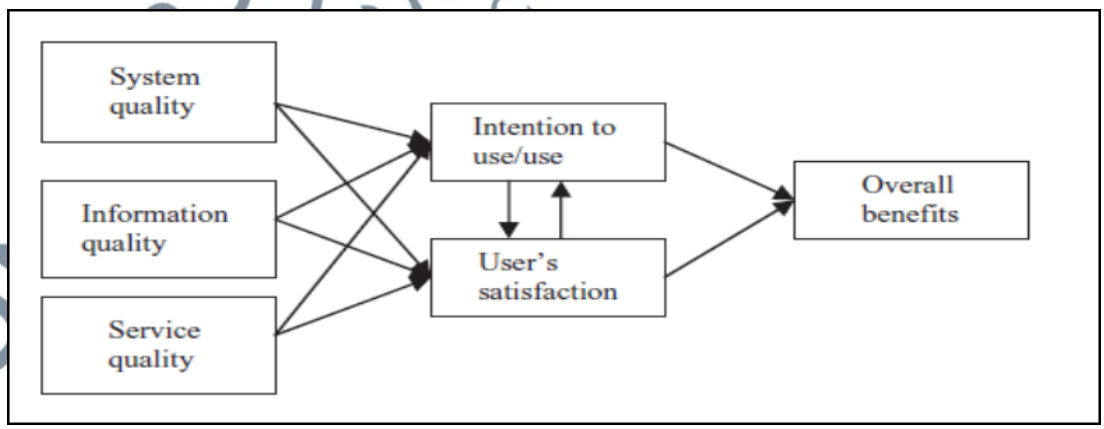


Figure 2.16: DeLone & McLean Updated IS Success Model (DeLone and McLean, 2003)

DeLone and McLean (2003) proposed three reasons as to why the success of an IS was commonly justified by "user satisfaction", which are:

1. A high degree of face validity.
2. Measurement tools development.
3. Conceptual weakness and unavailability of other measures.

Researchers have highlighted the role of system usage as an indicator of system success (DeLone and McLean 1992, 2003; Lyytinen and Hirschheim 1987). Thus, the DeLone and Mclean model (1992, 2003) is a development of strong theory and is now a model commonly used to assess the success of an IS. Moreover, theory indicates that "user information satisfaction and end-user computing satisfaction" can explain and determine user satisfaction. Urbach and Müller (2012) have shown that user satisfaction is influenced, positively or negatively, by the system's net benefits.

In summary, the IS field is an active research area, that has been evolving for more than 30 years. The model by DeLone and McLean (2003) is a highly cited and very well-known as a measure of the success of ISs. Table 2.10 shows a number of studies conducted using different models and theories.

Table 2.10: Previous Publications Related to Selection of Model of System Quality

AUTHORS	IS		Model / theory of IS			
	Others	SIS	D&M (2003)	TAM	TRA	UTAUT
Martins et al. (2019)	√		√			
Suryanto et al. (2018)	√		√			
Manisi et al. (2018)	√		√			
Aldholay et al. (2018)	√		√			
Daghouri et al. (2018)	√		√			
Puspitarini, (2018)	√		√			
Ali et al. (2018)	√		√			
Habidin et al. (2018)	√		√			

Table 2.10 continued

Robo et al. (2018)		√	√			
Ramírez-Correa et al. (2018)		√	√			
Yakubu and Dasuki (2018)	√		√			
Ali and Shrestha(2018)	√			√	√	√
Tian and Xu (2017)	√		√			
Alzahraniet et al. (2019)	√		√			
Irawan and Syah (2017)	√		√			
Zuama et al. (2017)	√		√			
Gürkut and Nat (2017)		√	√			
Inoco and Hernandez(2017)		√	√			
Noh and Park (2017)	√		√			
Ali and Soar (2016)	√			√	√	√
Suryanto et al. (2016)	√		√			
Chiu et al. (2016)	√		√			
Nindiaswari et al. (2016)	√		√			
Gürkut and Nat (2016).		√	√			
Dreheeb et al. Fabil (2016)	√		√			
Bayangan-Cosidon (2016)		√	√			
Mir and Mehmood,(2016)		√	√			
Fehrenbacher (2016)	√		√			
Almaiah and Man (2016)	√		√			
Sandjojo and Wahyuningrum (2016)	√		√			
Roky and Al Meriouh (2015)	√		√			
Sembiring, (2015)	√		√			
Montesdioca and Maçada (2015)	√		√			
Sherifi (2015)		√	√			
Orbán (2014)	√		√			
Santhanamery and Ramayah (2014)	√		√			
Mir and Mahmood (2014)	√		√			
Alshaher (2020)	√		√			
Chirchir et al. (2019)	√			√		
Mailizar et al. (2021)				√		
Mkinga and Mandari (2020).		√	√			
Sattari et al. (2017)						√
Salloum and Shaalan (2018)				√		
Isaac et al. (2019)						√
Total			**40**	**5**	**2**	**4**

According to Table 2.10, the D&M (2003) IS success model is the dominant basis for measuring IS success and system quality. Of the 45 articles reviewed, the overwhelming majority, 40, reported using this model. Five articles reported use of the TAM model, four the UTAUT model, and two the TRA model. The results also showed a gap, the application of the D&M (2003) model to assess SISs. This model's association of system quality with the perspective of the user, such as satisfaction with the system and users' intention appears especially suitable for assessment of SISs. These results motivated the researcher to base his research on the D&M (2003) model.

2.8 Theoretical Framework

As stated above, the D&M (2003) model involves six main constructs, namely, (1) information quality, (2) system quality, (3) service quality, 4) intention to use/use, (5) user satisfaction and (6) net benefits.

According to DeLone and McLean (2003), the definition of the model constructs is as follows:

1. System Quality is the system performance, the level which the system can fulfil regarding reliability, ease of use, convenience, functionality, responsiveness, timeliness, and other qualities.
2. Information Quality refers to the quality of the system output and the level it fulfils regarding accuracy, timeliness, and completeness.

Service Quality refers to the nature of the system support, and to which level the service can fulfil the responsiveness, reliability, and empathy requirements of the support organization.

3. Intention to Use and Use refer to user expectations, and their motivation to use the system, while "Use" is the actual consumption of the system.
4. User Satisfaction refers to the percentage user approval of the overall IS.
5. Net Benefits represent the overall advantages the IS bestows in terms of opportunities and perceived benefits to the individual, group, organization, society, and others.

According to DeLone and McLean (2003), ease-of-use, functionality, reliability, flexibility, data quality, portability, integration, and importance can be used as measures of system quality. Moreover, the type of user, analysis level, and the purpose(s) of the IS should be used to select relevant success metrics. The selection of IS success metrics within the six dimensions of the model should be determined by the nature of the users and stakeholders, the level of analysis, and the purpose(s) of the information system (DeLone and McLean 2016). On this basis this research develops an initial conceptual model as shown in Figure 2.17.

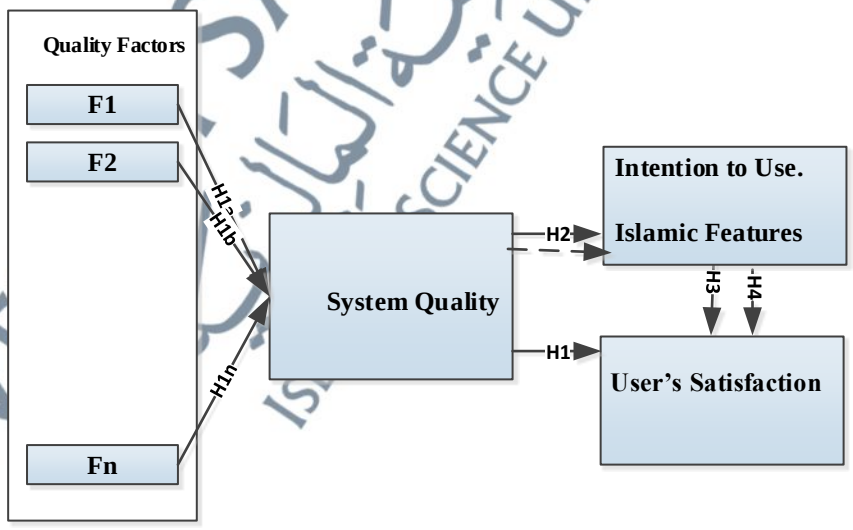


Figure 2.17: Initial Conceptual Model

2.8.1 System Quality (Independent Variables)

The literature review shows that high quality ISs attract more satisfied users, and system quality affects user satisfaction (Gürsel, 2015; Aziz, and Utami 2019).

According to the review of the literature certain factors should be provided in an IS to achieve a high quality system. Researchers have defined certain quality dimensions required of any IS, including: usability, accessibility, functionality, flexibility, data quality, convenience, responsiveness, and timeliness (Robert and Ping 2006; Larry, 2009; Lopes et al. 2010; Miller 2010; Nelson and Nelson 2010; Weik 2010; Felix-Robinson, et al. 2011; Karwowski et al. 2011). The literature also shows that the eight factors listed above are important in enhancng the intention to use the system (Efthymiou and Antoniou 2017; Filieri et al. 2017; Hussain et al. 2017; Lin, 2017; Woodham et al. 2017).

DeLone and McLean, (2003) identified that system quality directly affects intention to use an IS, and that relation measurements have a critical role with respect to ISs as they allows the organization to realize what users' preferances are and what they expect of the system. Therefore, it is important to investigate system quality, intention to use, and user satisfaction, and the relationship between them.

In Section 2.4, the factors of IS quality were discussed and summarized. Table 2.11 recalls and summarizes the frequency of each factor to identify the most common and widely used.

Table 2.11: Frequency of IS Quality Factors

Quality factors	Frequency	Quality factors	Frequency
Usability	22	Completeness	1
Functionality	15	Maintainability	2

Table 2.11 continued

Flexibility	16	Security	4
Data quality	10	Reusability	2
Responsiveness	17		
Accessibility	15		
Timeliness	11		
Convenience	7		

The Table 2.11 suggests a method for selecting the most common factors based on previous studies as listed in Table 2.8, System Quality Factors. The most frequent factors, those used in this research work to assess the quality of IS in relation to user requirements, are functionality, timeliness, flexibility, accessibility, convenience, data quality, usability, and responsiveness (Folstad et al. 2012; Shamsudeen et al. 2012; Raza et al. 2013). We ignore factors having frequencies of 4 or less.

2.8.2 User satisfaction (Dependent Variable)

User satisfaction is generally defined as user approval and acceptance regarding a system or computer. Doll and Torkzadeh (1988) defined user satisfaction as the user's opinion about a computer application or system that they use. In the IS context, pioneer scholars, such as DeLone and McLean (1992), considered user satisfaction as the key measure of system success. However, the research into measuring user satisfaction has always been dedicated to certain cases and subjects .

2.8.3 Intention to Use (Mediator Variable)

DeLone and McLean (2003) defined the intention to use an IS as being the notion that before a user decides to use the IS, his/her attitude must attain a certain level of intention to use the IS, after which the user starts to actually use the system. They

found that after using the IS, a user will often feel completely satisfied if he/she found certain quality factors (e.g., information quality, system quality).

Chang et al. (2013) investigated the integration of ICT into the Azarbaijan education system and found that, generally, an individual's decision to use IS innovations is a factor that significantly influences the intentions of the user and his/her behavior regarding the IS.

Initially, DeLone and McLean (2003) intended to have individual impact as an assigned variable but, as their research progressed, changed this is to intention to use. This research applies intention to use as a mediator with Islamic features as a specific component.

Previous studies have shown the importance of intention to use as a mediator in multiple areas (Ahmad et al. 2020). Uddin et al. (2020) have shown there is mediation of intention to use depending on the degree to which it is facilitated, and that intention will also mediate the relationship between responsible leadership and deviant work behavior. According to Cakici et al. (2019) and Aprian et al. (2020), the role of intention as a mediator increases satisfaction and enhances perception of system quality.

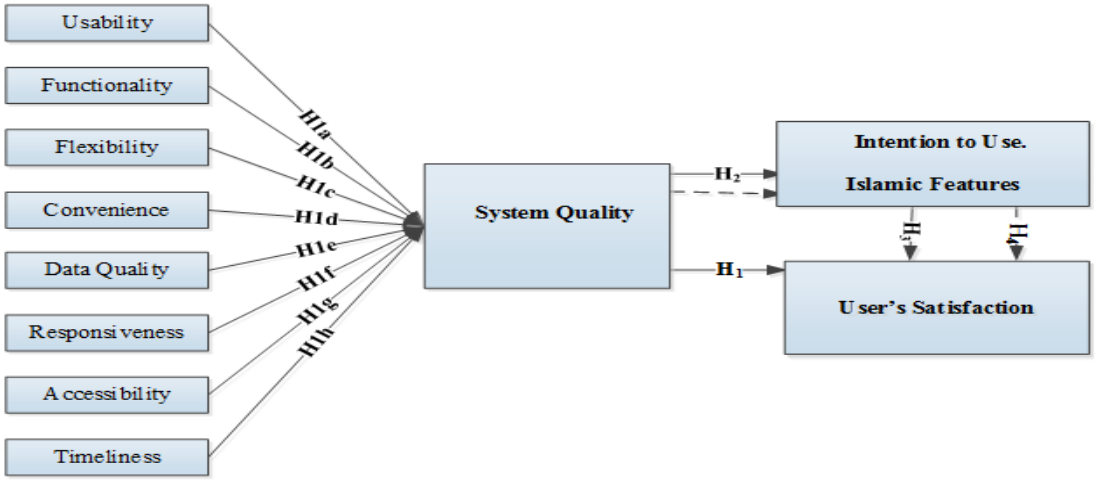


Figure 2.18: Model User Satisfaction of SIS Quality

2.9 Model Evaluation

A model is an illustration of an idea, a system, or even a process that is used to define and describe phenomena of interest, and can clarify interconnections between ideas that cannot be experienced directly (Fawcett and Desanto-Madeya, 2013). Models are essential to researchers, allowing them to refine operational definitions and identify empirical indicators for their ideas as well as assisting the development of theories, research questions, and providing logical hypotheses that can be tested in empirical research (Fawcett and Desanto-Madeya 2013).

There are several different methods that researchers can use to conduct and evaluate their research model. Each research method is considered to explore and evaluate precise research questions. However, the question remains as to which evaluation approach is most suitable for finding an appropriate answer in given circumstances. The objective of this research study is to evaluate and validate the research model, to assess its appropriateness and applicability.

Therefore, research into which evaluation approach to use becomes an important approach for institutions as they try to create ISs that meet the needs of target users. Six of these approaches are:

1. A behavioral objectives approach which concentrates on the degree to which the objectives of a given research study have been achieved, (Latifa, 2016).
2. The four-level model, which can be used to evaluate any style of training program, either formal or informal, by determining ability as based on the four criteria, (Alsalamah and Callinan 2021).

3. Responsive evaluation which uses responses collected from stakeholders, (Van Heijster et al. 2020).
4. Goal-free evaluation, an approach that assess a research program's worth based on its goals and objectives, (Zurqoni, 2018).
5. Expert/accreditation approaches, which rely on expert opinion to assess the quality of the research program, (Australian Medical Council Limited Specialist Education Accreditation Committee, 2016).
6. Utilization-focused evaluation, this approach is concentrated on a specific topic by specific users (Pilton et al. 2021).

This research uses a systemic grounded theory approach based on the expertise/accreditation approach to evaluate and investigate a specific phenomenon across different circumstances in order to produce a descriptive research model. With this approach survey tools are used to collect the opinions, desires, beliefs, and behavior of participants to evaluate the research model (Tsabedze, 2018). This evaluation approach can obtain quality professional judgments quickly, affordably, and efficiently to provide data to fulfil several goals (Veal, 2017). This approach is an adaptable instrument and can be completed in diverse ways, such as by email; email with a URL, or utilizing online tools (Ali et al., 2020). Nevertheless, this evaluation approach can be affected by certain traits of the respondents, including disposition and prior knowledge (Kumar, 2018).

2.10 Key Gaps

1. Most IS studies have focused on factors that affect intention to use and the performance of the IS, and overlooked the technological factors, such as system quality.

2. DeLone and McLean (2003) measured system quality using the following factors: adaptability, availability, reliability, response time, and usability. As a consequence, this research includes other factors: accessibility, convenience, data quality, flexibility, functionality, responsiveness, timeliness and usability. In Malaysia, there has been a lack of studies that address system quality factors in the academic domain. Moreover, no previous studies have investigate the effect of common factors on the intention to use and user satisfaction of SIS users.
3. Islamic features and their effect on the behavior of SIS users have not been examined in earlier studies.

2.11 Summary

The literature review examined the effect of system quality and its dimensions on user satisfaction of SISs. Previous studies have shown that using ISs for communication between students and university management is essential to improve university management and the academic achievements of student. Thus system quality has become an essential feature of SISs. In addition, scholars have indicated that SIS technologies contribute significantly to universities, in particular, relations with their students and interactions within their communities.

The theoretical model used in this research is derived from the D&M IS success model (2003), where IS is evaluated according to the quality of its system, information, and services. These three factors affect the intention to use SISs and user satisfaction, which determine the overall system benefits. These characteristics affect the subsequent use, or intention to use the SIS, and user satisfaction. Certain benefits will be achieved by using the enhanced system. The focus in this research is on the effect of system quality on user satisfaction, and measuring the effect of Islamic features as a mediator.