

# Finding a Correct Measure of Information Systems: The Integration of UTAUT and Lin Model into IS Success Model

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## Abstract

Finding effective and comprehensive model to measure information systems' acceptance, use, individual and organizational impacts is tricky. This has been contributed by limited factors of existing models and frameworks. This conceptual paper aimed at proposing a comprehensive and effective information success model called Lashayo10, which will have a capability to define, explain, and measure important factors for successful acceptance, user satisfaction and use of Information Systems (IS). Random literature review will be used to assess the literature critically, and to propose an enhancement model for the IS success. The proposed model (Lashayo10) will adapt DeLone and McLean IS model integrated with UTAUT and Lin (2008) model. The Lashayo10 will be subjected to empirical validation by researchers in information systems' projects. The novelty of this study lies on the number of effective and comprehensive measurement factors which are proposed in a single holistic model.

**Keywords:** model; information systems; factors; UTAUT; DeLone and McLean IS model; Lin model; Lashayo10.

## 1. Introduction

A number of e-learning systems have been dropping off after they have initially adopted [1-3]. Electronic learning system (e-learning system) is regarded as web-based information system which focused on distribution of learning contents in educational organisations using an internet as main means of integrating several users' accessing devices which the mode of interaction may be either asynchronous or synchronous [4-6].

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Adoption in this research context means a way of accepting and use of e-learning systems in the education institutions with special attention in universities [7]. Introduction of Information and Communication Technology (ICT) in institutions has changed critically traditional operations of institutions. Many organisations have tried to adopt varieties of information systems in their workplace to facilitate their daily activities; thus, resulting into adding value of their business processes, and on total performance of organisation. Such positive impacts include saving time, saving cost, and gaining business edge.

Information System is a set of interrelated components which gather, store, retrieve, and execute data; and deliver information to the right user, and on the right time [1]. According to Shannon and Weaver [2-3] on their theory of communication system, a communication system is considered successful if it overcomes technical challenges and semantic challenges, that is, any communication system has to have a technical component and a semantic component (to give the right information). DeLone and McLean (2003) model of IS success was built based on this theory [2-3].

Models which have been developed are struggling to create significant effects on information systems' acceptance (intention to use), actual use on individual and community/organisation at large. One of existing prominent framework is Diffusion of Innovation (DOI) which explains the rate of adoption of innovation (technology) [4-5]. DOI is currently used in adoption of information systems but it originated from technology diffusion in agriculture [4]. Technology, Organisation and Environment (TOE) is another framework. It was developed originally to explain three important factors: technology, organisation and environment [6]. This framework has not described explicitly information generation of a given technology as separate component as a product of technology [7]. The other prominent framework is Unified Theory of Acceptance and Use of Technology (UTAUT). This framework is based on individual and psychological decision on acceptance and use of technology, and it was formulated from eight combined theories and models (Theory of Reasoned Action-TRA, Motivational Model-MM, Theory of Planned Behaviour-TPB, Technology Acceptance Model-TAM, Combined TAM and TPB-C-TAM-TPB, Model of PC Utilization-MPCU, Innovation Diffusion Theory-IDT, Social Cognitive Theory-SCT) [8]. Each of this individual model and framework serve a specific part of implementation of information system. TAM, for example, is for individual acceptance and it is used in an environmental where "Use" is an optional. Consequently, to come out with a strong and a comprehensive model, which will assess both individual and organisational benefits, an idea of integrating UTAUT and Lin (2008) model into IS success model [9] as base models is implemented in this study. According to several citations, DeLone and McLean [9-10] and UTAUT are leading with 8,996 and 19,577 respectively ([www.google.com](http://www.google.com) accessed on 30/01/2018). The presence of more citations means more validations thus implies robustness; this has been proved by these two prominent frameworks [11-12].

Currently, studies show great number of efforts to develop individual model which guide acceptance, use, and implementation of information systems. However, no universal effective and comprehensive model has been attained to be set as information systems measuring model [13-17]. This study aims at proposing an effective and comprehensive conceptual model, with adequate factors to guide successfully information systems implementation and maintenance. To achieve this objective, this study will pursue the following specific objectives:

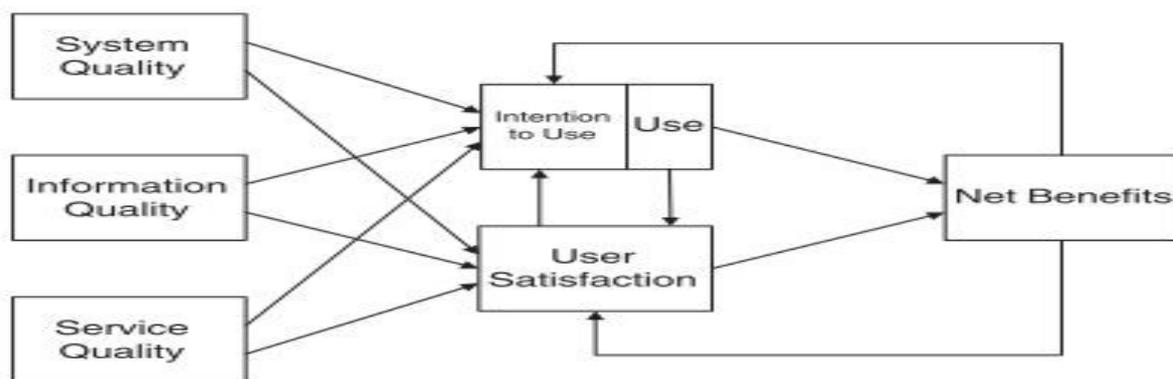
- 1) To enhance number of factors for Information Systems (IS) success.
- 2) To integrate logically identified number of factors into one holistic model

## 2. Related Works

### 2.1 DeLone and McLean (2003) IS Success Model

The DeLone and McLean (2003) IS model was developed purposely for assessing information systems which include success in technology, success in information generation, success in use, success in anticipating satisfaction to user, and ultimately, success in conveying net benefits to organizations which adopted information systems after a period of use.

The factors explained in DeLone and McLean IS model [9-10] did not accounting for social impacts, context and culture influences, especially trust, which any information system is expected to experience [9,18]. Figure 1 shows factors explained in IS success model developed by DeLone and McLean (2003) IS model with six constructs/factors.

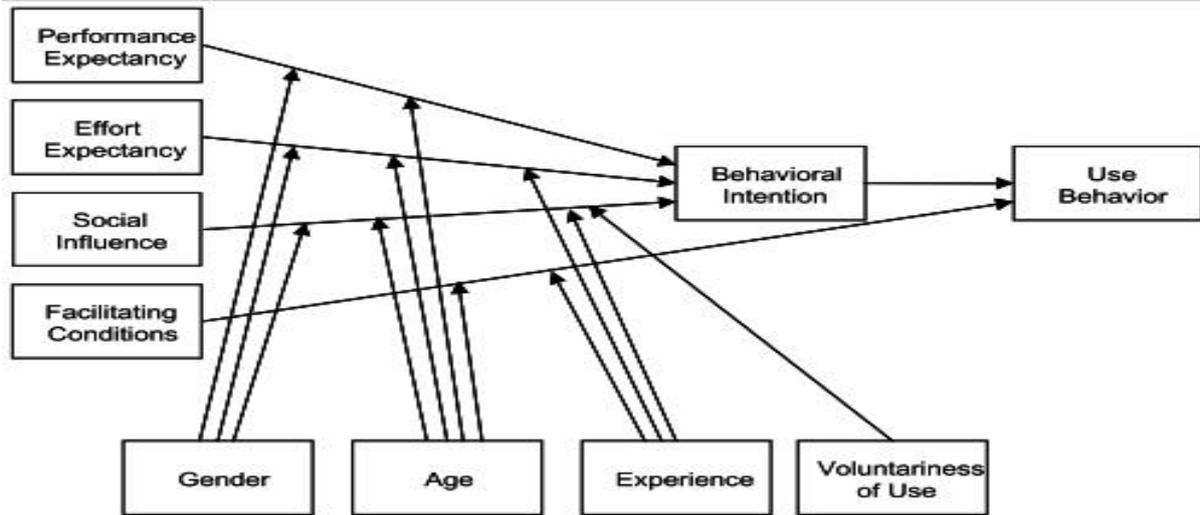


**Figure1:** The updated DeLone and McLean (2003) IS model [9]. Reprinted from The DeLone and McLean Model of Information Systems Success: A Ten-Year Update.

In an effort to enhance DeLone and McLean (2003) IS model shown in figure 1, Intention to Use is separated from Actual Use because it is empirically difficult to measure them which make some studies to overlook (Intention to Use) although it is important factor in technology acceptance [12]. The three factors (Information Quality, System Quality and Service Quality) from DeLone and McLean (2003) IS model show more impacts on Intention to Use than Actual Use [19].

Mardiana and his colleagues [12] suggested that Intention to Use (ITU), which is the same as Behaviour Intention (BI) in other studies, have not been explained fully by three factors from DeLone and McLean (2003) model, because it has an element of psychological decision. Based on this argument, the antecedent of BI/ITU has to be complemented with other psychological factors from UTAUT and Lin (2008) model. Apart from a large number of citations of UTAUT framework, making it a preferred compliment to DeLone and McLean

(2003) in measuring Intention to Use, UTAUT in its longitudinal study has proved to have high degree of determination for BI which its approximate equal to 70% and for Actual Use is 50% [20]. TAM which is contained in UTAUT has prediction of 40% towards BI [21]. The main idea here is to compliment what is missing in DeLone and McLean (2003) IS model i.e. social factors, context and culture [18]. Andersson and Gronlund in [22] argued that four main themes for information systems success include, Technological factors, User characteristics, Information and Context.



**Figure 2:** The UTAUT model. Reprinted from Venkatesh and his colleagues [20, p. 447].

## 2.2 UTAUT Constructs in Relation to DeLone and McLean (2003) IS Success Model

In UTAUT, antecedents of Behaviour Intention include Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC). These antecedents are explained more in the following parts.

Performance Expectancy is the “degree to which an individual believes that using the system helps him or her improve job performance” [23]. According to Thomas [23] performance expectancy in UTAUT reflects the following factors from other technology acceptance model bear in mind that TAM, TAM 1, TAM 2, TPB, MPCU, IDT and SCT are all nested in UTAUT therefore performance expectancy is analogous to Perceived usefulness (TAM/TAM2 and C-TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT), and outcome expectations (SCT). Nonetheless, performance expectancy is already described by a construct called Information Quality from DeLone and McLean (2003) model; as a result, there is no requirement of adding performance expectancy as a construct in the course of integrating DeLone and McLean (2003) model with UTAUT. Moreover, Effort Expectancy degree of ease that is associated with the use of the system [20,23]. This construct reflects the following constructs: perceived ease of use (TAM/TAM2), complexity (MPCU), and ease of use (IDT) [23]. Effort Expectancy construct is analogous to “System Quality” in DeLone and McLean (2003) IS model. Furthermore, Social Influence is referred to as the degree to which an individual perceives that important others believe he or she should use the new application system [20,23]. Kelman [24] suggested three elements of Social influence construct; identification, compliance and

internalization. Internalization refers to “acceptance of social influence because it is matching with the individual’s value system and perception of the reality” [20]. Identification means “accept and use of an individual behaviour because it satisfies the relationship with another person” [20]. Compliance refers to acceptance of an influence obviously to receive rewards and avoid certain punishment under the control of another person [20]. Social Influences are built on following previous constructs subjective norm: construct in TRA, TAM2, TPB/DTPB and C-TAM-TPB; social factors in MPCU; and image in IDT [23]., this factor is missing in DeLone and Mclean (2003) IS model, therefore, it has been added as shown in Figure 4. Lastly, facilitating Conditions are regarded as the “degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” [20]. This is a development of following constructs: perceived behavioral control (TPB/ DTPB, C-TAM-TPB), facilitating conditions (MPCU), and compatibility (IDT) [20]. Facilitating conditions contains training; provision of support in the working place; resources, for instance time and finance assistance; and compatible technology [24]-[27]. This construct in this study has been changed to accommodate what is missing from Service Quality of DeLone and McLean (2003) model. Consequently, any technical support is eliminated in this construct as it has already been defined by “Service Quality” from DeLone and McLean (2003) model. We will remain with non-technical support and a new label was given i.e. “Organisational conditions”, which will be characterised by availability of funds, top management support, and human resource support [28]. This construct affects Actual Use of systems [20].

### 2.3 Lin (2008) Model

Lin (2008) model in Figure 3 is an information system model which extend IS model and validated in virtual community of e-learning systems. It is made up of two endogenous factors; System characteristics and Social factors. System characteristics is also composed up of System quality and Information quality. Social factors are also composed of two factors; Trust and Social usefulness. These four endogenous factors are delivered through intermediate factors (member satisfaction and sense of belonging) to create an ultimately impact known as individual member loyalty.

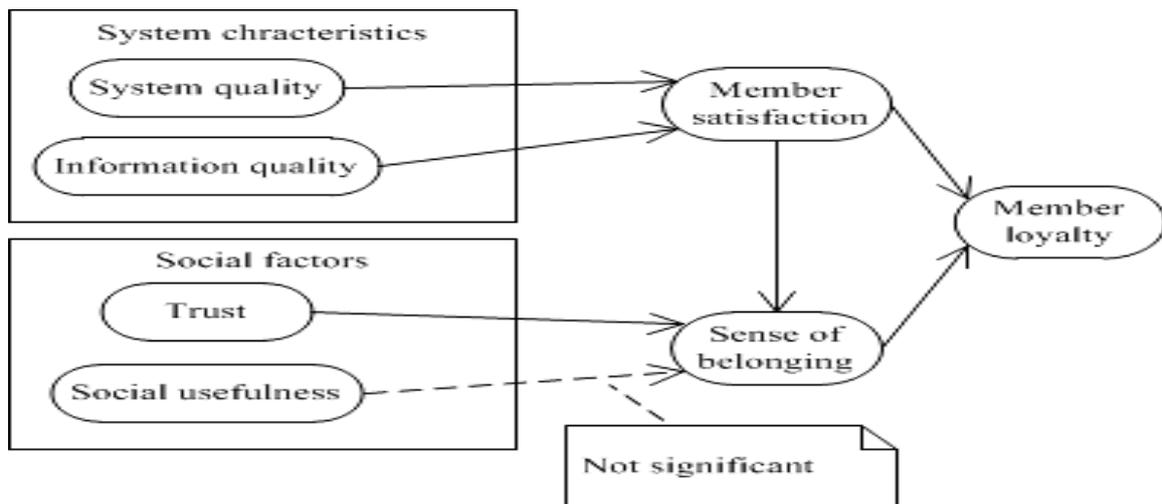


Figure 3: The 2008 Lin’s virtual communities model. Reprinted from [29].

Trust is one of the Social factors component which, together with social usefulness, affect the use of information systems [29]. In Lin (2008) model, which extend DeLone and McLean (2003) IS model, it was developed to serve online community of learners. Lin (2008) replace “Use” with “Sense of belonging” and include “Trust” which significant affect “Use”. In this note then, the model developed in Figure 4 includes Trust as one of construct which affect intention to Use.

#### 2.4 The Constructs of the Conceptual Model with their Corresponding Sources

**Table 1:** Orientation of Each Construct Formulating A Conceptual Model

Constructs	Brief explanation	References
Information Quality, System Quality, Service Quality, Intention to Use, Actual Use, User Satisfaction, Benefits of System	DeLone and McLean models of 1992, 2003 and 2016 identified six of these constructs as definitions of IS success. Intention to Use/Use was treated as single factor in the latest DeLone and McLean model.	DeLone and McLean [9]- [11]
Social Influences and Organizational Conditions	UTAUT (2003) model suggested that Social influences and Facilitating conditions (technical and organization conditions) are antecedents to BI and Actual Use respectively.	Venkatesh and his colleagues [20]
Trust	Lin (2008) model  Two of Social factors identified by Lin (2008) was Trust and Social usefulness.	Lin [29]
Intention to Use and Actual Use	There is stream of studies which suggested that “Intention to Use” and “Actual Use” are two separate factors.	Hassanzadeh and his colleagues [30], Mardiana and his colleagues [12], Mohammadi [31]  Lashayo and Gapar [28]

Table 1 explains different constructs/factors and their origination. Literature shows combinations of three models of information systems provide a strong hybrid model.

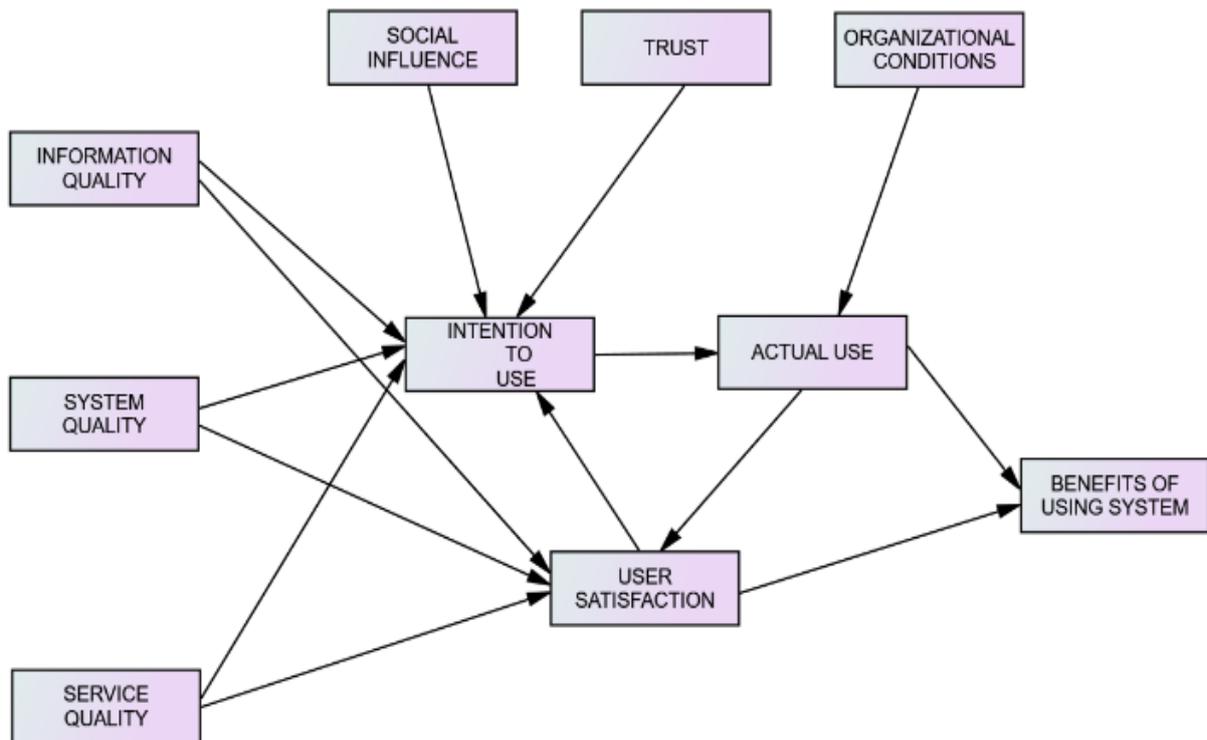
#### 2.5 DeLone and McLean (2003) IS Success Model Integrating with other Models and Theories

There are many research studies which applied an integration of models as a technique to maximise the capability of DeLone and McLean (2003) model to define and explain IS success. They span from one field of an information systems to another. Examples of such fields include the field of e-learning systems, where, Mohammadi [31] has integrated TAM on IS model, Samarasinghe and Tretiakov [32] integrated Self-efficacy

theory and Process Maturity theory on IS success model, and Thomas [23] integrated UTAUT, Wixon and Todd [32] models on DeLone and McLean (2003) IS success. In the field on e-governance, Sambasivan, Wemyss and Che Rose [33] combined TAM and DeLone and McLean (2003) IS success, Al-Khatib [34] built on Wixon and Todd's (2005) model, DeLone and McLean (2003) IS success and UTAUT. However, these studies have not integrated UTAUT and Lin (2008) model in DeLone and McLean (2003) IS model.

### 3. Conceptual Model

Figure 4 shows ten factors (constructs) that are available in the proposed IS model, dubbed “Lashayo10” after the author’s surname, these factors have been retrieved from random literatures which are believed to have influence on information systems’ acceptance, use and its impacts on organisation. These factors collectively explain four important themes in success of information systems. These themes are Technology success, Information generation success, Context success (Social success and Organizational success), and User characteristics success [22].



**Figure 4:** Conceptual model known as “Lashayo10”.

#### 3.1 Definitions of factors/constructs

##### 3.1.1 Information Quality

Information Quality means a construct explaining information generated from system which are characterised by accuracy, up-to-date, personalised, completeness, currency, relevance, understandability [9], [35].

### ***3.1.2 System Quality***

System Quality refers to a construct that explains typical information system characteristics including user-friendly/easy to use, flexibility, reliability, response time, accessibility, and integration [35].

### ***3.1.3 Service Quality***

Service Quality is a construct which measures the amount of support an Information Technology department is offering to users of system; it is explained by SERVQUAL [23]. SERVQUAL is an instrument developed by Parasuraman, Zeithaml, and Berry [36], which includes five dimensions; tangibility, reliability, responsiveness, assurance and empathy.

### ***3.1.4 Intention to Use***

Intention to Use is an attitude of using a system before being an actual user (routine user) [30]. It is measured either by using subjective (use of a questionnaire) or objective (use of a system log) [37].

### ***3.1.5 Trust***

Trust is a belief that the information system will not compromise an expected information and service, with which a user of system is looking for [28].

### ***3.1.6 Actual Use***

Actual Use is a construct which measures behaviour use of a system (a routine use). It is characterized by frequency of use, quantity of use, proper use, and extent of contents accessed [9].

### ***3.1.7 User Satisfaction***

User satisfaction is a construct which measure how much an information system encounters or fails to encounter each of user prospects [38].

### ***3.1.8 Social Influence***

Social influence measure a degree to which an individual perceives that important others believe he or she should use the new application system [20,23].

### ***3.1.9 Organizational Conditions***

Organizational Conditions measures the organization set up, providing an inhouse environment for acceptance, and use satisfaction of adopted information systems. This construct includes top management support, human resource support, and financial support [28].

### **3.1.10 Benefits of Using System**

Benefits of Using System is a construct which measure both individual and organizational impacts of using system. It includes image changes of organization, performance, saving cost, saving time, and personalization of output [9].

## **4. Conclusion and Future Studies**

The main objective of this research was to find a correct measure of Information Systems. In response to that main objective of this study, this paper presents a conceptual model (Lashayo10) for measuring information systems based on DeLone and McLean (2003) IS model integrating it with UTAUT and Lin (2008) model. The integration provides a model which is more robust for carrying out IS projects. The Lashayo10 supplement what is missing from DeLone and McLean (2003) IS model. The missing components are: user acceptance (intention to use as separate factor), context (organizational conditions), social influences and trust. Furthermore, the presented model is a parsimoniously model, that is, it is comprehensive, effective, simple to understand, and with fewer assumptions [39-40]. Carefully definition of added constructs' items is needed to avoid overlapping effects on existing measurement of base models, and in the course of empirical operation of the proposed model. A future study can try to examine empirically this conceptual model in different IS projects to validate and confirm the proposed factors.

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