

## **A Mobile Instant Messaging Update to the DeLone and McLean Model of Information Success**

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**Abstract:** Information System success model is a theory that seeks to provide a comprehensive understanding of Information Systems' success by identifying, describing, and explaining the relationships among critical dimensions of evaluation of success. This paper focused on Mobile Instant Messaging (MIM) systems which encompass a range of internet-based facilities that enable exchange of real-time messages using mobile phones. Research indicates that a comprehensive success model must always be followed to guide institutions in the adoption, implementation and use of a new technology such as MIM systems. Whereas general Information System (IS) success models exist, none specifically integrates MIM success factors to suit the uniqueness of emergent MIM systems. In light of the aforementioned, this paper aimed to develop an IS success model that integrates MIM success factors. The study specifically sought to investigate the existing success models and identify relevant MIM success factors determined to form the new model. Mixed method research design was employed with both quantitative and qualitative strategies being used. Simple probability sampling method was used to obtain a sample of 655 respondents drawn from four cadres of respondents in Kenyan public universities as follows; ninety three (93) Information and Communication Technology (ICT) administrative staff, ninety six (96) ICT technical staff, ninety eight (98) academic staff and three hundred and sixty eight (368) students. Data was collected by the use of questionnaires and interviews. Validity was ensured through triangulation, peer debriefing and review. Reliability test was done and generated a Cronbach's Alpha value of 0.827. Ethical considerations were taken into account and relevant clearances sought as required. The study established a total of thirty (30) success factors suitable for MIM. Factor analysis method was used to classify the success factors into six (6) constructs used to develop the new IS success model. The study found five key success areas namely; Task, infrastructural, social, spatial, temporal, context. The new model was consequently built by integrating the identified variables and validated for acceptance. Findings of the study were considered important for the academia given the MIM-related knowledge generated, and anticipated in the further research recommended herein. Besides, the new IS success model developed in this study stands to help institutions achieve success with respect to MIM technology adoption, implementation and use through the guidance the model provides.

**Keywords:** Information Success Model, Instant Messaging, Mobile Instant Messaging, Success Factor

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### **I. Introduction**

Recent times have witnessed widespread adoption of a great number of technologies, notably the personal computer, the Internet and the mobile phone with the corresponding convergence of technologies (IEEE, 2010). To date, the mobile phone has been one of the fastest growing technologies and necessities worldwide. Mobile technology has grown tremendously and today, a mobile phone is not only used to make a telephone call, but is packed with multitude of other abilities (IEEE, 2010). Mobile technology has therefore not only changed the world into a fully connected one, it has made the twenty first century completely unlike any other in history (Horst H., 2006). In Africa, more and more people are getting connected to mobile technology each day (Wireless Intelligence, 2008). With this high penetration rate of mobile technology amongst people of all cadres, many innovative possibilities have been opened up around the technology (Wireless Intelligence, 2008).

Figure 1 is a graph depicting relationship between changes in population, total connections and penetration rate of mobile technology in the continent of Africa over the last sixteen years.

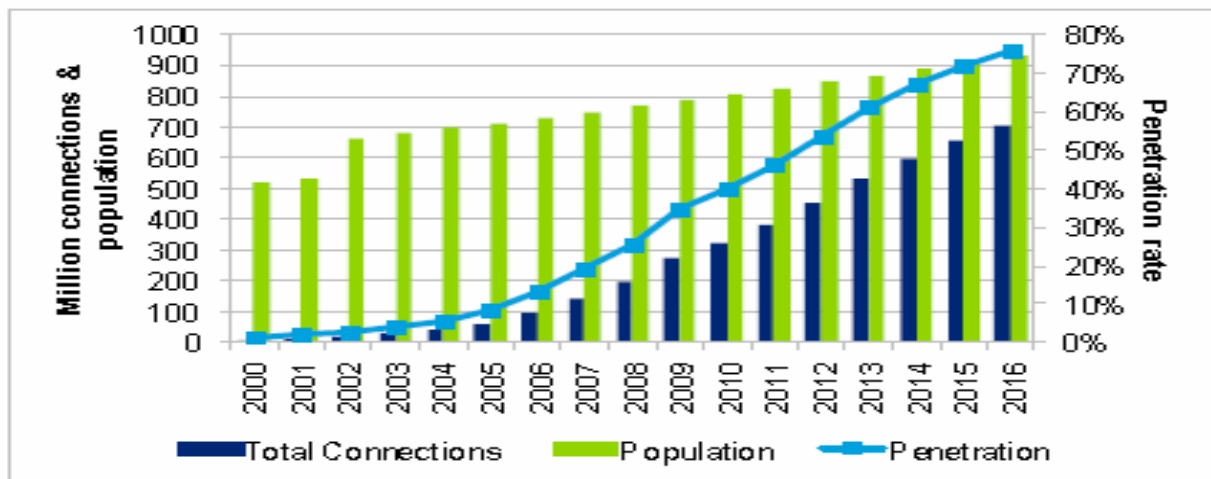


Figure 1. Growth of mobile technology in Africa (Wireless Intelligence, 2008)

One such emerging technology is Mobile Instant Messaging (MIM) that recently evolved from Instant Messaging (IM), in the advent of the mobile phone (Day M., 2000). Instant Messaging supports a real time messaging aspect as well as the availability of presence information of other users that is the means of finding, retrieving, and subscribing to changes in the presence information of those users (MobileIn.Com, 2004).

Mobile Instant Messaging (MIM) is a form of instant messaging service that uses mobile devices, employing various technologies such as text messaging, Wireless Access Protocol (WAP) and General Packet Radio Service (GPRS) (MobileIn.Com, 2004). Unlike SMS, MIM notifies the user when those in the contacts list are available or not available for chat. Some MIM applications are stand-alone programs, while others run on a Web browser (MobileIn.Com, 2004).

Mobile Instant Messaging holds a lot of promise in the future (Rochus S. &Ragnar E., 2004). Figure 2 shows how the technology has evolved to date;

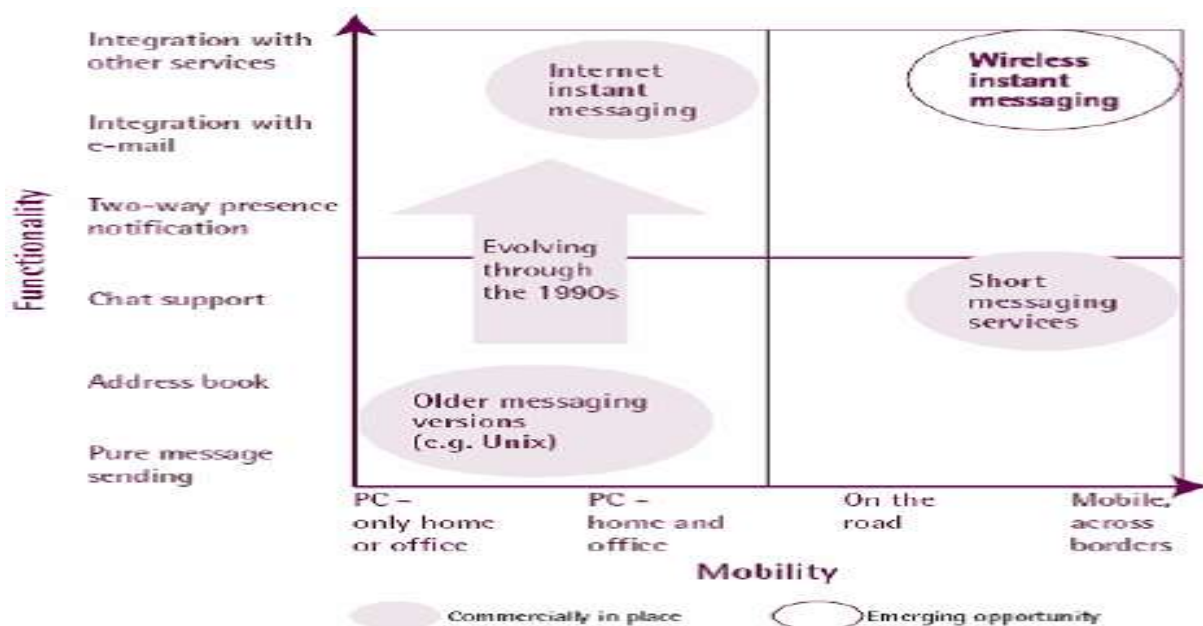


Figure 2. Instant Messaging development Trends (Rochus S. &Ragnar E., 2004)

Reports indicates that a comprehensive success model must always be followed to guide institutions in the adoption, implementation and use of a new technology such as MIM systems. Whereas general Information System (IS)

success models exist, none specifically integrates MIM success factors to suit the uniqueness of emergent MIM systems. In light of the aforementioned, this paper aimed to develop an IS success model that integrates MIM success factors. The study specifically sought to investigate the existing success models and identify relevant MIM success factors determined to form the new model.

## II. Literature Review

### Information System Success Models and Their Evolution over Time

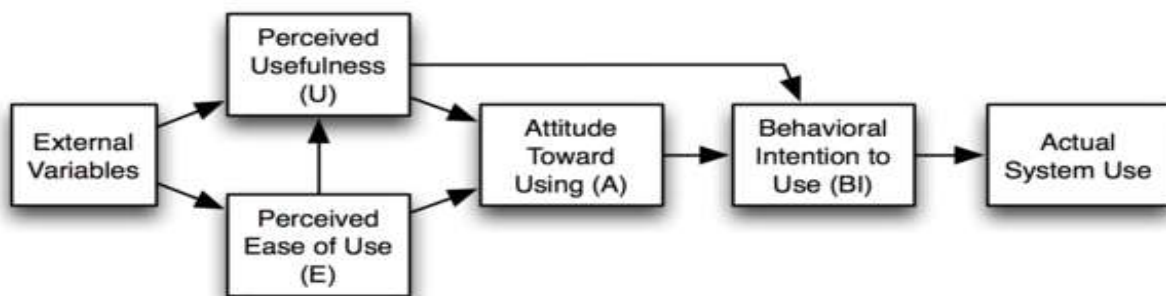
Literature defines Information System (IS) Success in several ways and provides several measures of IS success. There is no ultimate definition of Information System success (DeLone W. *et al*, 1992). IS success models have evolved over time starting with the Technology Acceptance Model (TAM) proposed by Fred Davis and widely used by the first stream of researchers for a while after it was developed. The next IS Success model after TAM was the DeLone and McLean model that lasted a while (DeLone W. *et al*, 2003). The DeLone and McLean model was later improved as described further;

Researchers have established that by adopting a success framework more IS projects are successfully implemented (DeLone *et al*, 2003; Ustasüleyman *et al*, 2010). This is due to the direction that the frameworks are able to give to senior management in areas such as technology adoption, implementation, and use (Chung *et al*, 2009). The leading model to determine successful use of technology has been the DeLone and McLean IS Success Model that has widely been used and evolved. DeLone and McLean compiled a list of variables to determine the success of and IS, posted by hundreds of studies, and transformed them into a cohesive framework that described IS success. DeLone and McLean later after ten years, updated the IS success model to incorporate the variables created by e-commerce to be at par with the technological advances made since the foundation of their first model. The Internet had transformed the manner in which business took place, and e-commerce became a major business model.

With the growth of mobile technology, researchers have shown increasing interest in mobile implementation issues and the larger impact of mobile phones on society and business (Lehmann *et al*. 2008; Lu *et al* 2005; Chiemet *al.*, 2010; Chung *et al*, 2009; Vatanparast *et al*, 2010). The literature is however fragmented. Several researchers have indicated that the measurement and use of mobile technology within IS is under-studied (Chatterjee *et al*, 2008).

### The Technology Acceptance Model (TAM)

The technology acceptance model (TAM) is an information systems theory that models how users come to accept and use a technology (Davis *et al*, 1989).



**Figure 3.** Technology Acceptance Model (Davis *et al*, 1989)

According to the model in Figure 3, when users are presented with a new technology, they are influenced by a number of factors influence to decide about how and when they will use it. These factors include; Perceived Usefulness and Perceived Ease-of-Use. Perceived Usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance (Davis *et al*, 1989). Perceived Ease-of-Use is the degree to which a person believes that using a particular system would be free from effort (Davis *et al*, 1989).

Technology Acceptance Model (TAM) begins with external variables as the starting point for tracing the impact of the factors perceived usefulness and perceived ease of use (Abdel N., 2012). Perceived ease of use also influences perceived usefulness besides the external variables. Perceived usefulness and perceived ease of use both influence users' attitude toward using IS. Attitude toward using IS, affects behavior intention to use, which determines actual conditions of system (Abdel N., 2012).

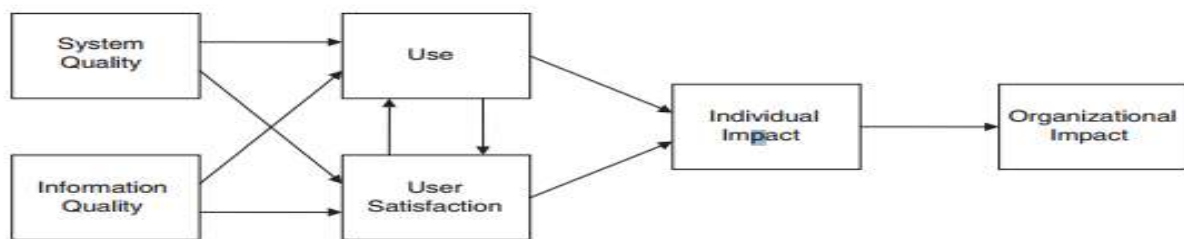
### DeLone and McLean Information System Success Model

In the year 1992, DeLone and McLean comprehensively reviewed literature on IS success and came up with a new model of IS success. It was based on theoretical and empirical IS research conducted by a number of researchers in the 1970s and 1980s.

The new model, known as the DeLone and McLean model, provided a strong indicator of the success of information systems by recognizing six interconnected dimensions of IS success: the dimensions include; System Quality, Information Quality, Use, User Satisfaction, Individual Impact, Organizational Impact (DeLone *et al*, 1992).

The new model introduced a way of measuring the success of information systems. Before DeLone and McLean published their work, IS researchers used a vast array of qualifying categories to determine information system success. But DeLone and McLean felt that some determinants were surely more important than others. Thus, DeLone and McLean tabulated nearly 100 separate variables used to determine IS success, shown in Appendix G. The model consisted of six interrelated dimensions that comprehensively defined IS success: (DeLone *et al*, 1992).

System Quality measures the information processing system itself. Information Quality measures information system output. Use measures the intention to use the output of an information system. User Satisfaction measures recipient response to the use of the output of an information system. Individual impact measures the effect of information on the behavior of the recipient. Organizational Impact measures the effect of information on organizational performance (DeLone *et al*, 1992).



**Figure 4** Dimensional relationships of the IS Success Model (DeLone& McLean, 1992)

As shown on the Figure 2.9; System Quality and Information Quality singularly and jointly affect both Use and User Satisfaction. Additionally, the amount of Use can affect the degree of User Satisfaction – positively or negatively – as well as the reverse being true. Use and User Satisfaction are direct antecedents of Individual Impact; and, lastly, this Impact on individual performance should eventually have some Organizational Impact (DeLone *et al*, 1992).

### Updated DeLone and McLean Information System success model

In the year 2003, DeLone and McLean made a few changes on their model. They added Service quality, Intention to Use, and combined Individual and Organization impact into Net impact (DeLone *et al*, 2003).

A large number of studies supported the updated IS Success model of DeLone and McLean. The results of the studies made significant contributions in regard to using (D&M) model in research and practice (Abdel N., 2012). It also enabled Governmental and Non-Governmental Institutions to include measures for information quality, system quality, service quality, system use, user satisfaction, and perceived net benefit in their valuation techniques of information system success (Jang C., 2010). The dimensions of IS success model include;

**Information Quality:** This refers to the quality of the information that the system is able to store, deliver, or produce, and is one of the commonest dimensions along which information systems are evaluated (Abdel N., 2012). Information quality impacts both a user’s satisfaction with the system and the user’s intentions to use the system, which, in turn, impact the extent to which the system is able to yield benefits for the user and organization.

**System Quality:** Overall quality of a system is also one of the most common dimensions along which information systems are evaluated (Abdel N., 2012). System quality indirectly impacts the extent to which the system is able to deliver benefits by means of mediational relationships through the usage intentions and user satisfaction constructs.

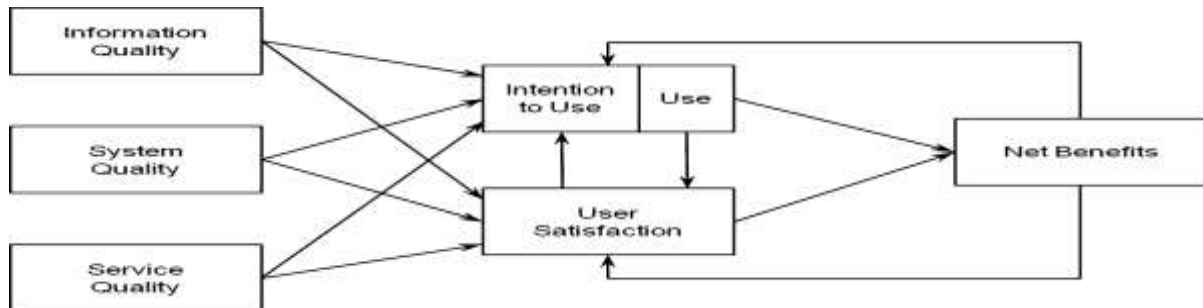
**Service Quality:** Information systems are also commonly evaluated according to the quality of service that they are able to deliver (Abdel N., 2012). Service quality directly impacts usage intentions and user satisfaction with the system, which, in turn, affects the net benefits produced by the system.

**System Use/Usage Intentions:** Intentions to use an information system and actual system use are well-established constructs in the information systems literature (Abdel N., 2012). In the IS success model system use and usage intentions

are influenced by information, system, and service quality. System use is posited to influence a user's satisfaction with the information system, which, in turn, is posited to influence usage intentions. In conjunction with user satisfaction, system use directly affects the net benefits that the system is able to provide.

**User Satisfaction:** Like actual system use, user satisfaction directly influences the net benefits provided by an information system. Satisfaction refers to the extent to which a user is pleased or contented with the information system, and is posited to be directly affected by system use (Abdel N., 2012).

**Net Benefits:** The net benefit that an information system is able to deliver is an important facet of the overall value of the system to its users or to the underlying organization (Abdel N., 2012). In the IS success model, net system benefits are affected by system use and by user satisfaction with the system. In their own right, system benefits are posited to influence both user satisfaction and a user's intentions to use the system.

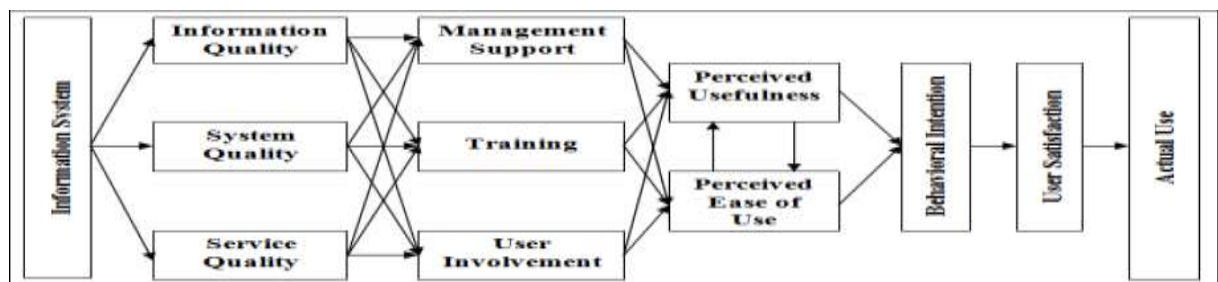


**Figure 5.** Updated DeLone and McLean Success Model (Abdel N., 2012)

**Integrated Success Model for Evaluating IS in Public Sectors (ISM)**

This model was developed by Jang C. in 2010 in accordance with TAM and D&M updated model. ISM recognizes ten dimensions for measuring information system success: These include; behavior intention, information quality, management support, perceived ease of use, perceived usefulness, service quality, system quality, training, user satisfaction, user involvement (Abdel N., 2012).

The model assumes that information quality, system quality and service quality are linked to management support, training and user involvement, and these in turn; influence perceived usefulness and perceived ease of use which affect behavior intention and user satisfaction (Abdel N., 2012).



**Figure 6.** Integrated Success Model for IS in Public Sectors (Abdel N., 2012)

**Measuring Information Quality:** Information quality (IQ) is an important factor for the adoption of services. In real every study has interpreted and classified IQ criteria conform to its context. The selected information quality elements include: Completeness; Understandability; Security; Availability; and Accuracy (Abdel N., 2012).

**Measuring Service Quality:** Service quality is a measure of how well the service level delivered matches customer expectations. The selected service quality elements include: availability; reliability; integrity; functionality; and efficiency (Abdel N., 2012).

**Measuring Management Support:** Management support refers to management approval and continuous support not only during the IS project implementation but also throughout the operational phase of the system. The selected management support measures are: management's encouragement; providing all necessary resources; discussing problems associated with the system; appreciating the optimal use of the system; and having sufficient knowledge of the system (Abdel N., 2012).



**Measuring Training:** The level of training an organization’s employees undergo with respect to information systems will have a positive relationship with implementation success. The selected training measures include: including training programs on the application; the clearance of training programs; users' role; availability of training material; and support (Abdel N., 2012).

**Measuring User Involvement:** User involvement defined as a matter of importance and personal relevance that users attach to a given system. The selected user involvement measures include: user's involvement in input design; user's involvement in output design; perceptions of service evaluations; perceived value; and customer attitude (Abdel N. H. Z., 2012).

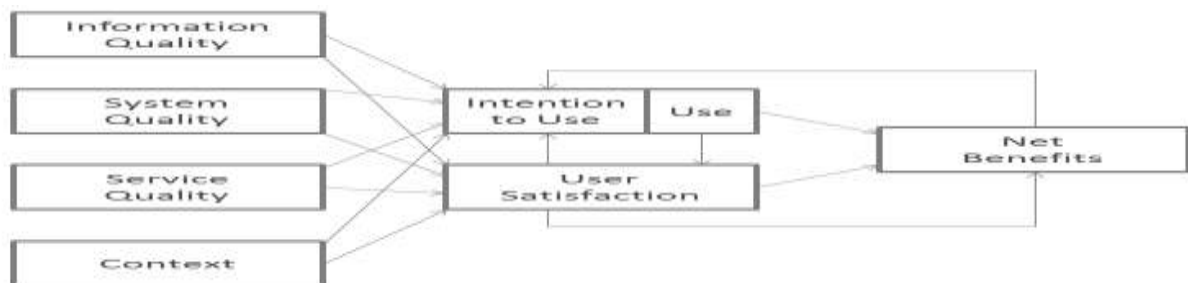
**Measuring Perceived Usefulness:** Perceived usefulness can be defined as an individual’s perception that use of technology will improve performance. The selected perceived usefulness elements include: performance; effectiveness; productivity; risk perception; and trust (Abdel N., 2012)

**Measuring Ease of Use:** Perceived ease of use can be defined as the degree to which an individual believes that learning to adopt a technology requires little effort. The selected perceived ease of use elements include: easy to learn; easy to manage; self-efficiency, simplicity; and compatibility (Abdel N., 2012).

**Measuring Behavioral Intention:** These items include: Personalization; Interactivity; Response time; Uncertainty avoidance; and Number of transactions executed (Abdel N., 2012).

**Measuring User Satisfaction:** Satisfaction is an overall affective response to a perceived discrepancy between prior expectations and perceived performance after consumption. These elements include: self-efficacy; repeat visits; personalization; perceived risk; and enjoyment (Abdel N., 2012).

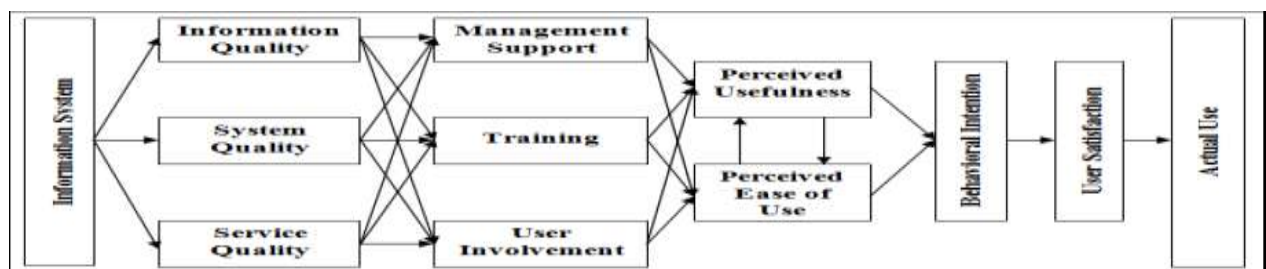
**‘Context’ variable in the Updated DeLone and McLean IS success model**



**Figure 7.** Update to DeLone and McLean Model with Mobile Technology (Jason R., 2012)

This model by Jason Ryberg includes a new concept named ‘Context’ which seeks to update the DeLone and McLean IS Success Model to accommodate mobile technology component the model. The update was based on the fact that it surfaced in many of the reviewed studies relating to mobile technology component integration in information systems (Jason Ryberg, 2012). The following are the twenty seven variables combined into the single variable namely Context: consistency and mapping, contextual, dangerous, factors related to mobile work context, information access, infrastructural context, localization, locatability, location dependency, location independence, location-centric, match between system and the real world, mobility, network externalities, portability, safety, social context, spatial context, task context, task mobility, temporal context, time independence, ubiquity, use situation, work variability and worker environment.

**Update into the Integrated Success Model for Evaluating IS in Public Sectors**



**Figure 8.** Integrated Success Model for IS in Public Sectors (Abdel N., 2012)

The IS success model in Figure 2.13 was found to be the most up-to-date, and relevant in terms of the advancement of success factors integrated and their level of depth. The new model was therefore developed from the model by integrating the mobile technology component.

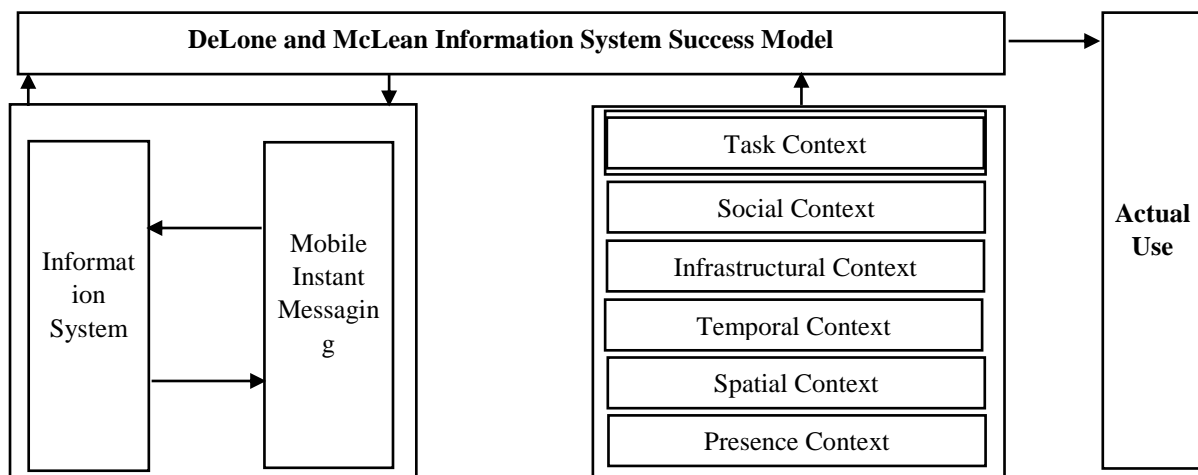
**III. Development of the New IS Success Model with Mobile Instant Messaging**

The proposed model was developed by integrating the established MIM service context model into two other existing IS success models namely;

- i. Updated DeLone and McLean IS Success Model that Includes Mobile Technology by Jason Ryberg (2012).
- ii. Integrated Success Model for Evaluating IS in Public Sectors (ISM) by Abdel Nasser H. Zaied (2012).

**The Proposed Integrated Success Model for Evaluating MIM in Universities**

Based on the results of exploratory factor analysis and findings from the area under study, the constructs of the new model were put together as shown in Figure 9;



**Figure 9.** The Proposed IS Success Model for Evaluating MIM in Universities (ISMM) (Ratemo M. C., 2016)

**Table 1:** Model summary of Service Context Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	0.689	0.680	0.596	10.105

- a. Predictors: (Constant), task context, social context, infrastructural context, temporal context, spatial context, presence context
- b. Dependent Variable: Service Context

**Table 2:** Table of coefficients of task, infrastructural, social, temporal, spatial and presence

Model	Unstandardized Coefficients		Mean Square	t	Sig.	
	B	Std. Error	Beta			
1	Constant	0.1649	0.003	0.011	0.148	0.003
	Task context	0.0366	0.011	0.048	0.669	0.002
	Social context	0.1756	0.007	0.044	0.221	0.003
	Infrastructural context	0.2198	0.004	0.016	0.225	0.002
	Temporal context	0.0733	0.006	0.027	0.372	0.003
	Spatial context	0.0733	0.003	0.011	0.148	0.002
	Presence context	0.2565	0.009	0.037	0.521	0.003

a Dependent Variable: Actual Use of Mobile Instant Messaging Systems

Based on the above analysis, the relationship of the constructs is as follows;  
 $Y=0.1649+0.0366X1+0.1756X2+0.2198X3+0.0733X4+0.0733X5+0.2565X6$  where;

- i. Y = Actual Use of Mobile Instant Messaging Systems
- ii. X1 = Task context
- iii. X2 = Social context
- iv. X3 = Infrastructural context
- v. X4 = Temporal context
- vi. X5 = Spatial context
- vii. X6 = Presence context

#### **IV. Conclusion**

This study recommends use of the new IS success model to turn around the current situation and utilize the new technology. Embracing the new model in the context of this study involves development of an appropriate policy, implementation of the policy and use of it with continual oversight based on based on the new IS success model. Each variable in the new IS success model holds specific success factors to be individually measured against and consequently exploited to realize success of the overall Mobile Instant Messaging technology.

This study recommends further research to improve the IS success model developed in this study. Further research is recommended so as to re-establish these success factors, their relationships and possible trends so as to develop a more futuristic IS success model that integrates Mobile Instant Messaging technology. Such research is necessary because the current research focused on success factors from previous studies and integrated them to form the new IS success model.

#### **V. Recommendations**

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