

**INFORMATION SYSTEMS SUCCESS MODEL IN MANDATORY SYSTEM
USAGE**

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INFORMATION SYSTEMS SUCCESS MODEL IN MANDATORY SYSTEMS
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ABSTRACT

The importance of Information System (IS) solutions for organizational competitive advantage has long been recognized but many of the IS implementations are unable to meet the acceptable IS success criteria. In addition, there are many models and frameworks that have been developed to measure and evaluate the success of IS, but none of them considers the role of user, specifically the user quality and personal characteristics. In this study, an IS success model for mandatory system usage that includes the role of user was proposed. The research design adopted a two-phase methodology comprising exploratory and confirmatory phases. The first phase consisted of identification and specification parts whereas the second phase or the confirmation part tested the proposed model. The proposed model was tested in the hospital Laboratory Information Management System (LIMS) which is part of the Hospital Information System (HIS). A survey instrument was developed and distributed to 249 respondents who are the hospital laboratory staff and users of LIMS of three hospitals in Iran. The results of the analysis showed that in the mandatory system usage in the laboratories of hospitals, the impact of the usage quality on the IS net benefits had an insignificant effect. However, the user quality significantly influenced usage quality and satisfaction quality, while their relationships were moderated by personal characteristics. The user qualities which can be manipulated were knowledge management and information technology capabilities, perception, motivation, and training. On the contrary, personal characteristics such as gender, age, education and experience cannot be manipulated during the research. Finally, these qualities have theoretical contribution as they have introduced and detailed the role of user in terms of user quality and personal characteristics in the IS success model for mandatory system usage in the healthcare context.

ABSTRAK

Kepentingan penyelesaian Sistem Maklumat (SM) sebagai kelebihan daya saing untuk organisasi telah lama diiktiraf tetapi kebanyakan pelaksanaan SM tidak dapat memenuhi kriteria kejayaan SM yang boleh diterima. Selain itu terdapat banyak model dan kerangka kerja yang telah dibangunkan untuk mengukur dan menilai kejayaan SM tetapi tidak ada model atau kerangka kerja yang mengambil kira peranan pengguna, khususnya kualiti dan ciri-ciri keperibadian pengguna. Dalam kajian ini dicadangkan supaya peranan pengguna diambil kira untuk model kejayaan SM bagi penggunaan sistem wajib. Reka bentuk penyelidikan ini menggunakan pakai kaedah dua fasa yang terdiri daripada fasa penerokaan dan fasa pengesahan. Fasa pertama terdiri daripada bahagian-bahagian pengenalan dan spesifikasi sementara fasa kedua atau fasa pengesahan adalah fasa pengujian model yang dicadangkan. Model yang dicadangkan ini telah diuji di Makmal Sistem Pengurusan Maklumat Hospital (MSPMH) yang merupakan sebahagian daripada Sistem Maklumat Hospital (SMH). Instrumen kajian telah dibangunkan dan diedarkan kepada 249 orang responden yang terdiri daripada kaki tangan makmal hospital dan pengguna LIMS di tiga buah hospital di Iran. Hasil analisis kajian menunjukkan bahawa impak penggunaan manfaat sebenar SM yang berkualiti mempunyai kesan yang signifikan terhadap penggunaan sistem wajib ini di makmal hospital. Walau bagaimanapun kualiti pengguna dipengaruhi secara signifikan oleh kualiti penggunaan dan kualiti kepuasan manakala hubungan antara kedua-duanya disederhanakan oleh ciri-ciri keperibadian pengguna. Ciri-ciri pengguna yang boleh dimanipulasi ialah pengurusan pengetahuan, keupayaan teknologi maklumat, persepsi, motivasi dan latihan. Sebaliknya, ciri-ciri peribadi seperti jantina, umur, pendidikan dan pengalaman tidak boleh dimanipulasi dalam penyelidikan ini. Akhirnya, kualiti ini mempunyai sumbangan teori kerana kualiti ini telah memperkenalkan dan memperincikan peranan pengguna dari segi kualiti pengguna dan ciri-ciri keperibadian pengguna dalam model kejayaan SM untuk penggunaan sistem wajib dalam konteks penjagaan kesihatan.

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LIST OF ABBREVIATIONS

AHS	- American Hospital Association
CEO	- Chief Executer Officer
CIO	- Chief Information Officer
CIS	- Clinical Information System
CRM	- Customer Relationship Management
CSF	- Critical Success factors
C-TAM-TPB	- Combined TAM and TPB
D&M	- DeLone and McLean
DSS	- Decision Support Systems
EMEIS	- Emergency Management Engineering Information System
ERP	- Enterprise Resource Planning
ESS	- Executive Support System
ES	- Enterprise System
EUCS	- End-User Computing Support
HIMSS	- Healthcare Information and Management Systems Society
HIS	- Hospital Information System
HIT	- Health Information Technology
IBM	- International Business Machine
IDT	- Innovation Diffusion Theory
IL	- Information Logistics
IS	- Information System
IT	- Information Technology
KWS	- Knowledge Work Systems
KM	- Knowledge management
KMS	- Management System

LIMS	- Laboratory Information and management System
LIS	- Laboratory Information System
MIS	- Management Information Systems
MM	- Motivational Model
MPCU	- Model of PC Utilization
OAS	- Office Automation Systems
PACS	- Picture archiving and Communication Systems
PDMS	- Patient Data Management System
PLM	- Product Life Cycle Management
PLS	- Partial Least Squares
PMI	- Project Management Institute
RBV	- Resource-Based View
RIS	- Radiology Information System
SCM	- Supply Chain Management
SCT	- Social Cognitive Theory
SEM	- Structural Equation Modeling
SN	- Subjective Norm
SPSS	- Statistical Package for the Social Sciences
TAM	- Technology Acceptance Theory
TOE	- Technology, Organization, Environment
TPB	- Theory of Planned Behavior
TPS	- Transaction Processing Systems
TRA	- The Theory of Reasoned Action
UIS	- Information Satisfaction
USA	- United State of America
UTAUT	- Unified Theory of Acceptance and Use of Technology

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays, many companies are implementing new Information System (IS) solutions for a better performance and to increase their competitive advantages. Such new IS solutions include Knowledge Management Systems (KMS), Supply Chain Management (SCM), Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM). This scenario is also occurring in hospitals in which Hospital Information Systems (HIS) is playing a critical role in the success of health context.

In modern world, due to rapid increase in the amount of medical information, hospitals are implementing HIS solutions to achieve a range of business benefits but consequently they encounter some issues. Such crucial issues are how hospital will be utilized to manage huge amount of patient information and then how to enhance the quality of the delivered medical services in various wards(Hung *et al.*, 2010). Furthermore, the managers of the organization want to ensure that their information systems are effective or “successful” (Petter *et al.*, 2012). Information systems in terms of implementation are affected by the size of organizations. Larger IS leads

organizations to a more complex and risky exercise, which pushes IS implementation to several problems concerning time schedules, quality, and allocated budgets (Bakker *et al.*, 2010; Hsu *et al.*, 2011).

Some researchers claim that IS success evaluation inadequate in practice and have called for further actions related to the research of IS success (Petter *et al.*, 2012). DeLone and McLean (2003) claimed that “More studies and researches should investigate and incorporate organizational impact measures,” and “this success model clearly needs further development and validation before it could serve as a basis for the selection of appropriate IS measures”. In order to answer the inadequacy of IS success evaluation and find an empirical solution for low success rate of IS implementation in terms of implementation and adoption, the present research is aiming at developing an IS success model for HIS that has both academic and practical implications. To do this, the researcher in the first step, focused on Critical Success Factors (CSF) of IS implementation in organization, especially in health context and produced a CSF model. Then IS models, framework, and theories were investigated in detail. DeLone and McLean IS success model was selected as IS platform model to develop in order to cover the neglected user’s role in the IS success which is observed by Petter *et al.*(2012). By comparing the CSF model which was retrieved in the first step with IS models, framework, and theories, the neglected user’s role in success model, was concluded and considered as a main problem for the current research.

1.2 Background of Problem

Many disappoints results were shown by business reports, academic experts and research groups (Chen and Wang, 2006; Heinrich, 2005; Richards and Jones, 2008; Zablah *et al.*, 2004) that IT project failure rate is quite high (Altuwaijri and Khorsheed, 2012; Gauld, 2007). According to an investigation in United State, IT

related issues, were top nine on CEO's lists of most concern (HIMSS, 2009). Moreno and Meléndez(2011) claimed that "there is still no conceptual framework to guide companies in its successful implementation". Many IS implementation failures have been found among previous studies and thus are very common. Standish Group reported, only 32% of IS projects were succeeded in terms of functionality, allocated budget, delivered on time, and met required features (International, 2009). Altuwaijri and Khorsheed (2012) predicted that around 24% of IS projects are total failures and therefore left, while around 44% of IS projects partially fail in terms of allocated cost overruns, allocated time, and other problems. Moreover, in the public sector, the failure rate of IS implementation is even worse and reach around 84%. From financial perspective, around 150 billion US dollars are wasted annually in the United States as well as European Union (Gauld, 2007). This report claimed that IS project failures are huge in terms of financial impact. Altuwaijri and Khorsheed (2102) also claimed that, in spite of the importance of information technology for many organizations, IS project success rate still remain low and is of a great concern for managing the daily transactions of an enterprise (Altuwaijri and Khorsheed, 2012). The current researcher concluded that, by understanding the different dimensions of IS success in organization, the body of knowledge in this field will be promoted and failure risk will be moderated.

Despite the existence of different IS models and framework such as Delone and Mclean IS success model, IS impact measurement model, and Enterprise System (ES) benefits framework which were introduced during two last decades, the user's role in IS success measurement in organizations has been constantly neglected (Petter *et al.*, 2012). Furthermore, investigations on the user's role in terms of gender, age, experience, and facilitating conditions such as IT capability, training, and perception are quite insufficient in the IS models and framework literatures. The user's role from satisfaction point of view was investigated as a dependent variable in DeLone and McLean IS success model. They measured satisfaction by criteria which are related to service, system and information quality. User in terms of individual impact was focused on in the IS-impact measurement model by Gable *et al.*(2008), they measured the influence of the IS to individuals and overlooked the user's influence on IS. The user's role has not been considered in the

ES benefits framework, they just focused on created outcome of the enterprise systems after some years of installation and use. It is concluded that investigation on the user's role in terms of user quality and personal characteristics on the success of IS is open to more study to make a clear information about the user's role.

Mandatory nature of system usage, referring to quantity of usage, makes it meaningless in terms of system success as an indicator, whereas quality of system usage seems to be more suitable when the system usage is mandatory for employees (Autzen and Heinzl, 2007). Past IS researches have largely focused on the study of voluntary usage, however investigation on the mandatory system usage was not adequate in terms of quantity of system usage. Thus, "IS models can't contribute to explain variations in the success of implementations when usage is mandatory" (Autzen and Heinzl, 2007). Usage quality in mandatory system usage should be tested as an important construction of system success with quantitative measures.

Although, the user's role in success IS model has been neglected, this issue was discussed by different researchers such as Venkatesh and Davis (2003) in the Unified Theory of Acceptance and Use of Technology (UTAUT) and Hung *et al.* (2010) and others. Venkatesh and Davis claimed that user perception is different from person to person (Davis, 1989; Venkatesh and Bala, 2008) which is related to quality of users' capabilities such as IT capability (Hung *et al.*, 2010), KM capability (Hung *et al.*, 2010), education (Venkatesh *et al.*, 2003), experience (Venkatesh *et al.*, 2003), motivation (Chalmers, 2006; Mendoza *et al.*, 2006). In this research, these weakness points were considered as a potential development of user's role in mandatory system usage for IS models and framework to propose an IS success model.

1.3 Problem Statement

Few studies show that despite the fact that many studies have been done in IS implementation, information system models and frameworks could not completely answer the needs of IS implementation in an organization. On the one hand, observations show that organizations trend to neglect the user's role in IS success measurement, and on the other hand, insufficient studies on mandatory system usage, in contrast to voluntary system usage, have been reported in recent literatures. Thus, there is a need to investigate a stronger and more comprehensive theoretical IS success model to cover aforementioned gaps. This study leads to identification of multi perspective factors of IS implementation success in organizations. This allows the relevant stakeholders to tackle IS implementation issues. Therefore, the research is designed to understand the arising issues related to success of IS implementation. The main research question is:

How can IS success model be developed to clarify the role of user in mandatory system usage in an organization?

This main question can be decomposed into following research sub-questions:

Question (1): What are the dependent and independent variables which influence and measure the success of information system in an organization?

Question (2): What is the user's role among independent and dependent variables in the IS success model?

Question (3): What IS success model can be proposed to clarify the user's role in mandatory system usage in health context?

1.4 Research Objectives

Objective (1): To identify independent and dependent variables which influence and measure the success of information systems in an organization.

Objective (2): To investigate the user's role among independent and dependent variables in the IS success model.

Objective (3): To develop an IS success model to clarify the user's role in mandatory system usage in health context.

1.5 Scope of the Research and Definitions

In this study, the prominent IS models, framework, and theories were reviewed, DeLoan and McLean IS success model was chosen as the IS platform model and considered to incorporate with IS-impact, ES benefits framework, and UTAUT. The main focus of the research scope is user's role in mandatory system usage in health context. Laboratory Information Management System (LIMS) applications in clinical and surgical laboratories has the most transaction among various subsystems of HIS. As a result, the LIMS is one of the most important HIS subsystems, was chosen as case study. Three public clinical and surgical laboratories in Shiraz, Iran were selected. Random simple sampling was chosen as sampling technique. The entire laboratory staff who had interacted with LIMS and had had at least one year of experience considered as respondents.

In this research, user's role refers to user quality (user capabilities) such as KM capability, IT capability, perception, involvement, training, and personal

characteristics such as age, gender, and experience. User's quality affects user's behaviours and can be manipulated during research, while personal characteristics affect user's attitudes and cannot be manipulated during research. Mandatory system refers to information system applications which has been implemented in an organization and had to be used by employees to deal with their daily tasks.

1.6 Significant of the Research

The proposed IS success model, not only enabled a study on the whole perspectives of the IS success model but also covered the neglected user dimension in the IS success model in mandatory system usage in health context. The result from this study can be used to support further research on various disciplinarians of IS especially in terms of IS implementation and adoption in healthcare context. The contributions of the research are listed as follows in three different perspectives including theoretical, methodological and practical.

1. The DeLone and McLean IS success model has been extended and developed incorporating with UTAUT to IS success model. (theoretical contribution)
2. Specified the user's role in the mandatory system usage in IS success model. (theoretical contribution)
3. A qualitative IS-impact research design has been specified and adapted to a quantitative IS success model. (methodological contribution)
4. Proposed model can be used by HIS mandatory system usage as well as other organization. (practical contribution)
5. Create deeper insight of IS success model, perception of IS implementation and adoption in healthcare context for all stakeholders of organization. (practical contribution)

1.7 Organization of the Thesis

The thesis is organized in seven chapters. All of the chapters are interrelated to one another. Thus, the chapters should not be read in isolation and the whole thesis is organized as follows:

- a. Chapter 1 presents background of problem, problem statement, main research question and research's sub-questions, as well as scope of the research and the significant and contribution of the research.
- b. Chapter 2 focuses on and talks about previous literatures of the relevant issues and subjects. Such reviewed issues were critical success factors, IS models, IS framework as well as IS theories. Usage quality in the system usage and decision rules to specify formative and reflective constructs were also discussed.
- c. Chapter 3 is allocated to presents road map of the research to achieve the research objectives and to answer the research questions. Research design in two main phases is detailed as well as analysis tools and techniques.
- d. Chapter 4 represents gap analysis and offers solution by proposing a new IS success model which is concluded from CSF model incorporating with Delone and McLean IS success model and UTAUT. Finally, based on proposed model, research hypothesis is listed.
- e. Chapter 5 is allocated to discussion on research instrument development and instrument validation. Pilot study is discussed and initial finding is presented.
- f. Chapter 6 is arranged to present reliability's test of specified research's instrument and validating proposed model and main survey steps. Measurement model and structural model, research's finding and discussion are also presented in the chapter six.
- g. Chapter 7 is allocated to revisit research questions and objectives to control the achievement. Brief conclusion is presented as well as future work and research limitations.

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