State of the art of Information Systems failure managements

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Abstract. Information systems (IS) play a vital role in our daily life. They collect, store, organize and distribute data in structured and organized ways to improve people's daily activities in the most efficient and effective manner. To achieve that, functions and structures are mixed together in a dynamic way to construct an information system with sophisticated capabilities beyond sending emails and publishing data online. Consequently, enterprises and government departments allocate huge financial and human resources for the development of interconnected information systems. However, failures in information systems projects have been growing in the last few years despite their massive allocated resources. That means any IS projects that do not meet their objectives and goal have gone beyond budget or not completed within the agreed time. While there are several factors triggering these failures, this research aims to investigate and address the key factors that are responsible for failure within information systems in various regions, The work conducted includes identifying different role of information systems components, comparing two important information systems success/failure models namely DeLone and Mclean model and ITPOSMO model, and summarising critical success/factors for information systems from various regions. The research findings can be used for developing an framework for effectively managing Information System.

Keywords. Information Systems, Failure, Failure Factors

1. Introduction

The rapid and fast development of technology changes the structure of organizations both in terms of business pattern and management of human resource. There are various kinds of information systems developed and designed for a range of different organizational settings such as online learning communication, correspondence and quick response to online queries in education sector. Nowadays, information systems connect individuals and business communities from one continent to another and continuously exchange information fragments. For instance, a student can attend his/her lectures while he/she is physically away from her university, i.e., through a virtual classroom provided by the university's online learning system, saving her time and money [1]. The Information System design have lots of issues when comes to the implementation i.e. compatibility of the system with the organizational environment and

user adoptability. Due to the fact, these that kinds of projects are different from other engineering projects because of abstract constraints, hidden complexity, excessive perception of flexibility and the goal to change current business processes and procedures [2]. Multiple platform and devices interfaces are now common in additions to modern public information systems [3].

Many countries had spent huge financial resources on the development of interconnected information systems. These are mainly manmade -machine-intelligence blended systems. According to Irani [4] *"Information systems (IS) make it possible to improve organizational efficiency and effectiveness, which can provide competitive advantage".* In public sector, information systems use to improve people activities in modern way with efficiency and effectiveness. That involves not only e-portal and emails or publishing data via internet. That means a list of structures and functions mixed in dynamic and professional ways. Thus, information systems projects are implemented in different countries in order to facilities organization services by using new technologies[5]. For instance, Education Information Systems and processing issues with students in universities where in many places, data records are manually entered and processed. However, these have a little reliability when a new device data is added or data is exported to other systems.

Kaur and Aggrawal [6] stated that *"An information system (IS) project management is the critical issue for the companies due to its high failure rate. This has been confirmed from most of the studies that not all the failures belong to technical aspects but also to the social aspects of the system as IS is a Socio-technical System."* Information systems projects costs billions of dollars and time. To achieve projects goals and initiatives, organizations should carefully consider success factors such as education, training, necessary infrastructure or management discipline [2]. Information systems failure means there is a gap between project design and reality. Evaluating the success/failure for information systems is by classifying the nature and dimension of these gaps [5].

2. Information Systems Components

An "Information systems" is a combination between computer software, hardware and communication technology that is developed, designed and implemented to handle organization information related to core and supportive organization processes and policies [7] [8]. Heeks [9] mentioned that "*Information systems (IS) can be defined as systems of human and technical components that accept, store, process, output and transmit information. They may be based on any combination of human endeavors, paper-based methods and IT*".

The first component of information systems is Hardware, it is a tangible part of computer, which are input, output and storage devices. Software is intangible part of computer, includes operating systems and applications that have instructions which operate and control the hardware. The third component is Data, a collection of facts and information as well as you cannot touch it, For instance, your business address, your home address and your mobile number. Network component is to enable electronic communication by Connect computers and equipment (software and hardware). People who are the major element in computer based information systems include technical support (the front-line help-desk), programmers, systems analysts and chief information officer (CIO). Process which includes methods, series of steps, policies, strategies and rules to achieve organizational goal and outcome. Nowadays, the integration between

information systems and organization processes appear to be more productive and best control. However, utilizing technology to automate processes is not sufficient alone to improve the efficiency of information systems. To achieve the ultimate goal of organizations, all actors include staff, vendor and consumers should manage and improve processes by using technology [10] [11].

3. Information Systems Models to Locate Success and Failure

DeLone & McLean [12] [13] produced useful framework for avoid failure of Information systems. The D&M framework content of six dimensions include: System quality: which explains information system characteristics such as system flexibility as well as ease of learning and use. Information quality: this dimension focus on system outputs (i.e. understandability, usability and relevance). Service quality: which means the quality of the support that should system users receive form technical teams. For example, empathy of the personnel staff, responsiveness and accuracy. System use: the technique of information systems abilities and how system users utilize it (i.e. frequency and reason of use). User satisfaction: level of support services and satisfactory. Net benefits: all actors such as individuals and organizations were participating in order to success of information systems (i.e. raise of sales and profit, consumer welfare and decision-making improvement) [14].

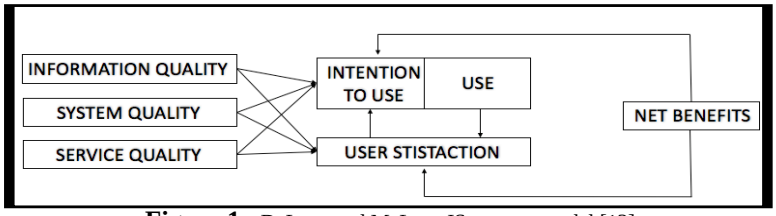

Figure 1. DeLone and McLean IS success model [13]

Heeks implemented ITPOSMO model to find out in simple way the range of fit between the purpose design and realities of organization's information systems "design-reality gap" in three main group, which are technical (information, technology and process), human (objectives, motivation and value) and organizational (management structures and other resources). Success/Fail of information systems is the range of change between the current situation "As Is" and the visualization into the project's design "To Be" of those information systems [15] [16].

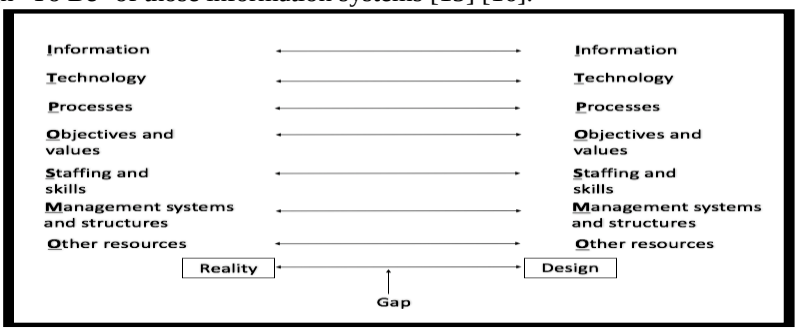

Figure 2. Heeks model (Design-reality gaps dimensions) [15]

4. Types of Failure for Information Systems

In many countries, various of information systems projects categorized as fail despite the high resources allocations. Information systems that achieved organization goal, finished on time within agreed budget considered as success project [6]. Several researchers summarized information systems failure to three major types. Table 1 illustrates, types of failure for information systems. Table 1 illustrates, types of failure for information systems.

Table 1. Types of Failure for information systems

Author	Project Failure	System failure	User failure
Heeks [9]	*"This may be the total failure of an initiative never implemented or in which a new system is implemented but immediately abandoned"*	*"The partial failure of an initiative in which major goals are unattained or in which there are significant undesirable outcomes"*	*"The sustainability failure of an initiative that succeeds initially but then fails after a year or so; or the replication failure of an initiative that succeeds in one place but cannot be repeated elsewhere"*
Goldfi [17]	*"The project does not meet the standards agreed, including the functions provided, budget, or completion deadlines"*	*"The system does not work properly, including not performing as expected, not being operational at the specified time, or not being used in the way intended"*	*"The system is not used in the face of user resistance because of such things as recalcitrance, lack of training and ability of staff, and the complexity of the new system"*
Abdelsalam, ElKadi, & Gamal [18]	*"the project does not meet the specification agreed upon, including the functional requirements, budget, or completion deadline"*	*"the system does not work properly, including expected performance, not being used in the way intended, or used as intended but does not deliver the expected benefits"*	*"the system is not used in the face of user resistance because of such things as recalcitrance, lack of training and ability of staff, and the complexity of the new system"*
Kaur & Aggrawal [6]	*"When the approved standards have not been met, it is called project failure, it includes meeting the deadlines, budgets and the functionality"*	*"When the system does not perform as expected and also does not operate at the particular time or not being used in the way intended it is called system failure. The projects may not produce productive gains even when they are used with right intentions"*	*"When the user is resistant in using the system, it is called user failure. The reason may be lack of training and ability of staff, complexity of the new system or a confrontation against a new system"*

5. Success and Failure Factors reported in previous studies

Goldfi [17] stated that *"Failure is a social construct, and perceptions of what is and is not failure can vary between persons and over time"*. Failure in information systems projects have been growing in the last a few years. That is because several reasons including lack of knowledge, difficulties of technology, functional problem, and managerial issues. Information systems failure is that when projects fail to meet requirement, goal, roles, expectation and collaboration between all information systems components during the same time and budget. It cost billions of dollars and time on that failed projects [2]. In order achieving projects goals and initiatives organizations should consider carefully success factors such as education, training, necessary infrastructure or management discipline [2]. Information systems failure means there is a gap between project design and reality. Evaluating the success and failure for information systems is by classifying the nature and dimension of these gaps [5]. As the development of frameworks and models for factors responsible of failure in information systems is

progressing, research varies in terms of various factors in the IS failure models. As table 2 illustrates, each paper focus on some area in information systems. Furthermore, some areas are covered only partially.

Table 2. failure / success factors

Author	Organization/country	Failure / Success Factors
SCHMID et al [19]	Hong Kong, US and Finland	Managerial issues include (deficiency in top management support, indefinite scope and objectives and Fail to consider the expectancy of the end-users) Project management issues include (lack of understanding user's needs, poorly managing change, increase number of org units and overlaps between functions and responsibilities)
Irani [4]	Manufacturing IS	lack of data accuracy, Technical issues include (hardware termination, support team cannot manage bar code systems), Production issues include (decrease in productivity and deliverables, misunderstanding of strategic direction between organizations and suppliers)
Al-Gahtani [21]	Saudi Arabia public organization	Individual factor (age, education level and attitudes) -Technical factor (relative advantage and complexity) - Organizational factor (support, culture and training)
Syamamsuddin [16]	Developing Countries	Information (limitations of groups that dealing with originations information) Technology (hardware technical problems) Process (unknown of systems goals by employees who work with e-government projects) Objectives (lack of understanding e-government project aim and value) Staff and skills (educational weakness) Other resources (new technology has been rejected by users)
Rugchatjaroen [5]	Developing countries	Information gap (limitation of project information)- Technology gap (the developer did not consider about maintenance for both software and hardware) - (unclear of process dimension) - (unclear of citizen participation in the projects" initiative and problem identification) - (they had not enough sufficient knowledge about the projects) - (lack of management system and structures required in the agency) - Other resources gap (budget problems)
Lee et al [22]	Manufacturing companies in China	clearness and accuracy of data and information, excellent cooperation between departments and they concentrate on business processes, the culture was changed to new management, strength on information technology infrastructure and possession, and adequate of information systems adoption.
Gil-García & Pardo [23]	US and Canada	Top management carefully consider (realistic goals, planning, feedback, quality), Technology (easy to use, measurable deliverables and improvement of business process) Staffs (Adequate training, skills, good communication and expertise)

6. Conclusions

In sum, trends in information systems are constantly changing due to the rapid technological advancement and the intense competitive environments of the organizations. However, failure phenomenon rates are high and widely clear in information systems projects. That is because these projects are complex in nature, complicated, unstructured and not readily quantifiable.

This paper discussed several failure types and factors of information systems projects, and then presented several recommendations for people who are involved in the design cycle of information systems to avoid critical factors responsible for failure in information systems. For instance, top management support, strong political lead, and training for end users are some recommendations, which play an important role of information systems success. Finally, a framework to manage failure factors is required to successful in their information systems.

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