Classification of Failure Factors in Information Systems

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Abstract

Failure rate of Information Systems have rapidly increased in different aspects due to different reasons. Although above situation is not a new sight in the field of Information System, it creates many obstacles to regular activities of any organization. The failure of Information System has become a common state for any organization or industry and not depending on their rank or status. Numerous factors may have affected for Information System Failures and these factors are functioning together or individually to create the failure situation of Information Systems. The objective of this paper is to identify the main failure factors in the Information Systems. An in-depth review of the existing literature has been done to meet the objective of this study. Multidisciplinary studies across different countries, industries and areas have taken into account for identifying the main failure factors of Information Systems. This paper is presented to focus the main failure factors that affected for Information System failures based on literature; environment, quality control, human related, technology related and other connected factors. It can be mainly divided into two parts. They are conceptual factors and background factors or hard factors and soft factors. User participation, participant behavior, user satisfaction, attitudes and expectation level, and the management of organization, infrastructure facilities and pattern of usage play a crucial role in the field of Information Systems that have been identified as background factors with significant impact on Information System failures. Quality failure, project failure, system failure, management failure and software failure identified as conceptual failure factors.

Key words: Information System, Information system failure, System failure, Information System management

Introduction and Background

Although the outdated aim of an Information System is to build, maintain, and operate information delivery systems, but providing information that has become the goal today (Leyland & Pitt, 1995). Information system is a powerful tool and it consists of many skills to collect, present, analyze the data and information and in the meantime helps for making effective decisions. Information Systems and their developments are complex in organizational and social phenomena that are still not well enough to understand. This lack of understanding is a major contributor to the persistently high level of problems and failures that continue to plague information systems development projects (Hart & Warne, 2007). Information System is described as "any organized combination of people, hardware, software, communications networks and data resources that collects,

transforms and disseminates information in an organization" (O'Brien, 2003 cited in Reeva & Johnston, 2007, p 73). They are not just self-operating control mechanisms and human involvement is needed. According to some definitions, it is difficult to understand the difference between Information Systems and computer systems. "Information systems are not computer systems but are systems of human activity or micro social systems and consequently the functionalist science or interpretative sociology appear an inadequate basis on which to study them a wider critical social context seeming more relevant" (Clarke & Lehaney ,2000, p 555). For some the web site is an Information System. Although it operates as a source of information it could not be introduced as an information system.

"Information System may have two ways; manual system or computerized system. Web site is not a typical information retrieval system. It may be a gateway to a set of structured databases, textual databases or other services outside of the Web itself" (Toleva – Stoimenova, 2010, p 303). Information system can be divided into four components and these are defined as a socio-technical system comprised of two sub-systems: a technical sub system and a social sub system. The technical sub-system encompasses the technology and process components while the social sub system encompasses the people and structure components (Watson, 2007). Technology, people, process components and system components are included in an Information System. The role of the Information System is to provide information to management and relevant field which will enable them to make decisions which ensure that the organization is controlled (Hardcastle, 2008).

Although Information Systems failure is a plentiful matter in the field, the approach of discussion on Information System failure has been changed from time to time moving among different factors. Research of IS failures dates back to 1960s. The early works were concerned with technological or engineering problems where systems were not delivering the required performance. These failures originated in hardware or software deficiencies. In 1970s, the focus turned towards to user resistance and the lack of user involvement quickly claimed to be a major reason for failure. Later, discussions included managerial or organizational issues but were still direction of IS failure that is moving on different dimensions and factors (Bartis & Mitev, 2008).

Many researchers have conducted research to identify the failure of IS (Kaur & Aggrawal, 2013). Failures in the IS has become a common thing in the technology field by today. "Failure is seen to derive from lack of fit between factors; success from congruence between factors. IS implementation models drawn on this theme have involved fit between "tool"/"technology " and "task" or between multiple factors "(Heeks, 2002, p 103). Kaur & Aggrawal (2013) have discussed a number of types of failures that can be seen in Information Systems elaborating Wilson and Howcroft. He has discussed three types of failures; Project failure, System failure and User failure. When the approved standards have not met, it is called project failure. It includes meeting the deadlines, budgets and the functionality. When the system does not perform as expected and does not operate at the particular time or not being used in, the way it was intended it is called system failure. The projects may not produce productive gains even when they are used with good intentions. When the user is resisted in using the system, it is called user failure. The reason may be lack of training and inability of the staff and complexities in the new system or a confrontation against a new system. Failure can have benefits, especially in relation to learning. Unfortunately, while learning from IS failure does occur, it is generally fortuitous rather than planned (Heeks, 2002 ; Bartis & Mitev, 2008).

An information system project management is the critical issue for the companies due to its high failure rate (Kaur & Aggrawal ,2013). Uwadia et al (2006) have reported considering previous research that up to 25% of large systems development projects were cancelled, 60% experienced cost overruns, 75% had quality problems, and less than 1% of all the systems developments projects studied within the schedule. Other studies confirm that the majority of IS projects are late, cost overruns or escalation are very common, and in some instances,

the IS projects are cancelled (Uwadia et al, 2006). "In a very direct sense, failure is also a problem because of the opportunity costs of resource investment in failure, as opposed to success. Such opportunity costs are likely to be particularly high in developing countries because of the more limited availability of resources such as capital and skilled labour"(Heeks, 2002, p 103). Information System failures in developing countries have become a noticeable issue than developed countries because of social, cultural and economic difficulties.

Many reasons may have affected for Information System Failures; environment factors, quality control factors and other connected factors. These factors come to influence the failure situation functioning together or individually. Although it is very difficult to identify those separately and individually it is needed to study one by one to make effective solutions for failure states.

Information System failures in Developing Countries

 "Many information systems in developing countries can be categorized as failing either totally or partially" (Heeks. 2002, p 101). Gunatunge (2003) has presented some examples for above statement. "There have been numerous failures in information systems development for organizations in Sri Lanka" (Gunatunge, 2003, p 1). Even though Sri Lanka is a developing country Information Systems are continuously being implemented because of the importance of Information Systems in the Sri Lankan context. According to Heeks (2002) there are three categories of Information systems in developing countries. They are identified as total failure, partial failure and success. His opinion on "lack of literature relating to IS in developing countries" as follows; "Lack of literature in general: until very recently, the entire literature on IS and developing countries would struggle to fill a single bookshelf. The attention of writers from researchers to consultants and journalists have been focused elsewhere" (Heeks, 2002. p 3). He has explained the success and failure of Information Systems in developing countries using Design-reality gap model. According that model dimensions are categorized under Information, Technology, Processes, Objective values and motivations, Staffing and skills, Management and structures, and other resources. He has included above factors one by one and also he has mentioned that on the result of Design-reality gap model comparing with developed countries.
- "Information: formal, quantitative information stored outside the human mind is valued less in developing countries.
- Technology: the technological infrastructure (telecommunications, networks, electricity) is more limited and/or older in developing countries.
- Processes: work processes are more contingent in developing countries because of the more politicized and inconstant environment.
- Objectives, values and motivations: developing countries are reportedly more likely to have cultures that value kin loyalty, authority, secrecy, and risk aversion.
- Staffing and skills: developing countries have a more limited local skills base in a wide range of skills. This includes IS/ICT skills of systems analysis and design, implementation skills, and operation-related skills including computer literacy and familiarity with the Western languages that dominate computing. It also includes a set of broader skills covering the planning, implementation and management of IS initiatives.
- Management and structures: developing country organizations are more hierarchical and more centralized.
- Other resources: developing countries have less money. In addition, the cost of ICTs is higher than in industrialized countries whereas the cost of labour is less" (Heeks. 2002, p 101).

Design–actuality gap leads to assess the match or mismatch between actuality and system design as above.

"It is a well-known secret in the computer industry that information systems projects are more likely to fail than not" (Stanforth, 2010, p 6). Although Information technology and Information System are different concepts, both have become key tools to control social and economic environment in a country. It is rapidly growing in public and private sectors in the global context. Although Sri Lanka has achieved improvements in technology during the past few decades and in the meantime IS failure situations have been noted. "There have been numerous failures in developing information systems for organizations in Sri Lanka. This is mainly due to the ignorance of the social context with which Information Systems are being developed and implemented. Information systems practitioners in Sri Lanka usually evaluate success of information systems from the standpoint of technical and economic rationality only" (Gunatunge, 2003, p 1). Gunatunge (2003) has explained Critical Social Theory of Habermas in his research. Habermas's theory provides potentially empowering theoretical framework to understand social context of organizations. He has used qualitative approach on case study method. "Users perceived that their participation in the system modification was essential if it were to be successful. However, user participation was restricted by the power of systems analysts and outside consultants" (Gunatunge, 2003, p 12). He presented an alternative approach to information system development based on communicative action. He has given an argument for a need of a contextual notion of rationality arising from a particular historical experience and socio-cultural, economic and political context of a country. It is a good aspect to do research regarding IS in developing countries like Sri Lanka.

There was a case study research on "Information Systems and Modernization of Organizations" done by Gunatunge (2004). "Information systems should be developed taking into considerations the social contexts of organizations in Sri Lanka"(Gunatunge, 2004, p 43). He has examined the "Critical Social Theory of Habermas" in his case study research. ABC ceramic company has chosen as the case study. ABC senior management   and outside consultants adopted objective positivist rationality in information systems development and practice. His rationality was clashed with the historically established socio-culture of ABC. As a result, Information System network was abandoned or partially implemented with little success.

Reasons for Information Systems Failures

Although the Information System was operational for a period of time, it was eventually deemed a failure. The reason for this was that a range of human and organizational factors prevented the organization from embracing the full impact of the system (Irani, Sharif and Love, 2001). "Information systems development is a high-risk undertaking and failures remain common despite advances in development tools and technologies" (Lyytinen and Robey, 1999, p 85). According to Lyytinen and Robey (1999), they have pointed out some reasons for failures in the Information Systems; organizations fail to learn from their experience in systems development because of limits of organizational intelligence, disincentives for learning, organizational designs, and educational barriers.

Certain failure factors in the information system projects issues in the Iranian organizational approaches that have been explained by Kaur & Aggrawal (2013) agreeing with Glaser(2005) are as follows.

- Non-establishment of clarified objectives for IS project initiative.
- Non-communication regarding achievements of objectives.
- Non-protection of the projects from organizational multiple projects sponsorship and management.

• Non-creation of reward systems to provide incentives for participants towards project success.
• Non-acceptance of the debates in the projects and reception of constructive feedbacks.
• Non-breakage of complexity in the projects at manageable pieces.
• Taking account of organizational resistance to change.
•Developing a good change management especially when facing a broad scope IT change.
• Providing adequate resources to project and assign best personnel to them.
• Accepting and limiting the rigorousness of the short-term operational disruption.
• Ensuring and communicating regular visible progress.
• Being vigilant of new and unverified technologies.

According to Kaur & Aggrawal (2013) the major failure factors seem to be valid merely from project manager's stand and regardless of type of organizations. Four major theoretical failure categories have been identified in the research on "Human error and information systems failure" by Paul Beynon. They are Correspondence failure, Process failure, Interaction failure and Expectation failure (Beynon, 1999). Kaur & Aggrawal (2013) have elaborated the findings of Standish Group on Information system development; "According to research conducted by Standish Group, Information system development and implementation projects often tend to end in failure. 40% of information system development and implementation projects have been failed to complete. Standish Group classifies the success in the recognition of information system development and implementation projects into three types
   • Successful projects;
   • Failed projects;
   • Projects exceeding the set deadlines and budget frameworks" (Kaur & Aggrawal,2013).

 Critical Failure Factors of an information system are described by Ganesh & Mehta (2010) as follows.

   1. Lack of consultant effectiveness
   2. Low quality BPR (Business Process Reengineering)
   3. Ineffective project management
   4. Misfit of IS Software
   5. High turnover rate of project team members
   6. Over-dependence on intense customization
   7. Insufficient IT Infrastructure
   8. Lack in knowledge in transfers
   9. Ambiguous Concept of the Nature of IS
   10. Unclear concept of IS from the Users perspective
   11. Impractical expectations from top management from IS projects
   12. Too firm project schedule
   13. Users' resistance to change
   14. Lack of top management support
   15. Low quality of testing
   16. Lack in formal communication between system developers and users
   17. Software modification
   18. Informal strategy
   19. Unprofessional dedication
   20. Functionality problems with the system
   21. Overrun costs

The above list highlights reasons as to why some IS are perceived as failures. (Ganesh & Mehta, 2010; Kaur & Aggrawal, 2013). Information Systems are implementing on different reasons and purposes and it is useful for entering data, accessing and retrieving information and making decisions. However, the purpose of the system is to fulfill users' information needs by retrieving relevant documents and not to return results based on simple keyword without any regard for the user context. The performance evaluation of an information retrieval system is the process that obtains the time and space measures. Usually it consists the estimated factors, which maintain direct relationships with the system technology: database coverage and volume, the response time for the search process – it is a function of indexing scheme, and expressive power of query language (Toleva-Stoimenova, 2010).

Iran is the fastest growing country in the Middle East and Information Systems face number of problems due to the political barriers in this country (Kaur & Aggrawal, 2013). Kaur & Aggrawal (2013) have pointed out that the top management failures are the main reasons for the failures of IS projects according to Glaser (2005) as elaborated below (Glaser, 2005 cited in Kaur & Aggrawal, 2013):

- Inadequate support from senior management,
- Insufficient leadership to commence a project,
- Inability to manage complexities,
- Failure to anticipate short-term interferences,
- Incapability to display the unseen progress,
- Ignorance of the stability and maturity of the used technology

Developing any Information Systems, whether it is based in a commercial organization or within a university environment, is an activity that is fraught with risk (Uwadia et al, 2006).
It is needed to investigate the organizational impact towards failure of IS. "Organizational politics and power politics are considered to be of high impact on failure or success. Inability to understand power relationships during systems analysis, design and implementation have serious implications and it is a key factor in Information Systems projects failure" (Bartis & Mitev, 2008,p 114). The failures push any countries on the negative side of the global technology. Therefore, Information Systems failure is a very real and practical problem in developing countries that needs to be addressed.

The research on "Analyzing e-Government Project Failure: Comparing Factorial, Systems and Interpretive Approaches" done by Stanfoth (2010) has shown different aspects in the Information management field. Critical failure factors for the information systems projects (proposed by flowers) as follows.

Table 1. Critical failure factors for the information systems projects.

Organizational Context	Conduct of Project
Hostile culture	Initiation Stage
Poor reporting structures	Technology focused
	Lure of leading edge
Project Management	
Over-commitment	Analysis and Design Phase
Political pressures	Poor consultation
	Design by committee
	Technical 'fix' for management problem
	Development Phase
	Staff turnover
	Competency
	Communication
	Implementation Stage Receding
	deadlines Inadequate
	setting Inadequate user training

According to Stanfoth (2010) critical failure factors can be influenced in many ways. Each and every step should be considered as a risk level to manage the failure situations. Failures can be generated in initiation phase, designing phase, developing phase or implementing phase.

User participation is a very important element for research on Information systems. According to He and King (2008), the user participation and Information system development outcome relationship has fundamental importance to both IS research and systems development practices. "User participation is minimally-to-moderately beneficial to Information system development and its effects are comparatively stronger on attitudinal/behavioral outcomes than the productivity outcomes. This attitudinal/behavioral impact may largely due to the result of the emphasis that has been placed on user participation by academics and consultants" (He & King, 2008). This means the user participation is important to understand the relationship between user participation and IS. He and King (2008), user participation, which is defined as the behaviors and activities that users or their representatives perform in the systems development process. "Many academics and consultants recommend user participation in information system development as an effective practice to achieve various favorable outcomes, including enhanced user satisfaction and increased system quality" (He and King, 2008, p 301). It is vitally relevant to academic institutions like university. In a market, the customer is the king and their opinion is very important to add value to the field to increase the user satisfaction. In academic institutes user is an important category to collect information to enhance the service quality. Three variables potentially lead to user satisfaction. They are IS service expectation, IS service quality and perceived service quality. (Jiang et al, 2012)

Participant behavior is an important consideration in developing an e-survey (Sutarso & Suharmadi, 2011). Toleva-Stoimenova (2010) has done a research on web based information systems. The paper focused on information system's quality to inform their users successfully. The paper shared the experience obtained in

assessment of university web sites according to system effectiveness and users' satisfaction. Cronin and Taylor, (1992) have done a research on "Measuring Service Quality: A Reexamination and Extension". They have examined the difference between satisfaction and attitudes and attitudes and expectation. They have tested twenty two items of SERVQUAL using factor analysis. Performance based scale developed: SERVPERF. The results suggested that the performance-based service quality construct and the service satisfaction have a significant measure of service quality that may be an improvement of measuring quality of consumer satisfaction and the consumer's effects on purchase intentions and service quality that have less effect on purchase intentions than the consumer satisfaction.

According to original formulation of the D&M Model, "use" and "user satisfaction" are closely interrelated. "Use" must precede "user satisfaction" in a process sense, but positively experience with "use" will lead to a greater "user satisfaction" in a causal sense. Similarly, increased "user satisfaction" will lead to increase "intention to use," and thus "use." (Delone & Mclean, 2003). "User satisfaction reflects the individual's psychological state of readiness to use a system. It is the most widely used measure in the success of Information System Development. User satisfaction refers to the extent to which users feel target systems or their deliverables (e.g., data and reports derived from using the system) meet their needs, requirements, and expectations" (He and King, 2008, 305). User participation, participant behavior, user satisfaction, attitudes and expectation level and the management of organization play a crucial role in the field of Information Systems, identified as background factors that have significant impact on Information System failures.

Conclusions

Implementing or purchasing the Information Systems are being rapidly increased with technology improvements over the world and all most manual systems are transferring to computerized systems. Many resources have been used for this process because of their importance. Although Information Systems failure is a plentiful matter in the field, the approach of discussion on Information System failure has been changed from time to time moving among different factors. Information Systems failures have become a common situation and a noticeable issue in an organization mostly in developing countries at present because of their socio-cultural, economic and political context. Information system failures can be seen every field without specification. However, while reviewing the literature it can be identified the literature gap and the research gap of the Information System failure in the area of higher education and this matter is needed to be investigated in the future. Many factors have influenced the failure situations of Information Systems and many reasons may have contributed; eg environment factors, quality control factors and other connected factors. These factors influence the failure situation functioning together or individually. Although it is very difficult to identify those separately and individually and it is needed to study one by one to make effective solutions for failure states. However it can be mainly divided into two parts. They are conceptual factors and background factors or hard factors and soft factors as shown in Table 2.

Table 2. Classification of factors which may have affected Information Systems Failures

Background Factors	Conceptual Factors
user participation	quality failure
participant behavior	project failure
user satisfaction	system failure
attitudes and expectation level of user	management failure
management of organization	software failure
infrastructure facilities	
pattern of usage	

User participation, participant behavior, user satisfaction, attitudes and expectation level, and the management of organization, infrastructure facilities and pattern of usage play a crucial role in the field of Information Systems that have been identified as background factors with significant impact on Information System failures. Quality failure, project failure, system failure, management failure and software failure identified as conceptual failure factors. Identifying factors is very essential to lead an efficient framework that would avoid failure situations.

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