한국산업정보학회논문지 제5권 제4호 (2000. 12)

AN INTERNAL STRUCTURE OF INFORMATION SYSTEMS FAILURE: What really constitutes IS failure?

Jong-Uk Kim*

Abstract Information systems (IS) failures still continue and are prevalent everywhere. When considering an enormous amount of budget currently invested on IS technology in many organizations, these continuing failures can be critical culprits to failures of the organizations themselves. However, the meaning and definition of IS failures are not unified among IS researchers as well as IS practitioners although there have been a lot of conceptual research regarding the concept of IS failures. Previous empirical studies are not enough yet and thus we anticipate further empirical studies to be performed which will validate previous conceptual research. In this regards, by analyzing IS practitioners perception toward IS failures in a more detailed manner, this research extends conceptual and empirical research in the past which previously identified the structure of information systems (IS) failures. Further, this current study identified the interrelationships among the categories. The data was analyzed using a multidimensional scaling program and fourteen categories of problems were identified as to constitute the IS failure structure. It was found that about a half of categories identified were related to technical failures such as network and system infrastructure, costs, data/information, and program errors. The other remaining categories were related with organizational or social problems such as business success, human resources, relationships, communication, and user skills.

1. INTRODUCTION

Despite of continuous efforts of information systems(IS) community to improve IS management practice and to develop further sophisticated development tools and diverse information techniques which in turn have led to improvements in efficiency, functionality, reliability, and ease-of-use, IS failures still continue to be reported in the numerous literature (Alter and Ginzberg, 1978; Ewusi-Mensah and Przasnyski, 1991; GAO, 1992; Keider, 1978; Lucas, 1981; Lucas, 1975; Lyytinen and Hirschheim, 1987; Poulymenakou and Holmes, 1996; Sauer, 1996). Widely known examples of these phenomena of IS failure are well presented in the two classical research of Brooks (1974) the mythical man-month and Lucas (1975) why information systems fail.

Turner(1982) reports that somewhere between one-third to half of all systems fail and Hochstrasser and Griffiths (1991) report that up to 70% of IS projects have failed. Gladden's (1982) survey in 1982 indicates a worse result that 75% of all systems development undertaken is either never completed or never used if completed. Mowshowitz (1976) even states that many, if not most, information systems are failures in one sense or another.

These IS failures are continuing in the 1990s. Abdel-Hamid and Madnick (1990) cite a headline in the Wall Street Journal explicitly saying Creating New Software was Agonizing Task for Mitch Kapor Firm, subtitled with Despite Experts Experience, Job Repeatedly Overrun Time and Cost Forecasts. Financial

*영남대학교 상경대학 경영학부 조교수
†이 논문은 1997학년도 영남대학교 학술연구조성비에 의한 것임.

implications of failure are far greater: the Westpac CS 90 $150 million failure and the $ 125 million CONFIRM project failure (Oz, 1994).

These IS failures are manifested in a number of ways. In case of discretionary users of the system, they may not use the system or may use it infrequently (Lucas, 1975); captive users, on the other hand, may resist the mandatory use of the IS (Frantz & Kahn, 1994; Markus, 1983) and may exhibit negative attitudes towards the system (Ginzberg, 1981). Thus, in any case, the potential benefits of the IS may not be realized from the organization's perspective (Alter & Ginzberg, 1978).

IS failure can be fatal to the success of organizations due to the current considerable investments in information systems. During the 1980s, investments in information technology (IT) reached $ 190 billion (Keen, 1991), and US expenditures for software development and maintenance has been estimated to grow by 1995 to more than $ 225 billion domestically and more than $ 450 billion worldwide. For the remainder of 1990s, companies will continue to spend an enormous capital on building their information systems. According to Coombs(1993), the worlds largest economies spend on IT on average 4% of their gross national product(GNP) and their figure is expected to be twice within the next eight years.

In this regard, it is important to understand in a clear and comprehensive way the concept of IS failure and its antecedent causes. Therefore, failures in IS development and implementation have been a subject of considerable discussion in the information systems literature (Bostrom & Heinen, 1977; Ewusi-Mensah & Przasnyski, 1991; Ginzberg, 1981; Kumar & Welke, 1990). The most prominent work for IS failures is provided by Lyytinen and Hirschheim (1987). They developed the most comprehensive classification framework for IS failures, identifying four ways of defining IS failures: correspondence failure, process failure, interaction failure, and expectation failure. Ewusi-Mensah and Przasnyski (1991) also identify multidimensional factors for IS project abandonment such as cost overruns, schedule delays, technological problems, and organizational, behavioral, or political issues. Lyytinen(1988) identifies the following four areas as major background areas for IS failure: information systems, the environment of the IS, information systems development(ISD), and the ISD environment.

Although a wealthy stream of research has existed on this issue (Ewusi-Mensah & Przasnyski, 1991; GAO, 1992; Ginzberg, 1981; Lucas, 1975; Lyytinen & Hirschheim, 1987; Markus, 1981; Robey & Markus, 1984), however, the concept of IS failure still remain ill-defined and poorly understood. A lot of previous research identified only one or two or, at most, several categories of IS failures from the individual cases of such failures. Some studies, although they recognized multi-perspectives of IS failures, also attached too limiting causes to the IS failure. The IS discipline still lacks understandings of its nature and the reasons behind which will enable us to derive appropriate courses of action. We need to clarify the dimensions of IS failure in a more comprehensive manner to define and well understand what IS failure really is.

Therefore, in order to identify its dimensions, we ask the following question: What constitutes IS failures as developers perceive them. The answer to this question may serve as a sound base to identifying valid causes or reasons of IS failures, and developing ways to prevent such previous fatal IS failures. What has not been forthcoming is an empirical investigation, not a conceptual work, of the IS failure categories which developers conceive (Lyytinen & Hirschheim, 1987). In this regard, the objective of this research is to examine empirically the classification of IS failures by identifying the underlying structure of IS failures as developers conceive them, thereby filling the empirical void which lasted for long regarding IS failure.

More specifically, the current study will address the following research questions: 1) what is the underlying classification structure of IS failure as IS developers perceive them? 2) what are the interrelationships between dimensions of classification structure? and 3) do previous backgrounds and work experiences of IS developers have any influence the importance of the problems formulated of IS failure classification structure?

2. PREVIOUS RESEARCH

IS failure has been a subject of considerable discussion among many IS researchers. They investigated IS failures from diverse perspectives. A number of behavioral and implementation researchers suggest that lack of attention to socio-organizational issues may often be the cause of these IS disasters (Bostrom & Heinen, 1977; Friedman & Kahn, 1994; Levine & Rossmore, 1993; Lucas, 1975; Lyytinen & Hirschheim, 1987; Robey & Markus, 1984). These studies have identified the following social and behavioral issues as antecedents to IS failure: user resistance (Frantz & Robey, 1984; Markus, 1983), implementation problems (Lucas, 1975; Lyytinen & Hirschheim, 1987), lack of user involvement (Ives & Olson, 1984), negative user attitudes and inadequate expectations (Ginzberg, 1981; Lyytinen & Hirschheim, 1987), and conflicts between diverse stakeholders (Markus, 1983). Such behavioral reasons for IS failures suggest that, in order to provide socially acceptable as well as functionally complete systems, socio-organizational issues should be given the attention during systems development.

On the other hand, the lack of technical completeness and efficiency is also considered a key culprit to the failure to realize the benefits of the IS. From the technical perspecitve, such critical conditions as functional capability, high system reliability, and ease of use should be achieved first in order to develop successful systems. A wide variety of examples of systems failures which originated from the technical limitations and incompleteness are provided in the issues of the ACM SIGSOFT Software Engineering Notes.

There is a viewpoint for IS failure from both the technical and social perspectives. Bostrom and Heinen (1977) suggested that neither techno-economic nor socio-organizational considerations can be ignored during systems development. They argue that technical and social aspects of IS development should be no longer seen as competing aspects in system development. Rather, it should be recognized that one cannot be complete without the other. Thus, systems analysts, in order to achieve the potential benefits of the IS and successfully accomplish its objectives, must possess a balanced view of the social and organizational, as well as technical aspects of information systems.

From the project management viewpoint, Genuchten (1991) investigated the reasons for schedule delays in software development and led to a conclusion that the distribution of reasons for delay varied widely from one department to another. And he recommended that the responsible department should reveal its reasons for delay in order to be able to take adequate actions for improvement. Abdel-Hamid and Madnick (1990) warned that, from a case study of a NASA project, because intuition alone is not sufficient to handle complex and dynamic interactions in the software project, managers could mislead to the wrong lesson. Thus, an effective postmortem diagnostic exercise to identify problems and their causes is essential in adequately identifying project deficiencies and thereby preventing repeated occurrences of the same errors on future projects. Thus, they argue that the payoff from an effective postmortem is a smarter organization that truly learns from its failures (p. 47).

Lyytinen and Hirschheim (1987) classified IS failures into four major categories. First, they identify three traditional classes of IS failures. The first category is correspondence failure, which defines IS failures when original system design objectives are not met. This perspective focuses on system quality and performance in a technical sense to judge whether the system failed or not. However, as they point out, the concept of correspondence failure is often too idealistic and the system could end in a failure although the system achieves all the initial objectives if the original requirements are ambiguous.

The second category of defining IS failure is process failure, which views failure as the inability to produce a workable system, or the ability to produce a workable system but with cost overruns and schedule delays. The third approach of failure is labeled as interaction failure, which is originated largely from the perspective of the user. It is generally characterized as a low level of IS use, negative attitudes of users towards IS, and low user satisfaction.

The last view of IS failure is expectation failure. The success or failure of the system depends on the users expectations, i.e., the beliefs and desires concerning how the IS will serve the groups interests.

So, they define the expectation failure as the inability of an IS to meet a specific stakeholder groups expectations. However, even this expectation failure has a limitation because there may be a conflicting situation which are not unambiguously defined by the concept of expectation failure. While one group of stakeholders benefit from the introduction of a new IS, the other groups of stakeholders may be disadvantageous, if they lose organizational power due to the new IS, for instance.

However, none of IS failure research provide sufficient views of IS failures covering the full range of IS failures. Although some studies recognized that IS failure consists of multiple perspectives, it is not clearly known that they provided a comprehensive view of IS failures. Furthermore, little empirical research has been performed to identify the underlying structure of IS failure by measuring a developers perception. Thus, the objective of this research is to examine a structure or categories of IS failures as developers perceive them. The results of this research will provide the classification structure of the IS failure concept and an empirical foundation contributing to the conceptualization and measurement of IS failure in the future studies.

3. RESEARCH METHODS

Data for the analysis was collected from the sorting task where the subjects sorted IS failure factors based on the perceived similarity. The list of the total 70 factors was created by the author from the previous IS success and failure literature (Bailey & Pearson, 1983; DeLone & McLean, 1992; Ginzberg, 1981), and the results of the sorting task was analyzed with the multidimensional scaling (MDS) method. The Appendix lists the 70 factors used in the sorting task.

3.1 Participants

Participants in this study were 86 programmers, systems analysts, or project managers in the IS departments of regional banks, department stores, and IS consulting companies located in the Southeast region of Korea. Their average age was 36.5 years and their average number of years in systems development was 6.6 years. Their average experience of 6.6 years served in systems development seemed reasonable for the purpose of this study because most of them already performed systems development projects and, thus, they could understand IS failure phenomena and meanings of the factors used in the sorting task.

3.2 Procedures and Sorting Task

Participants were individually contacted by the researcher and asked to participate in the study. When they agreed to participate, then they were instructed about the nature of the study and how to perform the sorting task.

The sorting method is a data-gathering technique for investigating a variety of cognitive, developmental, and perceptual phenomena and this method has been widely used in the personality research in psychology and social sciences (Bruner, Goodnow, & Austin, 1956; Cowan, 1990; Walsh, 1988). Several studies have adopted the sorting method in such diverse areas as subjective meaning, person perception, and perception of natural and ethnic groups (Cowan, 1990).

A randomly ordered deck of 70 cards was given to each subject for the sorting task. Each card was typed with one of 70 factors which were believed to be largely related to IS failures, with its number on the top. The participants were provided with adequate space to perform the sorting task and the list of detailed description regarding each factors was given to them during the sorting task in order to help them more clearly understand the meaning of the words written in the cards. The participants were instructed to sort the 70 IS failure-statement cards into groups based on similarity. They were told to make as many groups as they thought appropriate. Finally, the participants were asked to rank order those groups in terms of relevance or importance to IS failure. It took about 35 minutes in completing the sorting task.

The use of sorting data in identifying the underlying structure of IS failure was borrowed from psychological research originating from Bruner, Goodnow, and Austin (1956). As Walsh (1988) indicates, the sorting procedure has some strengths. Subjects are able to categorize a set of factors which is independent of the experimenters own category system and the method requires a much smaller number of comparison for estimating psychological distance between objects than Torgersons (1958) method which requires subjects to compare all pairwise similarities in a factor set.

4. RESULTS

4.1 Multidimensional Scaling (MDS)

To analyze the data in identifying the underlying dimensions of IS failure as perceived by systems developers, a multidimensional scaling (MDS) program was employed. A modified version of multidimensional scaling, the MDSORT program (Takane, 1981), was used to analyze the result data of the sorting task. The results of this program showed the underlying structure of 70 IS failure factors by providing significant dimensions and factors which loaded on each polarity of each dimension. Because MDS recovers the underlying structures or dimensions of products or services which are hidden among consumers, it has been widely used in marketing analysis. The program identifies the underlying structure of IS failures as developers perceive by analyzing the data gathered from the 86 programmers and analysts sorting tasks. Takane (1981) specifically indicates that it provides significant dimensions of a concept such as IS failure by developing a configuration of stimulus points in a multidimensional Euclidean space in such a way that the sum of squared intercluster distances averaged over subjects is a maximum under suitable normalization restrictions on the configuration (p. 698).

4.2 The Dimensions of IS Failure

The first task analyzing output was to determine how many dimensions best fit the data. On the average, the participants made 6.9 groups from the 70 IS problems cards. As Takane(1981) suggests, we used a chi-square test to determine the appropriate dimensionality. According to Takanes criterion, the dimension for which a chi-square value for each dimensionality exceeds twice the degrees of freedom is the most appropriate one. A seven-dimensional solution was found the most appropriate for the data collected in the study by this criterion, as shown in Table 1.

<table 1>

A Chi-square Test for Dimensions

Dimension	Chi-squares	Degrees of freedom
1	3857.7	574
2	2483.0	572
3	2212.8	570
4	1766.0	568
5	1617.1	566
6	1338.4	564
7	**1312.5**	**562**
8	1059.0	560

This seven dimensional solution is known as a group trait space (Walsh, 1988), which represents a common set of dimensions along which individuals are thought to perceive stimuli (p. 881). The dimension also represents the aggregate knowledge structure regarding the similarity of the 70 factors for the 86 systems developers.

Table 2 shows the seven dimensional MDSORT solution including loadings for each dimension. The squared correlation index(R2) indicating the proportion of variance explained by these seven dimensions was 0.354. The variance explained for each underlying dimension ranged from 8.3% for dimension one to 3.5% for dimension seven. The results of the MDSORT program provide both positive and negative polarities for each dimension since clusters of stimuli anchor the ends of each dimension. The title of clusters for each dimension was named by the author according to the factors loaded. Thus, for instance, the negative polarity for dimension one was titled as relationships following such factors loaded as inadequate communication between IS staffs and users, conflicts of objectives between the user and IS department, etc.

The MDSORT results in Table 2 show that factors related each other are grouped together at each dimension. For example, factors loaded on the positive polarity of dimension two are associated with problems of user understanding regarding the system or user skills in using the system, and thus the group was named as User Skills. Table 3 summarizes the fourteen underlying categories from the seven dimensions of IS failure identified from the analysis of

< table 2 > The Dimensions of IS Failure

Dimensions	Positive Polarity		Negative Polarity	
	Factors in the Dimension	Loadings	Factors in the Dimension	Loadings
One	**Network and System Infrastructure**		**Relationships**	
	Lack of telecommunication facilities to communicate with involved parties	0.250	Inadequate communication between IS staffs and users	-0.188
	Lack of linking the separate individual PCs with LAN	0.235	Conflicts of objectives between the user and IS dept.	-0.176
	Frequent hardware and software downtime	0.227	Failure to enhance communication between involved parties of users	-0.175
	Unreliable hardware and software	0.214	Poor relationships between the users and IS dept.	-0.163
	Improper hardware capacity	0.197	Increase of conflicts among involved parties of users using the system	-0.146
Two	**User Skills**		**Business Success**	
	Insufficient users understanding of systems	0.152	Lack of top management support and concern	-0.353
	Low user skills in using systems	0.146	No use of information technology for business competitive advantage	-0.298
	Lack of adequate computer education/training for users	0.143	Systems little help to support decision making	-0.290
	Inappropriate user interface	0.108	No contribution of IS to overall business success	-0.283
			Lack of system development priorities to reflect overall organizational objectives	-0.273

< table 2 > The Dimensions of IS Failure (continued)

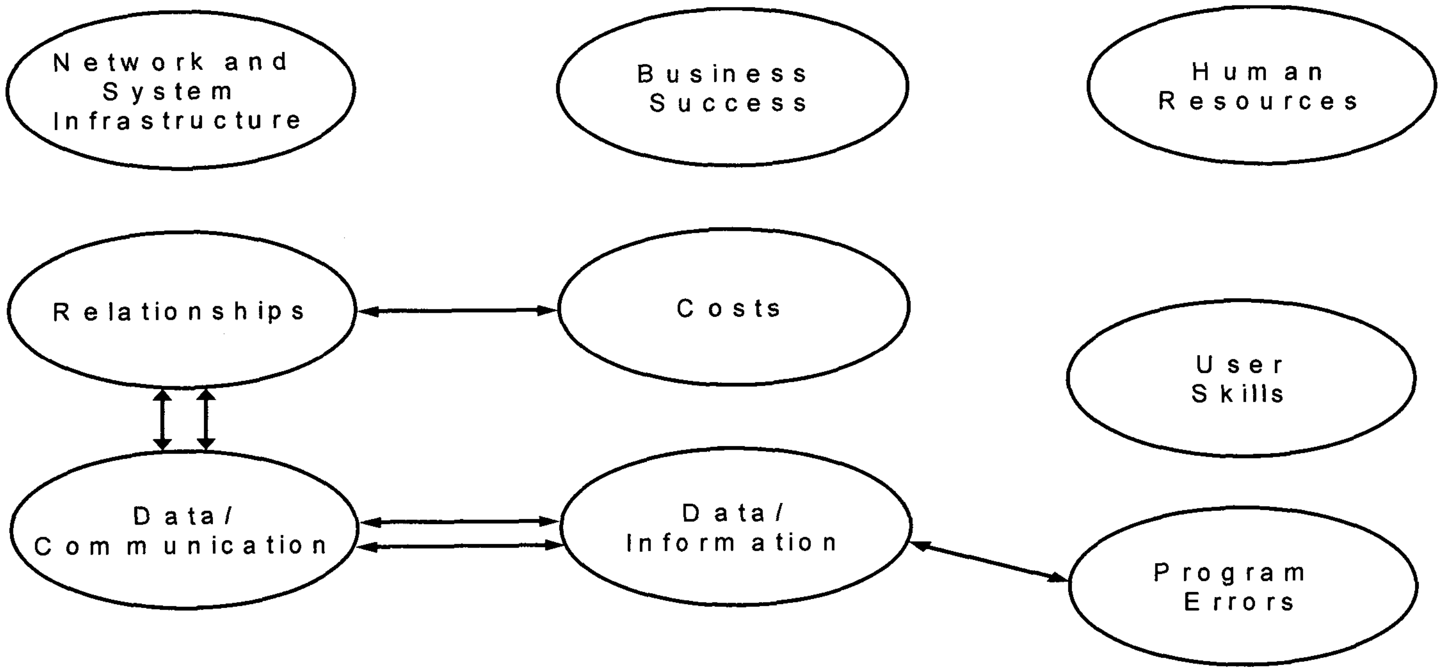
Dimensions	Positive Polarity		Negative Polarity	
	Factors in the Dimension	Loadings	Factors in the Dimension	Loadings
Three	**Relationships** Inadequate communication between IS staffs and users Poor relationships between the users and IS dept. Conflicts of objectives between the user and IS dept. Failure to enhance communication between involved parties of users	 0.161 0.143 0.141 0.134	**Data/Information** No security of data/information No privacy of data/information Lack of data integrity Unreliable output information Inaccuracy of output information	 -0.539 -0.488 -0.294 -0.218 -0.194
Four	**Data/Information** No privacy of data/information No security of data/information	 0.311 0.262	**Program Errors** Late error recovery for program correction Too often technical bugs encountered Bugs and low quality of programs Inaccuracy of output information	 -0.214 -0.212 -0.205 -0.184

< table 2 > The Dimensions of IS Failure (continued)

Dimensions	Positive Polarity		Negative Polarity	
	Factors in the Dimension	Loadings	Factors in the Dimension	Loadings
Five	**Data and Communication** No security of data/information Inadequate communication between IS staffs and users No privacy of data/information Failure to enhance communication between involved parties of users	 0.237 0.221 0.210 0.207	**Business Success** Overall cost-ineffectiveness of information systems No use of information technology for business competitive advantage No contribution of IS to overall business success No users benefits from the system	 -0.191 -0.186 -0.180 -0.178
Six	**Human Resources** Negative systems impacts on users job security problem Inadequate management of IS human resources Users unexpected job changes due to computer systems Absence of steering committee in systems development	 0.300 0.260 0.227 0.186	**Network Infrastructure** Lack of telecommunication facilities to communicate with involved parties Lack of linking the separate individual PCs with LAN Inappropriate information technology infrastructure	 -0.286 -0.231 -0.164

<table 2 > The Dimensions of IS Failure (continued)

Dimensions	Positive Polarity		Negative Polarity	
	Factors in the Dimension	Loadings	Factors in the Dimension	Loadings
Seven			**Costs**	
	User Skills		Cost overrun	-0.256
	Low user skills in using systems	0.258	High equipment purchase costs	-0.245
	Lack of adequate computer education/training	0.243	Increase of conflicts among involved parties	-0.203
			Costly operating of current systems	-0.213



<figure 1> Interrelationships among IS Failure Categories

the sorting data.

4.3 Interrelationships between the Failure Categories

A more detailed analysis has been performed in order to examine the way IS failure categories are interrelated each other. An inspection revealed that some factors were loaded on more than one dimension, indicating that certain failure categories share similarity with other categories, which is usual for complex information domain (Cowan, 1990).

To simplify the analysis, the factors loaded on the lower dimension were used in the analysis when the same category was located on two or more dimensions (e.g., User Skills category on dimension two and seven), because the lower dimension explains more variance of data. Figure 1 shows the interrelationships between categories, each failure categories represented by a labeled oval and each factor shared by more than one dimensions represented by a single line between ovals.

<table 3>
The Underlying Categories of IS Failure Concept

Network and System Infrastructure	Relationships
User Skills	Business Success
Relationships	Data/information
Data/information	Program Errors
Data/Communication	Business Success
Human Resources	Network Infrastructure
User Skills	Costs

4.4 Comparison of Programmers and Systems Analysts Groups

The programmer and systems analyst may have different frames of reference respectively (Dagwell and Weber, 1983) because they have different backgrounds, job experiences, etc. (Kumar & Bjorn-Anderson, 1990; Kumar & Welke, 1984). The programmer is, in general, believed to have a technical frame of reference and can be more concerned on the technical problem aspects such as system reliability, accuracy of the output information, data integrity, and hardware capacity, usually accompanied by a lack of attention to social issues. In contrast, the analyst may have a primarily social frame of reference and may view IS as a form of social interactions, and focus primarily on the human, social, and organizational issues of information system development and implementation, while giving little attention to technology. Thus, they give more attention to such social issues as user resistance, top management support for IS, organizational impacts of IS, and authority and power structures within the organization.

<table 4>
Comparison of Programmers and Systems Analysts

Category	Systems Analyst		Programmer	
	Standa-rdized Rank	Ranks	Standa-rdized Rank	Ranks
Business Success*	0.36	1	0.45	1
Relationships	0.54	2	0.53	3
InfrastructureNetwork and System	0.58	3	0.57	5
Program Errors	0.58	4	0.51	2
Costs	0.59	5	0.60	9
Human Resources	0.60	6	0.57	5
User Skills	0.61	7	0.59	8
Communication*	0.63	8	0.54	4
Data/Information	0.63	9	0.58	7

*: Statically significant at 5% significance level

At the last part of the sorting procedure, each participant was asked to rank order card groups divided based on similarity in terms of importance of the sets of related factors to IS failure. Among the total 86 participants, 65 were programmers and 21 were systems analysts or project managers. Table 4 indicates the standardized average ranks of each IS failure category for both programmers and systems analysts groups. The lower value of standardized ranks indicates that the respective category is more critical to IS failure. It is interesting that both groups identified lack of contribution to BUSINESS SUCCESS as the single most critical factor to IS failure. Next, Relationships, Network and System Infrastructure, Program Errors, etc. were highly ranked in terms of importance to IS failure, following Business Success. Programmers and analysts showed differences in the two categories of Business Success and Communication where the difference were statistically at the 5% significance level.

5. DISCUSSION and CONCLUSIONS

The primary goal of this study was to identify empirically the underlying dimensions of IS failure as perceived by systems professionals. The findings suggested the classification structure of IS failure through analyzing the empirical results, and provided a guideline for conceptualizing IS failure for future studies in a manner consistent with what practitioners perceive.

There were found seven MDS dimensions most appropriate in explaining the structure of IS failure and problems. Further, because the MDS algorithm provides two different clusters of concepts at the each end of the individual dimension, i.e., positive and negative polarities, the fourteen categories were found to form the classification structure of IS failure. As listed in Table 3, we found that such categories as network and system infrastructure, relationships, user skills, data, etc. formulated the structure of IS failure.

As indicated in Figure 1, it was interesting that most of the IS failure concepts categories were clearly recognized without sharing problem factors with other categories. In particular, network and system infrastructure, business success, and human resources were independently recognized and did not share any factors with other categories. The other categories also share only one or two failure factors each other. There were found no problem categories which stands at the center of IS failure classification structure sharing much with other problem concepts categories. It means that most of IS failure problems are relatively independent each other as developers perceive, and thus the reasons of IS failure can be easily located without much efforts and can be also communicated to others with little misunderstandings.

It was found that problems with user requirements were not distinctively formulated as an independent concept category of IS failure. Rather, people perceived user requirements as a part of relationships or conflicts with user departments which was conceived as one of distinct IS failure concepts.

As shown in Table 4, lack of competitive use of IS or no contribution of IS to business success was perceived the first important group to IS failure by both the analysts and programmers groups. But the analysts group recognized its importance far more critically than the programmers group, and the difference was significant at the 5% significance level. Inadequate relationships or conflicts with user departments was also perceived dangerous by both groups. A possible explanation for this is that, as the nature of their tasks, both groups usually contacts with users and need their cooperation and help for successful system implementation.

The programmer groups second important factor critical to IS failure was program bugs and technical errors. This result seemed reasonable because removing bugs and correcting program errors was a major part of their daily job.

Among the process failure defined by Lyytinen and Hirschheim (1987), while cost overruns was explicitly recognized as one of the IS failure, schedule delays was not formed as the distinct concept. Because most subjects who participated in the sorting task was working in the internal IS departments, not in the external outsourcing companies, a slight schedule delay may not be important to their job and schedule delays were not explicitly perceived as the failure by them.

It was also interesting to find that the results of the MDSORT data indicated that concerns of developers were balanced to technical and organizational problems. Among the nine distinct IS failure concept, network and system infrastructure, costs, data/information, program errors were IS failure concepts related with technical matters. Business success, human resources, relationships, communication, user skills were related organizational or social matters.

References

[1] Abdel-Hamid, T. and Madnick, S., The Elusive Silver Lining: How we fail to learn from software development failures, Sloan Management Review, 31, 1990, 39-48.

[2] Alter, S., and Ginzberg, M., Managing Uncertainty

in MIS Implementation, Sloan Management Review, 19, 1978, 23-31.

[3] Bailey, James and Sammy Pearson, "Development of a Tool for Measuring and Analyzing Computer User Satisfaction," Management Science, 29(5), May 1983, 530-545.

[4]Bostrom, R.P., and Heinen, J.S., MIS Problems and Failure: A Sociotechnical Perspective, Part I: The causes, MIS Quarterly, 1(3), 1977, 17-32.

[5]Brooks, F. The Mythical Man-Month. Reading, Mass.: Addison-Wesley, 1974.Bruner, J., Goodnow, J., & Austin, G. A Study of Thinking. New York: John Wiley & Sons, 1956.

[6] Bruner, J., Goodnow, J., & Austin, G. A Study of Thinking. New York: John Wiley & Sons, 1956.

[7] Coombs, R., *Organizational Politics and the* Strategic Use of Information Technology. Programme for Information and Communication Technologies, Brunel University, 1993.

[8]Cowan, D.A., Developing a Classification Structure of Organizational Problems: An empirical *investigation*, Academy of Management Journal, 33(2), June 1990, 366-390.

[9] Delone, W.H. and E.R. McLean, "Information Systems Success: the Quest for the Dependent Variable," ISR. 3(1), March 1992, 60-95.

[10] Ewusi-Mensah, K and Przasnyski, Z, On Information Systems Project Abandonment: An *exploratory study of organizational practices*, MIS Quarterly, 15, 1991, 67-86.

[11] Frantz, C. R., and Robey, D, An Investigation of User-led System Design: Rational and political perspectives, Communications of the ACM, 27(12), 1984, 1202-1209.

[12] Friedman, B., and Kahn, P., Educating Computer Scientists: Linking the social and the technical, Communications of the ACM, 37(1), 1994, 65-70.

[13] GAO (United States General Accounting Office). (1992). Information Resources: Summary of federal agencies' information resources management problems. GAO/IMTEC-92-13FS.

[14] Genuchten, Michiel van, Why is Software Late? An empirical study of reasons for delay in software development, IEEE Transactions on Software Engineering, 17(6), 1991, 582-590.

[15] Ginzberg, M., Early Diagnosis of MIS Implementation Failure, Management Science, 28, 1981, 459-478.Gladden, G., Stop the Life-cycle, I Want to Get Off, Software Engineering Notes, 7(2), 1982, 35-39.

[16] Hochstrasser, B. and Griffiths, C., Controlling IT investments Strategy and Management. London: Champman Hall, 1991.

[17] Ives, B., and Olson, M.H., User Involvement in Information Systems Development: A Review of Research, Management Science, 30(5), 1984, 586-603.

[18] Keen, P.G.W. Shaping the Future: Business design through information technology. Boston: Harvard Business School Press, 1991.

[19] Keider, S., Why MIS Projects Fail, Datamation. 1978, December.

[20] Kumar, K., and Welke, R.J. Methodology Engineering: A method for situation specific methodology construction, In W.W. Cotterman and J.A. Senn (Eds.), Systems Analysis and Design: A research agenda. Chichester: John Wiley & Sons, 1990.

[21] Kumar, K., and Welke, R., *Implementation* Failure and System Developer Values: Assumptions, truisms and empirical evidence, Proceedings of the Fifth International Conference on Information Systems (1-12). 1984, Tucson, AZ.

[22] Kumar, K., and Bjorn-Anderson, N., A *Cross-cultural Comparison of IS Designer* Values, Communications of the ACM, 33(5), 1990, 528-538.

[23] Levine, H., and Rossmore, D., Diagnosing the Human Threats to Information Technology Implementation: A missing factor in systems analysis illustrated in a case study. Journal of Management Information Systems, 10(2), 1993, 55-73.

[24] Lucas, H.C. *Implementation: The Key to* Successful Information Systems. New York: Columbia University, 1981.

[25] Lucas, H.C. Why Information Systems Fail. New

York: Columbia University, 1975.Lyytinen, K. & Hirschheim, R., Information Systems Failure: A survey and classification of the empirical literature, Oxford Surveys in Information Technology, 4, 1987, 257-309.

[26] Lyytinen, K., Stakeholders, Information Systems Failures and Soft Systems Methodology: An assessment, Journal of Applied Systems Analysis, 15, 1988, 61-81.

[27] Markus, M.L., Power, Politics, and MIS Implementation, Communications of the ACM, 26(6), 1983, 430-444.

[28] Markus, M.L., Implementation Politics: Top management support and user involvement, Systems, Objectives, and Solutions, 1(4), 1981, 203-215.

[29] Mowshowitz, A., Information Processing in Human Affairs. Reading, MA: Addison-Wesley, 1976.

[30] Oz, E., When Professional standards are lax. The CONFIRM failure and its lessons, Communications of the ACM, 37(10), October 1994, 30-36.

[31] Poulymenakou, A. and Holmes, A., A Contingency Frameworlkd for the Investigation of Informatuion Systems Failure, European Journal of Information Systems, 5, 1996, 34-46.

[32] Robey, D., and Markus, M. L., Rituals in Systems Design, MIS Quarterly, 8(1), 1984, 5-15.

[33] Sauer, C., Why Information Systems Fail: A case study approach. London: Alfred Waller, 1993.

[34] Takane, Y., MDSORT: A special purpose multidimensional scaling program for sorting data, Behavior Research Methods & Instrumentation, 13, 1981, 698.

[35] Torgerson, W. Theory and Methods of Scaling. New York, Wiley, 1958.

[36] Turner, J.A., Observations on the Use of Behavioral Models in Information Systems Research and Practice, Information & Management, 15(3), 1982, 207-213.

[37] Walsh, J. Selectivity and selective perception: An investigation of manager's belief: Structures and information processing. Academy of Management Journal, 31(4), 1988, 873-896.

APPENDIX:

IS Failure Factors Used in the Sorting Task

1. Late delivery
2. Cost overrun
3. Non-use of development tools (e.g., CASE tools, etc.)
4. Lack of data integrity
5. Untimeliness (late delivery) of reports and information from the system
6. Systems analysts lack of technical competency
7. Inadequate communications between IS staffs and users
8. IS departments slow response to change requests from users
9. Costly operating of current systems
10. Absence of steering committee in developing the system
11. Frequent hardware and systems downtime
12. Lack of adequate computer education/training for users
13. Low user skills in using systems
14. Inaccuracy of output information
15. Lack of user-oriented systems analysts who understand users business processes
16. No users participation in systems development
17. Insufficient users understanding of systems
18. Lack of system development priorities to reflect overall organizational objectives
19. Failure to adopt up-to-date information technology(database, client-server, network technology)
20. Lack of top management support and concern in systems development
21. Overall cost-ineffectiveness of information systems
22. Inappropriate user interface (report format and screen design)
23. Lack of helpful documentation (users manual, systems manual, etc.)
24. Late error recovery for program correction
25. Users failure to provide appropriate user requirements to systems analyst
26. Analysts failure to realize initial user requirements provided from users
27. Long system response time
28. Long turnaround time of reports

29. Failure of integration of systems across functional departments
30. Low organizational position of the IS function
31. Too high expectations regarding IS services provided by users
32. Users unexpected job changes due to computer systems
33. Lack of vendor support for hardware/software
34. Unreliable output information
35. Inconvenience of access to computer system
36. Lack of IS planning for adequate IS resource allocation
37. Disintegration of office automation and IS
38. Systems little help to support decision making of managers
39. Poor quality of the services provided by the MIS department
40. Too often technical bugs encountered by the users when using the system
41. Wrong choices made by the MIS department in the purchases of hardware and software
42. Failure to provide useful output information (reports, inquiry, etc.)
43. Failure to enhance overall quality of decisions of users
44. Increase of conflicts among involved parties of users by using the system
45. Failure to enhance communication between involved parties of users
46. Slow speed of printers and computers
47. High equipment purchase costs
48. No privacy of data/information
49. No security of data/information
50. Failure to increase office automation efficiency/effectiveness (word processing, spread sheet, etc.)
51. Bugs and low quality of programs
52. Failure to improve users job performance
53. Lack of linking the separate indivisdual PCs with LAN
54. Unreliable hardware
55. Incompatibility with other interfacing systems
56. Improper hardware capacity
57. Conflicts of objectives between the user and IS departments
58. No plan for backup and disaster recovery of the system
59. Lack of alignment of IS with business strategy
60. Negative systems impacts on users job security problem
61. Poor relationships between the user and IS department
62. No users benefits from the system
63. User resistance to the system
64. Difficult system modification
65. Poor analysts communication skill in eliciting correct system requirements
66. Inadequate management of IS human resources
67. No use of information technology for business competitive advantage
68. No contribution of IS to overall business success (revenue, profit, or market share)
69. Inappropriate information technology infrastructure
70. Lack of telecommunication facilities to communicate with involved parties

김 종 욱

서울대학교 산업공학 학사(1982)
미국 Georgia State University 경영정보학 박사(1994)
쌍용정보통신과 BASF Korea Ltd.에서 시스템 개발업무 담당
Clark Atlanta University에서 멀티미디어 시스템 개발 연구원 근무.
현재 영남대학교 경영학부 조교수 재직
주요관심분야 : 시스템 분석 및 설계, 전자상거래 비즈니스 모델 개발, 정보시스템 평가 등