Information System Managers' View Of System Development, Use, And Failure

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Abstract

Results of an empirical study focusing on information system (IS) managers' perception of IS failures are presented. One hundred thirty IS managers participated in this study. The study concluded that in spite of differences in background and personal characteristics, a substantial agreement existed among IS managers on issues of system development, use, and failure.

Introduction

The failure rate for applications of information systems (IS) is high enough to be of concern to both organizational management and information systems professionals. The consequences of IS failure become more acute as organizations continue to invest in information technology and application development. Research to date has found no single explanation for system success or failure. However, IS and other behavioral researchers have pointed out that the introduction or alteration of an IS has a powerful behavioral and organizational impact (Kraft, 1977; Cougar and Zawicki, 1979; Newman and Noble, 1990; Davis et al., 1992). Information systems

transform the way various individuals and groups perform and interact.

Various project management, requirement gathering, and planning methodologies have been developed for specific categories of problems or failures. Strategies have also been devised for ensuring that users play an appropriate role throughout the implementation period and for managing the organizational change process (Markus, 1983; Davis et al., 1992).

However, not all aspects of the implementation process can be easily controlled or planned. The chances for system success can be increased by anticipating potential development and implementation problems and applying appropriate corrective strate-

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gies.

Keeping the above objective in mind, the authors try to address the following two issues in this paper. First, the authors examine the relationship between IS managers' demographic and background characteristics and their attitudes toward system development and use problems and reasons for system failures. The demographic and background variables included gender, age, education, application area experience, and project complexity experience. Second, the authors examine the importance placed by IS managers for each failure type (i.e., system development problems, system use problems, and system failure reasons).

The authors feel that the results of this study will be of immense benefit to both practitioners and academicians. Since managers (both IS and non-IS) of organizations are involved in designing and implementing of specific/similar systems within their organization or departments, an analysis of this type will help them to better plan, design, and implement these systems, thus, leading to specific changes that will reduce the probability of future failures. The basic premise of this paper is that there are several common characteristics among systems and that organizations frequently benefit from an examination of reasons for a failure of a system. Since several research studies have suggested that system developers are likely to share the same attitudes toward system failure (Kraft, 1977; Couger and Zawicki, 1979), the authors feel that a careful diagnosis of any system, in this case an IS system, may provide insights leading to changes that reduce the probability of future failures. These changes may range from improved development processes to shifts in attitudes and concepts about the nature of systems in organizations. Academicians, on the other hand, can use the information to design and develop complex models and relationships that link specific failure

types to organizational profitability and future system implementations.

Review of Literature

The issue of IS failure has achieved a considerable amount of attention in the literature. Most of these studies have linked failure to specific issues/areas. For example, several researchers (Ginzberg, 1981; Hirschheim and Newman, 1988; Newman and Noble, 1990; Davis et al., 1992) have concluded that system failures are rooted in organizational behavior problems (e.g., user resistance, user involvement). Other researchers (Bostrom and Heinen, 1977; Kraft, 1977; Couger and Zawicki, 1979; Janson et al., 1993) have attributed system failures to social, political, psychological or technical issues.

Very few studies (Morgen and Soden, 1973; Lucas, 1979; Markus, 1983; Lyytinen and Hirschheim, 1987; Lyytinen, 1988) have made an attempt to study the specific reasons for IS failure. Except for Lyytinen (1988), most of these studies have also failed to offer adequate models of IS failure and considered too little the environment and types of IS failures.

Lyytinen (1988), by means of a comprehensive and structured questionnaire, investigated the system analysts' perception of the frequency of different types of IS failures and their relative importance. He also proposed a system failure framework which differentiates system stake holders, analyzes failure types, and tracks reasons for failure reasons from a broader perspective. In this framework, system developers can face two distinct types of problems: system development problems and system use problems. Within this framework, various reasons for system failures are also classified. The results of this study showed that systems analysts' view of failed systems largely coincide with their stakes with IS.

Keeping the limitations in the literature in mind, the authors attempt to examine how IS managers perceive and handle IS problems and failures. No systematic study in the past has really examined this issue. The authors feel that since all managers are involved in the design, development and implementation of systems within their departments or organizations, the results of this study will make them aware of problems they might encounter or anticipate and how they should plan to prevent or handle them.

Research Method

Hypotheses

One purpose of this study is to investigate whether there is a relationship between IS managers' demographic and background characteristics (e.g., education, age, gender, number of years of experience in different applications, complexity of projects) and their perceptions of system failures (including system development problems, system use problems, and system failure reasons). Fifteen hypotheses are examined. Three hypotheses on the affects of education illustrate the hypotheses.

H1a: There is a relationship between IS managers' educational background and their perceptions of the importance of system development problems.

H1b: There is a relationship between IS managers' educational background and their perceptions of the importance of system use problems.

H1c: There is a relationship between IS managers' educational background and their reasons for system failures.

Sample and Procedure

Chief Information Officers (CIOs) of

six organizations agreed to support this research. The number of employees in these organizations ranged from 2,500 to 25,100. An average of 1000 IS employees were employed in these organizations. The approximate annual IS budget of these organizations ranged from \$46 million to \$172 million (U.S.).

The CIO personally distributed a questionnaire (see "Instrument," section) to each IS manager during normal work hours. These managers were given two weeks period to complete and return their questionnaires. The managers were assured that their responses would be kept confidential.

Instrument

A questionnaire was pretested with MBA students. The changes suggested by the pretest respondents were incorporated into the final questionnaire.

The questionnaire asked about the managers' perceptions of the importance of system development problems, system use problems, and reasons for system failures. Importance was rated on a five-point scale, with each scale position labeled, from 1 (not important), through 3 (somewhat important), to 5 (very important). Reasons were adopted from Lyytinen (1988). Table 1 lists the system development and system use problems and the reasons for system failures. The instrument also asked for demographic and background information, specifically, gender, age, education, application area experience, and project complexity experience.

Results

Description of Sample

A total of 130 IS managers participated in this study. The respondents had considerable experience in IS design and de-

Table 1: System Developing Problems System Development Problems:

1a. Wrong or incomplete goals and goal analysis	3.73	2
1b. Wrong or incomplete cost-benefit calculations	2.82	5
1c. Organization and management of the development process such as project management, composition and phasing	3.98	1
1d. Wrong or incomplete models of the IS	3.60	3
1e. Wrong beliefs and assumptions about the development process	3.58	4

System Use Problems:

2a. Technical difficulties to use and maintain the application	3.42	5
2b. Difficulties to maintain correct and error-free data and users' difficulties to understand data	3.76	2
2c. Conceptual problems to analyze and comprehend the application and use it appropriately	3.71	4
2d. Human problems like resistance to change work patterns, decrease in motivation and job-satisfaction, political changes etc.	3.97	1
2e. Complexity of applications, their social and technical complexity	3.75	3

System Failures Reasons:

3a. Organizational environment of the IS and its features	3.52	12
3b. User environment like individual differences, behavior, stress-adaptability	3.39	13
3c. Inadequate technical environment to implement the system, such as the lack of application generator or a specific programming language	3.89	7
3d. Wrong or inadequate design methods	4.26	4
3e. Wrong or insufficient specification requirements	4.67	1
3f. Features of development environment such as communication problems, neglect of development risks, disappearing users	4.20	5
3g. Designers' attitudes	3.59	11
3h. Users' attitudes	3.87	8
3i. Incomplete understanding of implementation process	3.96	6
3j. Lack of user education	3.79	9
3k. Poor understanding of user's work	4.29	3
3l. Wrong or incomplete development assumptions	4.41	2
3m. Special contingencies in the development environment (politics, business policy, regulations etc.)	3.73	10

velopment. More than seventy-six percent had experience in four or more different application areas and 45.4 percent of the respondents had worked in projects whose average complexity (measured by staff years) was more than 5 years (Table 1). This indicates that the respondents were involved in both small- and large-scale projects.

More than eighty-four percent of the respondents had completed college; of these 32 respondents (24.6 percent) had earned a graduate degree. Most respondents were male (78.5 percent); the median range of respondents was 35 to 45 years of age.

Tests of hypotheses

The first question is what IS managers believe are the most common problems of

system development and system use, and what the reasons for system failures are. The mean scores and ranks are shown in Table 2.

The respondents, overall agreed on the following. Of the five system development problems, the most important was organization and management of the system development process (item 1c). The least important system development problem was the significance of wrong or incomplete cost-benefit calculations (item 1b). The most important system use problem was human problems, like resistance to change and political changes (item 2d). The least important system use problem was technical difficulty issues (item 2a). Of the 13 reasons for system failures that the IS managers evaluated, the two most important reasons are wrong or insufficient specification requirements (item 3e) and wrong or incomplete development assumptions (item 3l). The two least important reasons, for system failure, ranking 12th and 13th, respectively, were user environment issues (item 3b) and the IS environment (item 3a). Rank notwithstanding, of these 23 means, all but one (item 1b) were above 3.0 ("somewhat important") and five were above 4.0 ("important") (see Table 1).

The second question asked about the relationship between the IS managers' demographic and background characteristics and their perceptions of system failures. The authors tested 15 hypotheses using 15 MANOVAs. Results are in Table 3. As can be seen in Table 3, there is no relationship between respondents' perceptions of system failure and their age, gender, experience in different kinds of applications, and the complexity of projects involved in. Education background

Table 2: Demographic Information

1. Gender:			
Female	28	(21.5%)	
Male	102	(78.5%)	
Total	130	(100%)	
2. Age:			
Below 35	66	(50.8%)	
35 - 45	43	(33.1%)	
Above 45	21	(16.1%)	
Total	130	(100%)	
3. Education:			
Community College/			
Professional School Diploma	20	(15.4%)	
College Diploma	78	(60.0%)	
Graduate Diploma	32	(24.6%)	
Total	130	(100%)	
4. Experience in Different Kinds of Applications:			
Less Than 4 Application Area	31	(23.9%)	
More Than 4 Appl. Areas	99	(76.1%)	
Total	130	(100%)	
5. The Average Complexity of Projects Have Been Involved in (Measured by Staff Year):			
Less Than 5 Staff Year	71	(54.6%)	
More Than 10 Staff Year	59	(45.4%)	
Total	130	(100%)	

Table 3: MANOVA Results For Independent Variables

	F-Value	P-Value
1. Gender		
H1a: System Development Prob.	1.68	0.14
H1b: System Use Problem	1.86	0.10
H1c: System Failure Reasons	0.85	0.61
2. Age		
H2a: System Development Prob.	1.28	0.22
H2b: System Use Problem	1.05	0.32
H2c: System Failure Reasons	0.88	0.56
3. Education		
H3a: System Development Prob.	0.87	0.56
H3b: System Use Problem	1.95	0.04*
H3c: System Failure Reasons	1.08	0.36
4. Experience in Different Applications		
H4a: System Development Prob.	0.55	0.74
H4b: System Use Problem	0.40	0.85
H4c: System Failure Reasons	0.94	0.51
5. Complexity of Projects Have Been Involved (# of Staff/Year)		
H5a: System Development Prob.	1.09	0.37
H5b: System Use Problem	0.39	0.85
H5c: System Failure Reasons	0.56	0.88

Note: * indicated significant at 0.05 level.

was the only demographic variable that was related to system use problems ($p = 0.04$) but not to system development problems or system failure reasons.

To further examine the impact of education background on evaluations of system use, the authors performed 5 independent ANOVAs. The results are in Table 4.

Education background was related to one system use problem: human problems like resistance to change work patterns, decrease in motivation and job-satisfaction, political changes, etc. (item 2d). Specifically, as the number of years of education increased, the importance of human problems like resistance to change work patterns, among others decreased (Table 4).

Conclusions

There is relatively little research on IS personnel evaluations of system development and system use problems or about what they regard as the important reasons for system failures (e.g., Lyytinen, 1988). This situation was a major reason for the present research. Only a few studies have reported that IS managers hold varying attitudes toward IS issues (e.g., Hedberg and Mumford, 1975). However, a number of studies have found that demographic and background characteristics predict people's attitudes (Dos Santos and Hawk, 1988;

Table 4
ANOVA Results for Educational Background

ANOVA	F-Value	P-Value
<u>Dependent Variables</u>		
System Use Problems		
2a	1.01	0.37
2b	2.44	0.09
2c	0.23	0.79
2d	4.56	0.01*
2e	0.19	0.83

(refer Table 1)

Note: * indicated significant at 0.05 level.

Means

No College	College	Graduate
2d 3.84	3.83	4.35

Igbaria and Chakrabarti, 1990; Brock and Sulsky, 1994; Motwani and Jiang, 1995). Therefore, the authors examined the relationship between IS managers' demographic and background characteristics and their evaluations of (attitudes toward) system development and use problems and reasons for system failures. The demographic and background variables included gender, age, education, application area experience, and project complexity experience. The findings indicate that only education background affected the importance ratings of one issue (item 2d). Given these results, one conclusion that can be drawn is that there is a general agreement among the IS managers on the relative importance of issues. Most of the respondents, regardless of their background or organization characteristics, evaluated the problems in a similar fashion. Thus, one can conclude that these problems are more general rather than company or situation specific and that all managers regardless of their functional area will encounter similar problems when planning, designing, and implementing systems in their departments or organizations.

Implications for Future Research

This study contributes to the understanding of IS managers' views on system development, system use, and system failures. However, additional research is required to determine the stability of the attitudes, across more representative samples of system managers and over time. Although the study supports the usefulness of Lyytinen's analysis of system failure and his classification of system issues, researchers have to consider whether to expand the list of system development problems, system use problems, and reasons for system failure that Lyytinen (1988) has provided.

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