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Information systems objectives: Perceptions of information systems developers of different cultures

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ABSTRACT

An increasing number of corporations are developing and implementing information systems (IS) applications which cross national boundaries and span diverse cultures. As a result of the cultural differences, IS developers in different countries may have very different perceptions regarding the objectives of an IS. In the current study, developers from three countries -- Japan, Taiwan, and the United States -- rated the importance of eight objectives of a successful IS. The eight objectives are categorized by hierarchical levels, and also as short-term or long-term goals. The results indicated the IS developers viewed objectives at the system and organizational levels as more important than objectives at the user and strategic levels. Overall, the IS developers rated the short-term objectives as more important than the long-term objectives. There was no significant difference between the countries with respect to the perceived importance of the short-term/direct objectives. However, there were significant differences in the views of IS developers from the three countries regarding the perceived benefits of long-term/indirect objectives of an IS.

INTRODUCTION

Evaluation of information systems (IS) is critical for management control, and thus, the importance of IS evaluation has been well recognized by both academicians and practitioners. The general focus of IS evaluation studies has been on assessing the effectiveness of IS where the IS effectiveness is often defined by the accomplishment of IS objectives (Hamilton & Chervany, 1981). However, because it is often difficult, if not impossible to directly measure IS effectiveness, the opinions of managers and users are often used as surrogate measures. Some of the most frequently investigated measures include user satisfaction, system usage, and the perceived benefits (Bailey & Pearson, 1983; Garrity & Sanders, 1998; Lucas, 1975; Mirani & Lederer, 1998; Myers, Kappelman, & Prybutok, 1997; Saunders & Jones, 1992). As a result of numerous investigations involving these measures of IS effectiveness, much is known about the factors influencing users' views.

The perceptions and opinions of IS developers has generally been neglected in IS research. However, an examination of their views may be extremely beneficial in achieving an understanding of the factors associated with the development of a successful IS. IS developers make a series of important decisions regarding the design and implementation of the system during the complex and unstructured process of IS development. The developers have to define, interpret, and operationalize IS development strategies, and in so doing, they have to rely on their own judgement (Kumar & Bjorn-Anderson, 1990). The judgments and decisions made by IS developers are influenced by how they view IS success. Thus, the views of IS developers may affect how the objectives of the system are defined, as well as influence decisions related to such issues as project management and resource allocation.

Unfortunately, the views of IS developers may not always be consistent with organizational objectives (Kumar & Bjorn-Anderson, 1990). Research suggests that their opinions may not always be consistent with management or user groups. It has been suggested that the views of IS developers may be overly technical, accompanied by a lack of attention to political and organizational issues (Hamilton & Chervany, 1981). Schultz and Slevin (1975) suggest that developers are primarily concerned with "technical validity," while the users are concerned with "organizational validity" of the system. It has also been suggested that designers often fail to consider the effects of a system on user's jobs (Hamilton & Chervany, 1981). Finally, it has been speculated that users and developers differ in their perceptions of the systems objectives (McKenney & Keen, 1974; Doktor, 1979).

The differences in the perceptions between management, users, and developers of IS may be one of the factors contributing to the deficiencies in existing IS development practices (Kumar & Bjorn-Anderson, 1990). An understanding of how IS developers perceive the objectives of an IS may be useful towards improving the IS development process. The purpose of the present study was to examine the perceptions of information systems designers regarding their views on the importance of various IS objectives.

INTERNATIONAL ISSUES

Most of the research concerning IS development and implementation has been conducted under the assumptions that may only be applicable in the context of the United States (Ein-Dor & Orgad, 1992; Emery, 1995). The growth of multinational businesses in recent years has been accompanied by a significant increase in international IS operations. As a result, an increasing number of corporations are developing and implementing IS applications which cross national boundaries and span diverse cultures. In an era of corporate multi-nationalism and globalization of markets, the knowledge gained from cross-cultural research applicable to IS development can determine the difference between success and failure in the implementation of an international IS. According to Emery (1993), any framework for information technology that does not encompass international issues is an imperfect one, and would be increasingly untenable in the future.

Due to social and cultural differences, the successful IS implementation in a global environment may differ significantly from methods that have typically been proven to be successful in

the United States. This may be particularly true when Asian offices are involved (Burnson, 1989). The Asian culture differs from the Western culture on a number of aspects (Grover, Segars & Durand, 1994). For example, most Asian cultures place more emphasis on group interest and on the requirements for maintain social harmony than on individualism (Sekaran & Snodgrass, 1986). The corporations tend to be more centralized, with few individuals making the majority of the decisions. Employees are not accustomed to participating as much in the decision making process as their Western counterparts. As a result of the cultural differences, IS developers from Asian countries may have different perceptions regarding the objectives of an IS. To investigate possible differences and similarities between designers of IS from different cultures, the current study surveyed IS developers in the United States, Taiwan, and Japan.

OBJECTIVES OF A SUCCESSFUL INFORMATION SYSTEM

The objectives accomplished by a successful IS have been discussed in a number of articles. Early IS were simply designed to "automate," or quickly perform routine tasks. As such the objectives of the early information systems were concerned with reliability, efficiency and system availability (Myers, Kappelman, & Prybutok, 1997). Starting in the 1980s, information systems were utilized to "informate" and more recently to "transformate" organizations (Remeny, Money, & Twite, 1993). The application of IS to higher levels of organizational operations has expanded the objectives of an IS from efficiency to effectiveness. A modern IS is expected to have an impact on many levels of an organization and influence the overall organizational effectiveness.

Delone and McLean (1992) have suggested that an IS can be assessed on the following objectives, or dimensions: (1) system quality -- the measures of the IS itself, (2) information quality -- the measures of the IS output, (3) information use -- recipient consumption of the IS output, (4) user satisfaction -- recipient response to the use of the IS output, (5) individual impact -- the effect of information on the behavior of the recipient, and (6) organization impact -- the effect of information on organizational performance.

Other studies have also identified multiple purposes of an IS that have an impact at several levels within an organization (Garrity & Sanders, 1998; Mirani & Lederer, 1998; Myers, Kappelman & Prybutok, 1997; Saunders & Jones, 1992; Subramanian & Nosek, 1993). Based on these studies, the current paper identified four levels on which an IS could be evaluated. They are: (1) the System level, (2) the User level, (3) the Organizational level, and (4) the Strategic level. The present examined designers' views regarding objectives at each of levels.

Table 1. Objectives on the Four Levels of System Impact in Direct/Indirect Categories

<u>Levels</u>	<u>Direct/Immediate</u>	<u>Indirect/Longer-Term</u>
System	Reliable (bug-free) system	Easy maintainable system
User	Satisfying user needs	Improving productivity of managers
Organizational	Improving business operation	Generating operational benefits
Strategic	Improving customer service	Enabling cooperative partnership

In addition, previous studies have suggested that the objectives of an IS include both direct or short-term goals and indirect or long-term goals (Garrity & Sanders, 1998; Myers, Kappelman & Prybutok, 1997). Thus, the survey used in the present study categorized the above-mentioned objectives into two groups: short-term and long-term. The short-term objectives are also relatively direct for each of the four levels identified in the above paragraph. The long-term goals can be indirect from the perspectives of IS developers. The eight objectives are presented in Table 1 according to the level and by whether it is a direct or indirect objective.

Hypotheses. As previously mentioned, IS developers as a whole are assumed to place more emphasis on technical issues. Therefore IS developers may perceive System level objectives as more important than the objectives as the User, Organization and Strategic Levels. In addition, the objectives of IS designers may not be consistent with the organizational objectives or the objectives of others in the organization because the IS designers may view the long-term/indirect objectives as less important. Earlier studies suggest IS developers are concerned with short-term and direct consequences of IS implementation. IS developers consider an IS a success when a model is developed, installed, and operating with real world data (Hamilton & Chervany, 1981). Hence, the first two research hypotheses are:

H1. The IS developers will perceive the objects at the System Level as more important than the objectives associated with the User, Organizational, and Strategic Levels.

H2. The IS developers will perceive the Short-term/direct objectives as more important than Long-term/indirect objectives.

While employees in the United States are often encouraged to contribute in the decision making process, the decision-making process in Asian organizations is considered to be the domain of upper management with little input from subordinates. It might therefore be expected that the developers of IS in Asian countries to be more concerned with the objectives at the Systems level than at the Organizational or Strategic level. Likewise, since Asian programmers might be less likely to be included in the decision making process, they may also be less concerned with the long-term or indirect benefits of IS than their American counterparts. Therefore the final two research hypotheses are:

H3. The IS developers in Japan and Taiwan will not perceive the objectives at the Organizational and Strategic Levels as important as IS developers in the United States.

H4. The IS developers in Japan and Taiwan will not perceive the objectives associated with Long-term/indirect benefits as important as IS developers from the United States.

METHOD

Questionnaire and Sample. The questionnaire used in the present study was validated by a pre-test involving several faculty members working at a university in the United States. It was then pilot-tested with IS developers of two local companies in the Midwest United States. Based on feedback of the pilot test, several changes were made to improve the clarity of wording and

comprehension. For the Asian samples, the questionnaire was then translated by a faculty member at a University in the host country and pre-tested by several graduate students and faculty members working at the same school.

The questionnaires were distributed to IS developers working in large conglomerate corporations in the United States, Japan, and Taiwan. The sample consisted of IS employees from 13 different companies. Almost all of the respondents who received the questionnaire supplied data. A total of one hundred and twenty-four (124) usable questionnaires were returned by IS developers.

Companies. The type of organizations involved in the current survey included: manufacturing, wholesale/retail, financial/banking/insurance, transportation, public utility, and government. Of the firms surveyed, 27% had between 500 and 1,000 total employees, 46% had between 1,000 and 5,000 employees, and the remaining 27% had over 5,000 employees. The number of IS employees in the organizations ranged from 9 to 170, with a mean of 68.9 employees. For the non-government organizations, the annual gross revenue was between \$11 and \$500 million for 44% of the companies, with the gross annual revenue for the rest of the companies exceeding \$500 million.

Respondents. Individual IS developers were asked to provide some biographical information in addition to their importance ratings for the eight objectives of an IS. Table 2 summarizes the results of the biographical information. As can be seen in Table 2, for all three countries the majority of IS developers were males. Only 24.2% of the respondents in the survey were females. A majority of the respondents had at least a college degree (84%). The Taiwan sample was slightly younger and had less experience working as an IS developer, but the programmers from Taiwan tended to have more education than the other two countries.

Table 2. Profile of Respondents by Nationality

	<u>Japan</u>	<u>Taiwan</u>	<u>United States</u>	<u>Totals</u>
Sample Size	46	29	49	124
Gender				
Males	41	20	33	75.8%
Females	5	9	16	24.2%
Education				
Graduate Degree	2	13	5	16.2%
College Degree	37	16	31	67.6%
No College Degree	7	0	13	16.2%
Experience				
Mean	13.37	6.85	13.13	11.72
Standard Deviation	7.02	4.59	7.99	7.43
Age				
Mean	38.09	32.72	38.74	37.07
Standard Deviation	8.21	4.48	7.97	7.75

Data Measurement. The eight objectives for an IS are displayed in Table 1. The order in which these items were presented on the survey was randomly determined. Respondents were asked to evaluate the importance of each IS objective on a 7-point Likert-type scale ranging from (1) extremely unimportant to (7) extremely important.

RESULTS

Hypotheses 1 and 2. The means for each condition for all IS developers are presented in Table 3. To test Hypothesis 1, a 2 (Short- vs. Long-term objectives) X 4 (Levels) repeated measures ANOVA was performed on the data. The analysis yielded a significant effect of levels ($F(3,369) = 20.39, p = .001$). The simple main effects analysis indicated that the Systems and Organizational level objectives were perceived as more important than the objectives at the User level and that the User level goals were viewed as significantly more important than the Strategic level goals ($p < .05$). Thus there was partial support for Hypothesis 1, in that the User and Strategic objectives were not considered to be as important as the System level goals.

The analysis also produced a significant difference between Long- and Short-term objectives ($F(1,123) = 154.88, p = .001$). As can be seen in Table 3, the IS developers perceived the Short-term/direct objectives as more important than the Long-term/indirect objectives. Thus, Hypothesis 2 was supported.

Table 3. Objective Means for All IS Developers

<u>Level</u>	<u>Short-term/direct</u>	<u>Long-term/indirect</u>	<u>Grand Means</u>
System	6.33	5.85	6.09
User	6.12	5.65	5.89
Organizational	6.36	5.80	6.08
Strategic	6.25	4.70	5.47
Grand Means	6.267	5.500	

Hypotheses 3 and 4. The third hypothesis speculates that there will be an interaction between nationality and level of organizational impact. To test this hypothesis, a 3 (Nationality) X 4 (Levels) X 2 (Short- vs. Long-term objectives) split-plot ANOVA was performed on the data. The results yielded a significant interaction between Nationality and Levels ($F = 7.19, p = .001$). Table 4 displays the means for the items by Nationality and Levels As can be seen in Table 4, all countries viewed the System and organizational objectives as more important than the User and Strategic objectives. It was anticipated that the designers in the United States would view all levels as very important, while developers from Asian countries would place less importance on

the User, Organizational and Strategic goals. However, Table 4 indicates that it is the developers from Taiwan that viewed all levels as nearly equal in importance with Japan and U. S. viewing Strategic and User goals as less important. Also contributing to the interaction was the extremely low importance the Japanese programmers placed on strategic objectives. Thus, the results were not completely consistent with Hypothesis 3.

Table 4. Mean Objective Score by Nationality and Level

<u>Level</u>	<u>Japan</u>	<u>Taiwan</u>	<u>United States</u>
System	5.90	6.29	6.16
User	5.77	6.05	5.87
Organizational	5.91	6.37	6.09
Strategic	4.73	6.17	5.76

The fourth hypothesis suggests there would be an interaction between Nationality and Short- vs. Long-term objectives. The 3 X 4 X 2 ANOVA yielded a significant interaction between these two factors ($F = 23.06$, $p = .001$). Perhaps the results can best be illustrated in the analysis presented in Table 5. Table 5 provides the mean for each item according to Nationality, along with the results of a one-way ANOVA on each item. The results indicate there are no significant differences between the countries in terms of Short-term/direct benefits. The IS developers in all three countries rated the Short-term/direct benefits as very important.

Table 5. Objective Mean Score by Country

<u>Level</u>	<u>Japan</u>	<u>Taiwan</u>	<u>U.S.A.</u>	<u>F</u>	<u>P-value</u>
<i>Short-term/Direct Benefit</i>					
System--Reliable (bug free) System	6.24	6.44	6.32	0.43	.652
User--Satisfying User Needs	6.04	6.00	6.24	.085	.429
Organizational--Improving business operation	6.27	6.52	6.35	.081	.449
Strategic--Improving customer service	6.09	6.44	6.27	1.54	.219
<i>Long-term/Indirect Benefits</i>					
System--Easy maintainable system	5.55	6.14	6.00	3.38	.037
User--Improving productivity of managers	5.49	6.10	5.50	3.81	.025
Organizational--Generating operational benefits	5.56	6.21	5.82	3.07	.050
Strategic--Enabling cooperative partnerships	3.38	5.90	5.24	48.02	.001

However, there were significant differences between the three countries with respect to all four Long-term/indirect benefits. In each case, the IS developers from Taiwan viewed the Long-term objectives as more important than programmers from the United States, while IS developers in Japan rated them less important than programmers in the United States. For each of the four Long-term/indirect benefits, a Duncan's test was conducted to determine which groups differed significantly from the others. For the Organizational level (generating operational benefits) and the Systems level (Easily maintainable systems), the Duncan's test indicated that the programmers in Taiwan viewed these two items as significantly more important than the programmers from Japan. For the User level (improving productivity of managers), the Duncan's test suggested that the Taiwanese programmers viewed this item significantly more important than both the American and Japanese programmers. Finally, on the Strategic level (Enabling cooperative partnerships), the results showed that the developers in Taiwan viewed this item as significantly more important than the United States programmers, who viewed it as significantly more important than the Japanese programmers. Thus, there was some support for Hypothesis 4 in that the programmers from the United States generally perceived the Long-term benefits as more important than did the Japanese programmers. However, of the three countries examined in the present study, the IS developers from Taiwan gave the highest importance rating to the Long-term goals.

CONCLUSIONS

Examining the perceptions of IS developers regarding IS objectives is important since developer's values affect various decisions associated with system development and resource allocation. This study evaluates and compares the views of IS developers of different cultural backgrounds with respect to IS objectives. Several observations can be drawn from the study.

First, there are some demographic similarities between programmers in the United States and in Japan. The mean age in Japan was 38.09 while the mean age in the U. S. was 38.74. Job tenures of developers in both countries were also very similar (13.37 versus 13.13). In terms of education, about 15% of Japanese and 27% of the U. S. developers did not have the college degree. However, there were gender differences. In Japan, most developers were male; females represented only 11% of the respondents. For U. S. respondents, 33% were female.

In spite of many similarities in demographic backgrounds, the study illustrated that the U.S. and Japanese respondents have very different views with regards to Long-term IS objectives. According to the Hofstede (1980) model, Japan is characterized by high-power distance, high uncertainty avoidance, and slightly high collectivism. The United States is characterized by low power distance, low uncertainty avoidance, and very strong individualism. In a society with high uncertainty avoidance and collectivism, a high value is placed on conformity, discouraging risk-taking attitudes. Strategic decisions are typically the responsibility of a few people at the upper level of management, and their authority is virtually unquestioned. It is also noted that the cultural characteristics of the Japanese may not be conducive to innovation (Sekaran & Snodgrass, 1986). The risk-averse nature of the Japan culture may encourage short-term objectives and hinder formulation of long-term planning.

Taiwan respondents were different from the developers of the two other countries in several aspects. First, educational level of Taiwan respondents was very high. All Taiwan respondents have college degrees. In fact, 45% of the respondents have at least graduate degrees. The respondents were younger (mean age of 32.72), and their job experiences was also shorter (mean 6.85 years compared to 13 or more years of the developers of U.S. and Japan).

All developers considered System and Organizational level objectives more important than User or Strategic level objectives. All developers also considered Short-term objectives more important than Long-term objectives. All developers also considered Short-term objectives more important than Long-term objectives. The data analysis indicate that there were more similarities among IS developers in different countries than differences. When individual objectives are examined, all developers considered the objective of "improving business operation" as the most important, closely followed by "developing reliable system." The developers in the three countries also considered "improving customer service" more important than "satisfying user needs." However, the developers in the United States rated the objective of satisfying user needs" higher than the developers in other countries, although the difference was not significant.

As for Long-term/indirect objectives, the Taiwan developers rated these items higher than the developers in other countries. This phenomenon may be due to the fact that the Taiwan developers had a higher level of education; 45% of the developers had a graduate degree.

In conclusion, the results of this study show that there are some significant differences among developers of three countries with respect of their views on the long term IS objectives. However, there are more similarities than dissimilarities among developers. There are no significant differences in terms of the short-term objectives and hierarchical levels of the objectives. With higher education, internationalization of businesses, and globalization of information sharing, it is more likely that the differences in terms of knowledge, strategies, and values will become even smaller in the future among developers in different countries.

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