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INFORMATION SYSTEM SATISFACTION AMONG IS MANAGERS

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This study applied Pearson's (1977) user information system (IS) satisfaction instrument to measure IS managers' satisfaction. The instrument was found to possess desirable psychometric qualities using the sample of this study. The factor loadings of the IS satisfaction components were found different between IS users and IS managers. The study further provides empirical evidences to support the use of Ives, Olson, and Baroudi's (1983) 4-item scale or simply a one-question global scale for measuring overall IS satisfaction.

INTRODUCTION

Information systems (IS) have been recently regarded as competitive weapons by organizations in diverse industries (Rockart & Scott-Morton, 1984; McFarlan, 1984). The development of an effective information system (IS) usually requires large manpower and capital investments. It is therefore necessary to assess the effectiveness of an IS and its contributions to organizational objectives. Such an assessment not only assists in identifying corrective actions but also facilitates IS budget allocations and policy formation.

Recently, Pearson (1977) studied and recommended the construct of user's satisfaction with ISs as a practical and realistic surrogate of IS effectiveness. Many researchers (Bailey & Pearson, 1983; Ives, Olson, & Baroudi, 1983; Baroudi & Orlikowski, 1988) supported this instrument and regard it as the most reliable instrument available to date. They

recommended this instrument as the most viable starting point for the measurement of IS satisfaction (ISS). Their rationales were based on Cyert and March's (1963) argument that an IS will not be effective and successful if its users are not satisfied. History had shown that many IS fiascoes were resulted from IS management's incompetence in understanding user's information requirements (Ackoff, 1967). By measuring user's satisfaction with the existing ISs, one can provide IS management with user's feedback and avoid future similar blunders.

More often than not, a successful IS is positively correlated with the level of user's IS satisfaction. However, user's IS satisfaction is not always indicative of a successful IS. There are many IS-specific problems that users are not aware of due to the system boundaries or their lack of technical knowledge. IS managers rather than IS users are normally better equipped to assess the quality of a system from a technical point of view and to gain a pivotal insight into the potential and effectiveness of the existing system. An organization should measure not only its users' but also its IS managers' ISS. Such a practice is likely to provide top management with added perspective in allocating IS resources, prioritizing IS projects, and comparing its present ISs with their optimal alternative systems.

PREVIOUS ISS STUDIES

The existing empirical studies on ISS have focused on user's perception within an organizational context. Pearson (1977) developed a set of scales to measure various components (or factors) of ISS. Thirty-six critical and conceptually distinct ISS components (or "items") were identified through a review of existing literature and three were added through consultations with three IS professionals. The instrument was validated using the self-report responses from 29 middle managers in 8 different organizations. Each ISS component was assessed against four bipolar semantic differential subscales. For example, "top management involvement" was assessed on four subscales: "strong vs weak," "consistent vs inconsistent," "good vs bad," and "significant vs insignificant." The summation of the scores on the four subscales was used as the score of the respective scale. Each scale score was initially multiplied with a weight of importance to reflect the saliency of each component in the overall ISS score. Subsequently, this adjustment was found superfluous and abandoned due to a high correlation ($r = 0.9968$) between the weighted and unweighted overall ISS scores. The work of Pearson (1977) was later published in Bailey and Pearson (1983).

Ives, Olson, and Baroudi (1983) undertook a replication of Pearson's (1977) study to validate and shorten the instrument. They surveyed 800 production managers in U.S. manufacturing organizations and obtained 200 usable samples. Their study supported the reliability and validity of Pearson's instrument. However, it was recommended that continuous studies of the instrument's psychometric properties across more diverse settings should be conducted. Furthermore, they proposed a short form containing 13 items, each with 2 bipolar subscales to serve as a global measure of ISS and suggested that the instrument be tailored to the situation by the instrument user. They also advocated the development of a central data bank containing the evaluation results. Such a data bank would allow comparison of results across organizations and across other variables of interest.

Raymond (1985) used a 20-item instrument adapted from Bailey and Pearson (1983) along with a 2-item measure of system utilization as the surrogate measure of IS success. The questionnaire was mailed to the controllers of 3,699 small firms in Quebec, Canada. Among the 1,226 responses, 464 were from computerized firms. The latter group of responses were analyzed to identify the associations between organizational characteristics and IS success, though no psychometric properties of the instruments were reported in the study.

Mahmood and Becker (1986) used a 22-item instrument adapted from Bailey and Pearson (1983) to measure ISS. The questionnaire was pretested with 16 executives and then mailed to 375 companies randomly selected from the 1984 Standard and Poor's directory. Fifty-nine heavy end-users completed and returned the questionnaires; two of them were not usable due to missing values. The study explores the relationship between organizational maturity and users' ISS. However, it did not examine the psychometric properties of the instrument.

Montazemi (1988) conducted a study similar to the one by Raymond (1985). The study set out to explore the potential relationship between the organizational characteristics of computer usage and end-user's satisfaction with the application systems. The latter variable was measured by a 35-item instrument adapted from Bailey and Pearson (1983). The instrument was pretested with 11 subjects from 4 small firms. Subsequently, the questionnaire was mailed to 86 end users and 67 IS personnel. Responses were received from 40 end users and 37 IS personnel. The study was based on these responses. The results supported the reliability and validity of the 35-item instrument and revealed the difference in the perceived satisfaction as well as the perceived importance of each scale between the end users and the IS personnel.

Baroudi and Orlikowski (1988) reexamined the psychometric proper-

ties of the 13-item short form developed by Ives, Olson, and Baroudi (1983). A sample of 358 employees in 26 New York area organizations was obtained. The reliability, validity, and the factor structure of this short form was found to be consistent with those from Ives, Olson, and Baroudi (1983). They concluded that the short form is a more reasonable instrument for application in practical situations than the 39-item long form developed by Pearson (1977).

PURPOSE OF THIS STUDY

The present study set out to investigate ISS among IS managers. The purpose of this inquiry is twofold. First, we were interested in the validation of Pearson's (1977) instrument for this different population group—IS managers. Second, we were interested in the potential differences and similarities in factor structures between IS users and IS managers. To the extent that IS managers differ systematically from users in their evaluation of ISS components, one would need to investigate the potential conflicts between these two groups. This study thus explores the satisfaction with ISS components as perceived by IS managers and compare the results with those previously reported on the IS users.

METHODOLOGY

Subjects

One hundred and thirty-five IS managers in the Southwest belonging to a large national IS association were contacted by mail and agreed to participate in a study on information systems and organizational dynamics. This sample represents 135 different companies. A survey questionnaire containing a modified version of Pearson's (1977) 39-item ISS instrument as well as Ives, Olson, and Baroudi's (1983) 4-item overall ISS measure was sent to each IS manager. Of the 135 questionnaires sent, 109 (or 81%) usable responses were obtained. These respondents came from a wide variety of industries including banking, EDP (electronic data processing) services, education, government, insurance, manufacturing, medical, printing, retailing, utilities, and wholesaling, and so on. Among them, 70 were top managers, while 20 were middle and 19 were operating managers.

Measures

The present study adopted a modified version of Pearson's (1977) instrument. Due to time and space constraints, the subjects were asked to evaluate each ISS component on only one 7-point Likert-type scale rather than on the four semantic differential subscales employed by Pearson (1977). In a separate section, subjects were asked to assess the importance of each element on a 7-point Likert-type scale ranging from "extremely unimportant" to "extremely important." As independent measures of ISS, the present study employed a single-item global ISS scale (GISS) developed by the authors as well as a 4-item overall ISS measure (OISS) developed by Ives, Olson, and Baroudi (1983). The summary statistics of IS satisfaction and importance scores are shown in Figure 10.1.

Analytic Procedures

Following the procedure prescribed by Ives, Olson, and Baroudi (1983), the psychometric properties of the instrument were first examined. Factor analysis was applied to reveal the underlying structure of the instrument. The differences in importance rating and in factor structure were identified. Several important conclusions were drawn based on the results of these analyses.

RESULTS

Importance Ratings

The correlation between the overall ISS scores weighted and unweighted for importance ratings was 0.98 which is significant at the 0.001 level. Since the predictive power was not improved by the multiplication of ISS score with importance rating, the adjustment for importance rating seems superfluous. This finding conforms to that of Pearson (1977) in which a correlation of 0.9968 was reported. Inasmuch, the present study relied exclusively on the satisfaction scores as had been adopted by Pearson, Bailey, Ives, and others.

Reliability

Since this study and other previous studies on this instrument did not administer the questionnaire at multiple times, it is not possible to

Item No.	Item Description	Satisfaction ^a		Importance ^b	
		Mean	Std.Dev.	Mean	Std.Dev.
1.	User/DP staff relationship	1.193	1.398	2.560	.833
2.	IS change requests	.853	1.339	2.064	.974
3.	User/EDP center I/O	1.413	1.002	1.578	1.219
4.	EDP/non-EDP competition	.587	1.454	.294	1.646
5.	User confidence in IS	1.110	1.480	2.450	.844
6.	Timeliness of Output	1.606	1.139	2.321	.912
7.	Chargeback Method	.404	1.611	-.459	2.016
8.	Perceived Utility	.991	1.531	1.477	1.222
9.	Vendor support	1.495	1.295	2.000	1.284
10.	Language features	1.312	1.379	.670	1.851
11.	Support expectations	1.018	1.298	1.807	1.004
12.	Error correction	1.275	1.239	2.000	1.072
13.	Data security	1.385	1.340	1.936	1.376
14.	User training	.486	1.561	1.642	1.126
15.	User understanding	.358	1.385	1.505	1.259
16.	User Participation	.743	1.423	1.807	1.265
17.	Output currency	1.798	.998	2.046	1.066
18.	EDP staff attitude	1.459	1.288	2.037	1.170
19.	Output reliability	1.734	1.160	2.606	.805
20.	Top management involvement	.376	1.799	1.963	1.113
21.	Output format	1.358	1.093	1.303	1.118
22.	Response time	1.486	1.119	1.954	.947
23.	EDP resource allocation	.606	1.627	1.550	1.126
24.	Access convenience	1.459	1.323	1.807	1.118
25.	Output relevancy	1.541	1.135	2.083	.894
26.	Output volume	1.294	1.257	.174	1.557
27.	Job affects of IS	1.220	1.294	1.138	1.236
28.	Output accuracy	1.624	1.192	2.697	.866
29.	Output precision	1.670	1.131	2.073	1.160
30.	User/EDP staff communication	1.128	1.341	2.239	.932
31.	EDP position in organization	.688	1.671	1.138	1.481
32.	IS development timeframe	.165	1.602	1.569	1.133
33.	Personal control over IS	1.073	1.550	1.202	1.153
34.	EDP scheduling	1.532	1.093	1.422	1.157
35.	IS documentation	.266	1.665	1.550	1.417
36.	Output completeness	1.422	1.012	2.028	1.067
37.	EDP staff competence	1.505	1.183	2.037	1.060
38.	IS flexibility	.927	1.562	2.073	.910
39.	IS integration	.670	1.639	1.725	1.201

Four-item Overall ISS Measure—(OISS)^c

1.	How adequately do you feel the current EDP/MIS group meets the information processing needs of your area of responsibility?	1.468	1.295	n/a	n/a
2.	How adequately do you feel the current EDP/MIS group meets the information needs of the broader class of users they serve?	1.119	1.366	n/a	n/a
3.	What is your overall sense of satisfaction with the efficiency of the current EDP/MIS group?	1.330	1.248	n/a	n/a
4.	What is your overall sense of satisfaction with the effectiveness of the current EDP/MIS group?	1.404	1.248	n/a	n/a

Single-item Global ISS Measure: (GISS)

0.	What is your overall sense of satisfaction with the current EDP/MIS services?	1.239	1.452	n/a	n/a
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a All satisfaction items are measured on a 7-point Likert-type scale ranging from -3 (Extremely dissatisfied) to +3 (Extremely satisfied).

b All importance items are measured on a 7-point Likert-type scale ranging from -3 (Extremely unimportant) to +3 (Extremely important).

c Adopted from Ives, Olson, and Baroudi (1983).

Figure 10.1. Summary statistics of IS satisfaction and importance scores.

determine test-retest reliability of the scales. However, an overall reliability alpha coefficient (Cronbach, 1971) of 0.962 was obtained for the 39-item ISS measure, a finding that approximates the internal reliability coefficient of 0.97 reported by Ives, Olson, and Baroudi (1983). The reliability coefficient of the 4-item overall measure was 0.871. Because the present study did not employ multiple bipolar subscales for each ISS scale, it was not possible to determine the reliability of each scale. However, evidence of such reliability might be inferred from those reported by Pearson (1977), Bailey and Pearson (1983), and Ives, Olson, and Baroudi (1983).

Content Validity

An instrument's content validity fundamentally depends on the extent to which it reflects a specific domain of content of the theoretical concept being measured (Carmines & Zeller, 1979). Ives, Olson, and Baroudi (1983) used two types of circumstantial evidence for content validity: internal consistency and the correlation of individual scale scores with the total score of an independent overall ISS measure. In the present study, 697 (or 94%) of the 741 intercorrelations among the 39 ISS scales were significant at the 0.01 level while 718 (or 97%) significant at the 0.05 level. The intercorrelations among the 4 overall ISS scales (i.e., items OISS1 to OISS4) ranged from 0.54 to 0.79 and all were significant at the 0.001 level. The internal consistencies of Pearson's instrument and Ives, Olson, and Baroudi's 4-item overall measure were thus supported.

The correlations between individual ISS scales and the 4-item overall ISS measure were all significant at the 0.001 level and ranged between 0.26 and 0.70, with 24 (or 62%) of the 39 correlations higher than 0.50. Had the single-item global ISS scale (i.e., item GISS) been used, all correlations were significant at the 0.001 level and ranged between 0.24 and 0.63, with 20 (or 51%) of the 39 correlations higher than 0.50. This result is consistent with Ives, Olson, and Baroudi's (1983) finding.

The four overall ISS scales were further correlated against the GISS. These correlations were 0.81, 0.81, 0.63, and 0.70, respectively, and all were significant at the 0.001 level. The correlation between the total score of the 4-item overall measure and the GISS was 0.87 which is significant at the 0.001 level.

Predictive Validity

Predictive validity refers to the extent to which the instrument score can be used to "predict" performance on some other measure of the same construct. In order for an instrument to have any real credibility, its

score must converge with those of other scales which are believed to measure the same construct. Ives, Olson, and Baroudi (1983) reported a correlation of 0.55 ($p = 0.001$) between the total score of the 39 ISS scales and the total score of the 4-item independent measure. The present study found such correlation to be 0.82 and significant at the 0.001 level. Had the single-item global scale GISS been used, the correlation would have been 0.70 and also significant at the 0.001 level. These significant correlations strongly supports the use of the single-item global scale or the 4-item overall scale to measure overall ISS.

Construct Validity

Construct validity concerns the validation of the underlying theoretical framework of the instrument. As indicated by Ives, Olson, and Baroudi (1983), a final claim of construct validity can only be made after subjecting the instrument to "several alternative forms of testing with consistent findings" (Ives, Olson, & Baroudi, 1983, p.789).

Two methods of construct validation were recommended by Kerlinger (1973). The first method assumes the total score to be valid and assesses the correlation of each scale score against the total score. A significant and high correlation of a scale score with the total score would, from this reasoning, suggest some level of validity for the scale. In order to avoid any kind of spurious part-whole correlation (Cohen & Cohen, 1975), each ISS scale score was correlated against the total ISS score minus the respective scale score. The correlations ranged from 0.38 to 0.73 and all were significant at the 0.001 level with 36 (or 92%) of the 39 scales correlating at above 0.50. The same approach was applied to the four items of the overall ISS measure. The correlations were 0.73, 0.68, 0.90, and 0.64, respectively, and all were significant at the 0.001 level.

A second method of construct validation is factor analysis. The loading of an item on a factor was considered evidence of the item's construct validity. In this study, a principal factor analysis with varimax rotation was employed. Before factor extraction, the correlation matrix of the 39 items was first subjected to sphericity test (Bartlett, 1950) and the null hypothesis was rejected at the 0.01 significance level. Orthogonal factors were then extracted from the correlation matrix and rotated according to the orthogonal varimax criterion (Kaiser, 1958). Individual factors were identified by those items which loaded significantly (above 0.50 or below -0.50) on the factors resulted from the rotations. Several factor solutions were examined and a 5-factor solution was selected. The resulted matrix of the rotated 5 factors was highly interpretable. These

five factors were labeled as: (a) IS effectiveness, (b) user/IS relation, (c) information quality, (d) knowledge or involvement, and (e) IS efficiency. The significant factor loadings of these five factors along with the communality estimates are shown in Figure 10.2.

Although the resulted factor structure is somewhat different from the one obtained in Ives, Olson, and Baroudi's (1983) study on IS users, overwhelming similarities exist between them. While it is worth reiterating the cautions concerning the interpretation of factor analytic results under a relatively small sample-to-item ratio (2.8 to 1), the differences and similarities found here make sense given the different populations surveyed. The validity of this 5-factor structure was supported by the total variance explained (56%) as well as by the alpha reliability coefficients of the five extracted factors. The reliability coefficients in sequence were 0.91, 0.86, 0.93, 0.75, and 0.81, and all were above the acceptable level (0.70) recommended by Nunnally (1978).

Ives, Olson, and Baroudi (1983) also obtained a 5-factor structure in their study: (a) EDP staff and services, (b) information product, (c) vendor support, (d) information product, and (e) knowledge or involvement. Factor 1 of this study (i.e., IS effectiveness) roughly corresponds to their two "information product" factors. Factor 2 (user/IS relations) approximates their "EDP staff and services." Factor 4 (knowledge or involvement) is identical to their Factor 5. In addition, there is some overlap between factor 3 (information quality) and their factor 2, "information product."

The present study further obtained a factor unique to the IS managers: Factor 5, "IS efficiency." While users appear to focus more on IS effectiveness (specifically, the quality and utility of the information made available), IS managers seem to give attention to not only the effectiveness but also the efficiency of the IS by which the desired information is produced. Coupled with the fact that efficiency is often used as a performance measure for IS personnel, this finding implies that IS managers and IS departments may have to continuously measure their performance in terms of the quality of services provided at a given budget.

The factor of vendor support had a single loaded item in Ives, Olson, and Baroudi's (1983) study. Yet, it did not emerge as a factor in this study. We believe that this lack of loading may be resulted from the nature of duties of IS managers. Most IS managers are responsible for providing maintenance support to the users once a system has been installed. Such maintenance support may be performed by in-house IS personnel or acquired from outside vendors. Users, on the other hand, do not have such responsibilities and may not be aware of the source of their maintenance support. In fact, users often confuse such services

Item No.	Item Description	Factor Loading					Communi- nality
		IS Effec- tiveness	User/IS Relation	Information Quality	Knowledge/ Involvement	IS Effi- ciency	
1.	User/DP staff Relations		0.56				0.631
2.	Processing IS change requests						0.432
3.	EDP center I/O						0.303
4.	EDP/non-EDP competition		0.53				0.336
5.	User confidence in IS						0.581
6.	Timeliness of Output	0.57					0.511
7.	Chargeback Method						0.177
8.	Perceived Utility						0.512
9.	Vendor support						0.275
10.	Language features	0.52					0.366
11.	Support Expectations		0.54				0.607
12.	Error Corrections						0.567
13.	Data Security	0.51					0.482
14.	User Training				0.67		0.674
15.	User Understanding				0.69		0.727
16.	User Participation				0.62		0.715
17.	Output Currency	0.54					0.554
18.	EDP staff attitude	0.50					0.482
19.	Output Reliability			0.67			0.765
20.	Top Management Involvement		0.69				0.624
21.	Output Format					0.69	0.648
22.	Response Time					0.61	0.562
23.	EDP Resource Allocation		0.64				0.643
24.	Access Convenience	0.50					0.589
25.	Output Relevancy	0.52					0.717
26.	Output Volume	0.60					0.520
27.	Job Effects of IS					0.53	0.578
28.	Output Accuracy			0.85			0.888
29.	Output Precision			0.88			0.904
30.	User/EDP staff communication		0.61				0.620
31.	EDP position in org.		0.61				0.427
32.	IS Development timeframe	0.51					0.528
33.	Personal control over IS						0.522
34.	EDP products scheduling						0.499
35.	IS Documentation						0.480
36.	Output Completeness	0.60					0.744
37.	EDP staff competence	0.57					0.521
38.	IS Flexibility	0.71					0.638
39.	IS Integration	0.58					0.574
Variance Explained		16.230	2.150	1.439	1.136	0.967	21.922
Percent of Variance		41.615	5.513	3.690	2.913	2.479	56.210

Figure 10.2. Facot Loadings and communiaty estimates for IS satisfaction from IS managers.

provided by in-house IS personnel with those provided by outside vendors, or vice versa. In order to remove this confusion, we hereby recommend the use of the term "maintenance support" in place of "vendor support" in the ISS instrument.

DISCUSSION

The results of scale validation in this study are consistent with those of Ives, Olson, and Baroudi (1983); while there are differences in the degree of some correlations, the direction of the relationships are identical and most correlations are significant at the 0.001 level. The results support the reliability, content validity, predictive validity, and construct validity of the 39-item and 4-item instruments adopted by this study.

Some interesting differences emerged between the present study and that of Ives, Olson, and Baroudi (1983) in terms of the loaded items on the extracted factors. These differences may be attributed to the heterogeneity between the subjects of the two studies. In this study, IS managers rather than IS users are the subjects. Figure 10.3 contrasts the factor numbers and loadings from both IS managers and IS users. While 18 items were loaded among both subject groups, 4 were loaded only among IS users, 11 were loaded only among IS managers, and 6 were loaded among neither groups. Figure 10.4 lists these items in sequence. Such differences in loaded items are indicative of potential differences in the underlying ISS valuation processes between IS managers and IS users.

The items loaded only among IS users (i.e., items 2, 5, 9, and 33) are indicative of the unique concerns among that group. In view of the argument we have made that the term "vendor support" (item 9) may be interpreted differently by the two subject groups; IS users tend to be more responsive to such support than IS managers. Inasmuch, it was loaded among IS users rather than IS managers. Beside vendor support, three other items loaded only among IS users include processing of requests for system changes (item 2), user's confidence in systems (item 5), and personal control over EDP systems (item 33). They all seem to be legitimate users' concerns.

The items which loaded only among the IS managers (i.e., items 4, 10, 11, 13, 20, 21, 22, 27, 31, 37, and 39) are also reasonable for that group. It is common knowledge that IS managers rather than IS users are better able to evaluate the technical competence of the EDP staff (item 37) as well as the integration of systems (item 39). Being an IS

Item No.	Item Description	IS Managers' Satisfaction* Factor/Loading	IS Users' Satisfaction** Factor/Loading
IS Effectiveness:			
38.	Flexibility of systems.	1 0.71	1 0.56
36.	Completeness of output	1 0.60	2 0.70
26.	Volume of output	1 0.60	2 0.56
39.	Integration of systems	1 0.58	- -
6.	Timeliness of output	1 0.57	4 0.66
37.	Technical competence of the EDP staff	1 0.57	- -
17.	Currency of output	1 0.54	2 0.54
25.	Relevancy of output	1 0.52	2 0.74
10.	Features of computer language used.	1 0.52	- -
13.	Security of data and models.	1 0.51	- -
32.	Time required for systems development.	1 0.51	1 0.65
18.	Attitude of the EDP staff.	1 0.50	1 0.73
24.	Convenience of access.	1 0.50	1 0.55
User/IS Relation:			
20.	Top management involvement.	2 0.69	- -
23.	Allocation, priorities for EDP resources.	2 0.64	1 0.55
30.	Communication between users and the EDP staff.	2 0.61	1 0.71
31.	EDP organization position.	2 0.61	- -
1.	Relationship between users and the EDP staff.	2 0.56	1 0.62
11.	User's expectations of computer-based support.	2 0.54	- -
4.	Competition between EDP and non-EDP units.	2 0.53	- -
Information Quality:			
29.	Precision of output	3 0.88	2 0.80
28.	Accuracy of output	3 0.85	2 0.80
19.	Reliability of output	3 0.67	2 0.74
Knowledge or Involvement:			
15.	User's understanding of systems.	4 0.69	5 0.71
14.	Training provided to users.	4 0.67	5 0.57
16.	User's participation.	4 0.62	5 0.55
IS Efficiency:			
21.	Format of output	5 0.69	- -
22.	Response/turnaround time	5 0.61	- -
27.	Job effects of computer-based support	5 0.53	- -
Other:			
5.	User's confidence in systems	- -	2 0.61
2.	Processing of requests for systems changes	- -	1 0.69
12.	Correction of errors.	- -	- -
9.	Vendor/maintenance support.	- -	3 0.61
3.	Means of input/output with EDP center.	- -	- -
35.	Documentation of systems and procedures	- -	- -
8.	Perceived utility (worth versus cost).	- -	- -
33.	Personal control over EDP systems.	- -	1 0.56
7.	Chargeback method.	- -	- -

* Scales are listed in sequence of factor loadings and importance ratings from this study.
 ** The factor numbers and factor loadings are excerpted from Ives, Oldson, and Baroudi (1983).
 - This factor was not significantly loaded.

Figure 10.3. Comparison of loaded factors of IS satisfaction.

Item No.	Item Description
Items Loaded among IS Managers and IS Users:	
1.	Relationship between users and the EDP staff.
6.	Timeliness of output.
14.	Training provided to users.
15.	User's understanding of systems.
16.	User's participation
17.	Currency of output.
18.	Attitude of the EDP staff
19.	Reliability of output.
23.	Allocation priorities for EDP resources.
24.	Convenience of access.
25.	Relevancy of output.
26.	Volume of output
28.	Accuracy of output.
29.	Precision of output.
30.	Communication between users and the EDP staff.
32.	Time required for systems development.
36.	Completeness of output.
38.	Flexibility of systems.
Items Loaded Only among IS Users:	
2.	Processing of requests for system changes.
5.	User's confidence in systems.
9.	Vendor/maintenance support.
33.	Personal control over EDP systems.
Items Loaded Only among IS Managers:	
4.	Competition between EDP and non-EDP units.
10.	Features of computer language used.
11.	User's expectations of computer-based support.
13.	Security of data and models.
20.	Top management involvement.
21.	Format of output.
22.	Response/turnaround time.
27.	Job effects of computer-based support.
31.	EDP organizational position.
37.	Technical competence of the EDP staff.
39.	Integration of systems.
Items Not Loaded among Either Groups:	
3.	Means of input/output with EDP center.
7.	Chargeback method.
8.	Perceived utility (worth versus costs).
12.	Correction of errors.
34.	Scheduling of EDP products and services.
35.	Documentation of systems and procedures.

Figure 10.4. Satisfaction items loaded among IS managers and IS users. The loaded items of IS managers are from this study while those of IS users are from Ives, Olson, and Baroudi (1983).

manager, one must compete with non-IS managers for resources (item 4), gain top management involvement (item 20), and develop a power base within an organization to elevate EDP position in the organizational hierarchy (item 31). In addition, IS managers appear to be concerned about respond/turnaround time (item 22), format of output (item 21), and job effects of computer-based support (item 27). In other

words, IS managers appear to be concerned about IS efficiency while IS users appear not to.

Traditionally, IS users were not required to interact directly with the systems, nor were they required to maintain their own data or models. These two activities were normally handled by the IS department. Based on this observation, one can understand why IS users are not concerned about the features of computer language used (item 10) or the security of data and models (item 13). Nonetheless, the growing trend toward end-user computing and distributed data processing may soon push users to increase their concerns about these two aspects.

Further examination of the loaded items reveals that IS managers seem to be concerned about user's expectation of computer-based support (item 11). This may be a result of a common practice which uses the deviation from user's expected level of computer-based support to measure directly the IS department's ability to satisfy users' demands, whether reasonable or not. Without sufficient knowledge or involvement in IS activities, users are likely to place unreasonable demands. The challenge faced by the IS managers is therefore to provide users with adequate training, involve them in the pertinent IS projects, and foster the interfaces between them and the IS personnel (Withington, 1987).

LIMITATIONS

A significant limitation of the present study is the relatively small sample size that was available to assess the factor structure and the psychometric properties of ISS instrument. Due to the relatively small ratio of sample size to the number of scales, the factor structure of ISS in this study may or may not be stable and reliable. However, increasing sample size is likely to cause changes only among those less significant factors, that is, the factors explaining a lesser proportion of the total variance (Bass, 1985). Since the five extracted factors have accounted for more than half (56%) of the total variance, we expect that the primary factors would remain relatively stable. To verify and solidify our results, we welcome researchers to replicate our study with a large sample.

A second limitation is the use of the single-item scale for each ISS component. While scale reliability was obtained in previous studies on users, the present study was not able to verify that the scale reliability of each ISS scale can be directly generalized to IS managers. However, no sign was found indicating undesirable psychometric qualities of these scales. As alluded to in the results section, the extracted empirical

factors yielded reasonable alpha coefficients, coupled with the overall reliability and the content, predictive, and construct validities, all suggesting scale reliability.

Finally, another limitation applies not only to the present study but also to previous ones in that longitudinal data have not yet been employed. The effects of time are particularly interesting and relevant in such a rapid-changing area as information systems. It would be reasonable to expect that the importance and satisfaction ratings of both users and IS managers would change dramatically as they become accustomed to new technological developments, distributed processing, end user computing, and raising demands and expectations.

CONCLUSIONS

This study is the first to apply the ISS instrument developed by Pearson (1977) to a group of IS managers and examined the psychometric properties of the instrument among this group. Several conclusions can be drawn from the study. First, the study confirms Pearson's (1977) finding that weighting the ISS scores with their corresponding importance ratings is unnecessary. Second, Pearson's (1977) 39-item instrument was found applicable to IS managers as evidenced by the reliability and the content, predictive, and construct validities of the instrument. Third, although the scales (or items) loaded on the ISS construct of IS managers were slightly different from those of Ives, Olson, and Baroudi (1983) and Baroudi and Orlikowski (1988) which focused on IS users, the extracted factors were found consistent mostly with these previous studies. Fourth, the single-item global ISS scale and the 4-item overall ISS measure appear to accurately reflect the overall level of ISS as evidenced by their significant correlations ($p = 0.001$) with each other and with all the other scale scores. Finally, given the evidence uncovered by this and other studies, it is recommended that Pearson's instrument be adopted as the standard, uniform instrument for measuring ISS across organizations and professional communities. Such an instrument can provide data which would not only permit comparison of results across organizations and communities, but also provide the bases for longitudinal investigations between ISS and other variables of interest.

In all, IS managers and IS users appear to have four common sources of ISS: IS effectiveness, user/IS relation, information quality, and knowledge or involvement in IS functions. In addition, IS managers seem to be concerned with IS efficiency but IS users seem not. The study