

PERCEIVED IMPORTANCE OF INFORMATION SYSTEM SUCCESS FACTORS

Eldon Y. Li, National Chung Cheng University, Chia-Yi 621, Taiwan, R.O.C., 886-5-272-1500

ABSTRACT

There are many factors influencing the success or failure of an information system. This study proposes the existing factors of information system success (ISS) be classified into 8 different dimensions. It uses the data available in the literature as well as those collected from a field survey to analyze the differences in the perceived importance of ISS factors between four groups of subjects, namely, the user staff, the IS staff, and the managers of the two groups. It reveals that the rank orders of ISS factors between IS staff and IS managers and between user staff and user managers are not significantly different. However, the rank orders between IS personnel and user personnel are significantly different. Based on the rank orders, the top and the least important ISS factors are identified. The findings in this study render several implications for IS management practice.

INTRODUCTION

For the past two decades, many researchers have been attempting to identify those factors which make an information system (IS) successful. Among the various studies, the one reported by Bailey and Pearson [1] has received the most attention. The study identified 39 distinct factors that influence a user's IS satisfaction (UISS) and proposed an instrument to measure them. Due to its richness and validity, the instrument has been adapted by many academicians and practitioners for UISS studies [2,4,8,9,10,11,13,17,19]. Pearson's factors encompass 7 major dimensions of IS success (ISS): 1) system quality, 2) information quality, 3) information use, 4) user satisfaction, 5) individual impact, 6) service quality, and 7) conflict resolution. However, it does not consider the "organizational impact" dimension [5] and several other factors. This weakness is rectified by introducing 7 more factors, thus the number of factors increased to 46. The 7 additional factors are: 1) user's attitude toward using the computer-based information system, CBIS [6], 2) the clarity of output information [18], 3) the instructiveness of output information [18], 4) the support of productivity tools [12], 5) the overall contribution of IS to the organizational goals [3], 6) the efficiency of the systems [9], and 7) the effectiveness of the systems [9]. Table 1 shows the 46 factors of IS success (ISS) under the corresponding ISS

dimensions. Note that the fifth additional factor, the overall contribution of IS to the organizational goals, is operationalized through the productivity improved by the CBIS in user's organization. The purpose of this study is to: 1) survey a group of IS managers and report their perceived importance of ISS factors, 2) to compare the importance ratings from the IS managers with those of the end user [13], the IS staff [13], and the user managers [16] reported by the other studies, and 3) to explore the relative importance of the 7 additional ISS factors proposed by this study.

RESEARCH METHOD

Subjects

To begin the study, 608 members of a national IS professional association in the U.S. were randomly selected, each represents a different company. The subjects were solicited to participate in this study and 160 of them agreed to do so. Among these volunteers, 135 (84%) indicated that they are supervising some IS personnel. These latter group were selected as the subjects for this study. Subsequently, a survey questionnaire containing 46 ISS factors was sent to these managers. Of the 135 questionnaires sent, 115 (85% of 135) were completed and returned. However, 6 of the returned questionnaires were found to have too excessive missing values to be included in this study, leaving only 109 usable respondents. 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, etc. Based on various demographic distributions, the representativeness of the sample appears to be adequate. The distribution of the demographic characteristics are so diverse that it allows us to use the sample means as the estimated average importance ratings of the entire population.

Questionnaire

For the purpose of comparison, this study adapted the 39 UISS factors identified by Bailey and Pearson [1]. Furthermore, seven ISS factors were added. The descriptions of all these 46 factors are listed in the Appendix. Each surveyed subject was asked to evaluate the importance of each ISS factor based on a 7-point Likert-

type scale ranging from -3 ("extremely unimportant") to +3 ("extremely important"). Such plus-minus coding method allows the positive scores to indicate the levels of importance, and the negative scores to indicate the levels of unimportance. In order to reduce the completion time, the 7-point Likert-type scale similar to Tan and Lo [19] was used instead of the bipolar semantic differential subscale employed by Bailey and Pearson [1].

Analysis

The summary statistics and the frequency distribution of the important ratings perceived by the IS managers of this study was first examined. These statistics are compared with those perceived by the user and IS staff as well as the user managers as reported by Montazemi [13] and Pearson [16]. The importance ratings from these different groups were subjected to Wilcoxon's signed ranks test to determine if they are significantly different. If no significant difference is found, both staff and manager groups are combined and treated as a group, called "the personnel group". Furthermore, the rank orders of the factors were derived and the importance ratings of the seven factors were analyzed based on the ratings of the other 39 factors.

RESULTS AND DISCUSSION

Based on the data, the top five important factors as perceived by the IS managers are: accuracy of output (Item 16, $\mu=2.70$), reliability of output (Item 19, $\mu=2.61$), relationship between users and the CBIS staff (Item 5, $\mu=2.56$), user's confidence in the systems (Item 32, $\mu=2.45$), and timeliness of output (Item 17, $\mu=2.32$). The five least important factors in sequence are the chargeback method (Item 4, $\mu=-0.46$), volume of output (Item 24, $\mu=0.17$), competition between CBIS and non-CBIS units (Item 2, $\mu=0.29$), features of computer language used (Item 23, $\mu=0.67$), and job effects of computer-based support (Item 36, $\mu=1.14$) or organizational position of the CBIS unit (Item 37, $\mu=1.14$). The only factor with negative importance score is Item 4, the chargeback method ($\mu=-0.46$). It is the only factor which has unusual number of "extremely unimportant" ratings.

In order to investigate if the ratings in this study are different from those of the other subject groups, the average importance scores of the 39 factors from the other two studies [13,16] are included in Table 2. While the "Staff" columns in Table 2 show the ratings from the IS staff and the user staff in Montazemi's [13, p. 248] study, the "Mgr." columns show the ratings from the IS managers in this

study and the user managers in Pearson's [16, p. 174]. The ratings of IS managers and IS staff were subjected to Wilcoxon's [23] signed ranks test to see if they are significantly different. Similar test were conducted for the pair of ratings from user managers and user staff. Both null hypotheses were not rejected, indicating each pair of ratings should be from the same distribution and may be combined as one group. Subsequently, the first pair of columns showing IS personnel's ratings were pooled by multiplying an average importance rating with its sample size and summing the two products. A pooled average was then computed by dividing the sum with the combined sample size. Similarly, a pooled average importance rating was derived for the user personnel using the other pair of columns. The outcome of this pooling process is shown in the right-most two columns of Table 2. These two columns were subjected to a similar signed ranks test and the null hypothesis was rejected ($p = 0.0039$), indicating they are significantly different and cannot be pooled. To reveal the differences in the ratings between the two samples of IS personnel and the two samples of user personnel, the same signed ranks test was applied to each pair of IS and non-IS groups. Significant differences were found between user staff and IS staff ($p < 0.0001$), and between user staff and IS managers ($p = 0.0288$). No significant differences were found between user managers and IS staff or IS managers at $p < 0.05$.

To identify the most and the least important ISS factors perceived by the sampled IS personnel and user personnel, the average importance ratings in Table 2 were rank ordered within each column. The results of such rank orders are shown in Table 3. While the maximum difference in rank orders between IS staff and IS managers is 24.5, the one between user staff and user managers is 28.5 and the other between the pooled IS personnel and the pooled user personnel is 20. The three pairs of rank orders were subjected to Wilcoxon's signed ranks test and no significant difference was found at $p < 0.05$. To disclose the differences in the rank orders between the two samples of IS personnel and the two samples of user personnel, the same signed ranks test was applied to each pair of IS and non-IS groups. All four null hypotheses were not rejected at $p < 0.05$, indicating the differences in rank orders between IS personnel and user staff or managers are not significant. The rank orders of the two pooled average importance ratings (see the rightmost columns in Table 3) indicate that several ISS factors are rank-ordered identically ("Diff." = 0) by the two groups of subjects and that the 5 most and the 5 least important ISS factors perceived by the pooled user personnel were rated as among the 7 most and the 7 least important factors by the pooled IS personnel. The aforementioned 5 most important

ISS factors include: 1) accuracy of output, 2) reliability of output, 3) timeliness of output, 4) user's confidence in systems, and 5) realization of user requirements (Items 16, 19, 17, 32, and 25). On the other hand, the five least important factors include: 1) chargeback method, 2) competition between CBIS and non-CBIS units, 3) organizational position of the CBIS unit, 4) features of computer language used, and 5) personal control over CBIS systems (Items 4, 2, 37, 23, and 34). Note that Montazemi [13] did not use Items 2, 4, 8, and 37, therefore the rank orders of these 4 ISS factors were determined primarily by the ratings from IS managers and user managers. The factors that have identical rank orders of the pooled average importance ratings (see the right-most "Diff." column in Table 3) include: "accuracy of output", "reliability of output", "time required for systems development", "features of computer language used", "competition between CBIS and non-CBIS units", and "chargeback method of payment for services."

A scrutiny of Table 3 reveals that the 5 most and 5 least important ISS factors as perceived by IS managers are mostly consistent with those perceived by user managers. However, there are two exceptions: 1) "relationship" and "communications" between users and the CBIS staff were perceived by IS managers to be more important than "realization of user requirements" while user managers perceive otherwise, and 2) "training provided to users" was perceived by user managers to be less important than "volume of output" and "job effects of computer-based support" while IS managers perceive on the contrary. Ironically, "relationship between users and the CBIS staff" was rated as the 3rd most important ISS factor by IS managers, yet it was rated as the 16th by the IS staff and the 23rd by the pooled user personnel. Such difference in rank orders is indicative of potential differences in the underlying ISS evaluation process between IS managers and the other members in the IS community.

Based on the results of this study, several important findings were revealed. First, the 7 new ISS factors ("user's attitude toward using the CBIS," "clarity of output," "instructiveness of output information," "support of productivity tools," "productivity improved by the CBIS," "efficiency of the systems," and "effectiveness of the systems") are rated as important by the IS managers in this study. Second, IS managers and the pooled user personnel have fairly consistent rank orders of the 5 most and the 5 least important ISS factors. Third, the pooled IS personnel and the pooled user personnel are notably different in the importance rank orders of "perceived utility," "format of output," "job effects of computer-based support," "relationship between users and the CBIS staff,"

and "processing of requests for system changes." Fourth, user staff and IS staff appear to regard "top management involvement" as a very important ISS factor while user managers and IS managers do not think so. Finally, "chargeback method" and "competition between CBIS and non-CBIS units" (Items 4 and 2) appear to be of little importance to the level of ISS among both user and IS managers.

CONCLUSIONS AND RECOMMENDATIONS

This study is the first in the literature to analyze the differences in the perceived importance of ISS factors between and within IS and user personnel. Through the analysis of the data collected either from the previous studies or from the survey conducted by this study, several conclusions can be drawn. First, the 7 new ISS factors proposed by this study appear to be moderately to very important. These factors along with the 39 factors identified by Bailey and Pearson [1] can cover all the 8 ISS dimensions identified by this study. Second, despite the different ages of data, the importance ratings between IS managers and IS staff appear to have no significant differences. The same conclusion applied to the importance ratings between user managers and user staff. Similarly, IS managers and user managers appear to have no significant differences. However, given the same age of data, IS staff and user staff appear to have significant differences in their importance ratings. Third, the top five important ISS factors indicated by the IS managers in this study are: 1) accuracy of output, 2) reliability of output, 3) relationship between users and the CBIS staff, 4) user's confidence in the systems, and 5) timeliness of output. This list is fairly consistent with the other three groups of subjects, namely, IS staff, user staff, and user managers. The major difference lies in the factor of "top management involvement." The staff personnel regard it as the most important ISS factor while the managerial personnel think it is somewhat to moderately important. It is our recommendation that IS management should closely monitor those top important factors regarded by each group of personnel and properly allocate IS resources to maintaining or improving the level of satisfaction with these factors.

Fourth, both user and IS managers regard the chargeback method and the competition between CBIS and non-CBIS units as the two least important factors. Although these two factors appear to be unimportant to the level of ISS, they are indispensable because excessive chargeback may drive the users away from the IS services. Furthermore, unfair competition may endanger the relationship and communications between users and the CBIS staff. Fifth,

user personnel and IS personnel, as a whole, appear to have opposite rank orders for several ISS factors. Users and their managers seem to concern more about the ends of IS services (such as "perceived utility," "format of output," and "job effects of computer-based support") than IS personnel. In contrast, IS managers and staff appear to concern more about the means of IS services (such as "relationship between users and the CBIS staff" and "processing of requests for system changes") than user personnel.

In all, although the scores of the perceived importance of individual ISS factors are different from one person to another, the rank orders of the factors' importance may be similar. IS management should use only the rank orders of ISS factors to identify the relative importance of an ISS factor among the others. The rank orders obtained from the user personnel in this study appear to be significantly different from those obtained from the IS personnel. Such difference indicates the underlying ISS evaluation process between IS personnel (especially IS managers) and user personnel may be somewhat different. IS management should periodically conduct a survey of the importance of ISS factors as perceived by the user and IS personnel, so as to resolve the differences in rank orders of importance between the two groups. These rank orders allows IS management to prioritize corrective actions and resource allocations. For example, assuming there are two dissatisfied ISS components, ISS-1 and ISS-2, and ISS-1 was rated more important than ISS-2. In this case and given other things being equal, actions should be taken and IS resources should be directed to bring up the level of satisfaction with component ISS-1 first, and then ISS-2. The author highly recommends that a company should institutionalize such a survey and prioritization scheme because it is an easy yet effective practice.

REFERENCES

* References and the other tables are available upon request.

[1] Bailey, J.E. and Pearson, S.W., 1983.
 [2] Baroudi, J.J. and Orlikowski, W.J., 1988.
 [3] Bartlett, M.S., 1950.
 [4] Conrath, D.W. and Mignen, O.P., 1990.
 [5] DeLone, W.H. and McLean, E.R., 1992.
 [6] DeSanctis, G. and Courtney, J.F., 1983.
 [7] Hufnagel, E.M. and Birnberg, J.G., 1989.
 [8] Iivari, J. and Karjalainen, M., 1989.
 [9] Ives, B., Olson, M.H. and Baroudi, J.J., 1983.
 [10] Joshi, K., 1990.
 [11] Mahmood, M.A. and Becker, J.D., 1985-86.

[12] Martin, J., 1984.
 [13] Montazemi, A.R., 1988.
 [14] Nolan, R.L., 1977.
 [15] Olson, M.H. and Ives, B., 1982.
 [16] Pearson, S.W., 1977.
 [17] Raymond, L., 1985.
 [18] Swanson, E.B., 1974.
 [19] Tan, B.W. and Lo, T.W., 1990.
 [20] Wilcoxon, F., 1945.

Table 1. Dimensions and Factors of IS Success

I.D.	Description of Factor
<i>System Quality:</i>	
13.	Response/turnaround time
15.	Convenience of access
23.	Features of computer language used
25.	Realization of user requirements
26.	Correction of errors
27.	Security of data and models
28.	Documentation of systems and procedures
38.	Flexibility of the systems
39.	Integration of the systems
<i>Information Quality:</i>	
16.	Accuracy of output
17.	Timeliness of output
18.	Precision of output
19.	Reliability of output
20.	Currency of output
21.	Completeness of output
22.	Format of output
41.	Clarity of output
42.	Instructiveness of output
<i>Information Use:</i>	
24.	Volume of output
<i>User Satisfaction:</i>	
1.	Top management involvement
4.	Chargeback method of payment for services
32.	User's confidence in the systems
33.	User's participation
43.	Support of productivity tools
<i>Individual Impact:</i>	
29.	User's expectation of computer-based support
36.	Job effects of computer-based support
31.	Perceived utility
<i>Organizational Impact:</i>	
44.	Productivity improved by the CBIS
45.	Efficiency of the systems
46.	Effectiveness of the systems
<i>Service Quality:</i>	
7.	Technical competence of the CBIS staff
8.	Attitude of the CBIS staff
9.	Scheduling of CBIS products and services
10.	Time required for systems development
11.	Processing of requests for system changes

12. Vendor's maintenance support
14. Means of input/output with CBIS center
30. User's understanding of the systems
35. Training provided to users

Conflict Resolution:

2. Competition between CBIS and non-CBIS units
 3. Allocation priorities for CBIS resources
 5. Relationship between users and the CBIS staff
 6. Communications between users and the CBIS staff
 34. Personal control over CBIS systems
 37. Organizational position of the CBIS unit
 40. User's attitude toward using the CBIS
-