
The Impact of Information Centers on End-User Computing

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This paper reports the findings of a study conducted to determine the end user's perspective regarding the value of an Information Center (IC) in enhancing end-user computing (EUC). The study was conducted during 1987-1988 and included 158 end users from 67 companies. Approximately one-half of the subjects came from companies with ICs and one-half from companies without such a formal organization. A comparison between these two groups is made to ascertain the impact of the IC on the perceived penetration, decision-making effectiveness, and management support of EUC. This research supports the hypothesis that the existence of an IC has a positive impact on the assimilation and effective use of EUC for decision making in specific contexts. Relationships between the presence of an IC and the penetration of EUC in certain functional areas are found. The implications for other functional areas and suggestions for the future are presented.

Introduction

The term "end-user computing" (EUC) is one that has become pervasive in today's information systems and computing literature. Mayo (1986) defines EUC as the "shifting of EDP resources and activities from EDP professionals/departments to users with minimal or limited EDP knowledge" (p. 24). The essence of EUC is that individuals work directly with computers to analyze data and enhance decisions rather than relying on EDP personnel to develop

programs to perform the needed analysis. It has been observed that corporate management has become increasingly intolerant of waiting for organization-wide applications to be completed (Arnoudse & Ouellette, 1987).

EUC is viewed as a method for increasing personal productivity. Indeed, "end-user computing has penetrated deeply into the white-collar work place" (Arkush & Stanton, 1987, p. 66). Freiser (1987) foresees that by the end of 1990 virtually all white-collar workers will have

direct access to computers and that EUC power will exceed computing power of EDP departments by 3 to 1. According to Rockart and Flannery (1983), "interest in end-user computing is booming" (p. 776). This interest exists throughout all functional areas of the organization (Alavi, 1985).

The management of EUC has become an issue of concern to organizations that strive to be proactive in the dynamic information systems (IS) environment. In the Delphi study of IS management issues by Dickson and Wetherbe (1985), "Facilitation and Management of End-User Computing" was cited by IS executives as the second most important issue of the 1980s. The only issue rated more important was "IS Planning." Freiser (1987) has called for senior management to "chart a course for end-user computing" (p. 4).

One approach to facilitate management of the rapid growth in EUC is the establishment of what have become known as Information Centers (ICs). Prudent corporate leaders have realized that guidance of the end-user boom has become an essential function of Information Centers (McNurlin, 1987). Most agree that the IC and its purpose must be distinct from traditional EDP services (Johnson, 1985). Information Centers have thus been developed primarily to support and manage end-user computing by helping users to gain confidence and competence in achieving goals through the use of computers (Arnoudse & Ouellette, 1987?).

ICs vary in size and scope, primarily providing consulting, training, and assistance to users throughout the organization. The nature and sophistication of the support provided vary from firm to firm (Goldstein, 1987); however, the purpose of the IC is to improve the productive use of computers (Arnoudse & Ouellette, 1987?) so that business benefits are maximized (Sumner, 1985).

For the Information Center to have a strategic impact on the firm's activity, it must be productive — matching IC strategy and goals with that of the organization (Oglesby, 1987).

Critical success factors for ICs have been identified, including "facilitation of end-user computing," "coordination of EUC," and "quality of IC support" (Magal, Carr, & Watson, 1988).

Most of the literature has focused on the need, purpose, nature, and implementation of Information Centers. The impact and value of ICs have been mentioned in the literature and discussed in only a few papers, including Brancheau, Vogel and Wetherbe (1985), Sumner (1985), and Bergeron and Berube (1988).

Cook (1985) purports that ICs often have hidden costs and Mikita (1985) questions whether ICs have proven to be worth their expenses. According to Panko (1988), costs are usually much easier to discern than are benefits. So, subjective estimates of value must be used to accomplish a cost/benefit analysis. Results of the Bergeron and Berube study (1988) reveal that end users were more satisfied with their microcomputing activities when there was an information center to support end-user activity.

Perhaps the excitement of establishing and creating ICs has not subsided enough to determine if they do possess a real "value-added status" for their organizations and for the end-user effort. A study by Leitheiser and Wetherbe (1985) concluded that information centers are plagued with problems including political, service, and internal concerns. These problems diminish the value offered by the IC. The question of the significance of the value added by the IC is an important one.

The assessment of the impact that ICs may have on EUC and decision making is a valuable endeavor that may have implications for decision makers in their allocation of IS resources. Firms that do not elect to form such centers may be unwilling to divert resources from their traditional data processing or information systems budgets. Such firms are probably willing to allow end-user computing to grow within the organization in a natural, unmanaged fashion.

The future of ICs is also an important question. ICs, in their present organizational

form, will exist for only as long as organizations feel a need for them to promote end-user computing. When end-user computing becomes sufficiently widespread throughout organizations, either the centers will be disbanded or they may undergo a change in focus. As hardware and software become more advanced and specialized to meet the needs of specific functions, such centers may become decentralized.

Assessing the impact of ICs also raises issues concerning the management of technological innovation within organizations. Is it more effective for an organization to manage and steer technology or should the organization allow the technology to naturally become a tool of end users? In assessing the impact of ICs, one is really studying the effect of managerial intervention on the growth of information technology within an organization. Such an analysis has implications for the management of future information technologies in addition to end-user computing.

The present study has been performed in an attempt to measure the effectiveness of Information Centers in enhancing end-user computing efforts within an organization. The breadth of end-user computing (also called "penetration" by Doll and Torkzadeh, (1988) is analyzed as it relates to the existence of an IC. The major question to be answered is whether the existence of an IC has a positive impact on the penetration of end-user computing in organizations. Subordinate to that issue are two additional questions:

- (1) *Does the existence of an Information Center positively impact the effective use of computers for decision making?*
- (2) *Does the existence of an Information Center affect employees' perception of the level of end-user computing support that exists in their organization?*

Research Methods

Companies both with and without ICs participated in a questionnaire process. Infor-

mation was collected through a designated person from each company, with whom a personal contact was made. Information was gathered from end-users, IC managers, and contact persons. Three types of questionnaires were administered.

1. Company Questionnaire. This questionnaire requested information such as the size and type of company and was filled out by the contact person for each firm.

2. End-user Questionnaire. Questions on this instrument included those pertaining to perceptions of the extent, support, and effectiveness of EUC throughout the organization as well as some personal information about the respondent such as functional area and management level. For the end users in organizations having ICs, a section of questions dealing with the actual functions performed by the IC was also included.

3. IC Manager Questionnaire. This questionnaire, given only to organizations with ICs, contained questions regarding the adequacy of resources and overall functioning of the IC.

Seventy companies were initially included in the study. Approximately one-half of them possessed an Information Center (Note: for the purposes of this study, ICs were defined as formal departments or efforts within an organization whose mission was to promote/enhance end-user computing). When the contact persons were notified that the study would begin, 67 of them agreed to participate and were sent appropriate packets of questionnaires. Each was sent five end-user questionnaires along with company questionnaires. The companies with ICs were also sent IC manager questionnaires. The contact person was asked to distribute the end-user questionnaires among as diverse a sample of end users as possible.

Telephone contact was maintained throughout the period of questionnaire distribu-

tion, response, and return in order to provide answers to questions that respondents had as well as to offer encouragement in completing the task. Thirty-six out of the sixty-seven companies sent back a packet of questionnaires for a 54% response rate. The packets included 158 completed end-user questionnaires. The proportion of responses received by companies with Information Centers was approximately the same as that from those companies without such centers.

Sample Characteristics

The variety of industry types included in the sample is quite diverse, including: manufacturing, banking, retailing, construction, and insurance. Small as well as large companies are represented by the responses (see Table 1). Company contacts are mostly from within the MIS/DP area or from the accounting/ finance

departments. Marketing, manufacturing, and other functional areas are also represented in the set of company contacts. Actual end-user respondents come from a wide range of functional areas and various levels of management as shown in Figures 1 and 2.

In terms of the Information Centers in our study, 14 out of 18 (78%) have managers who report to the MIS/Data Processing department. The size and tenure of the Information Centers are described in Table 2. Questions about the resources of the IC revealed that approximately one-half of the IC managers were satisfied with their budgets and two-thirds reported adequacy with respect to the amount of floor space allotted to their facility. Responses from the IC managers regarding the functioning of their center reveal that in 83% of the cases, IC staff are encouraged to visit end users in their offices, and in 88% of the companies, end users

Table 1: Size of Participating Companies

<u>Number of Employees</u>	<u>Frequency</u>
Less than 100	8
100 - 999	9
1000 - 4999	11
5000 - 9999	2
10,000 - 50,000	3
	33*
(Minimum = 15, Maximum = 50,000 Median = 700)	
* 3 companies did not provide this information	

Table 2: Characteristics of the Information Centers

	<u>Range</u>	<u>Mean</u>	<u>Median</u>
No. of Employees	1 - 51	8.3	4
No. of Years in Existence	1 - 11	3.8	3

Figure 1: Functional Areas of End Users

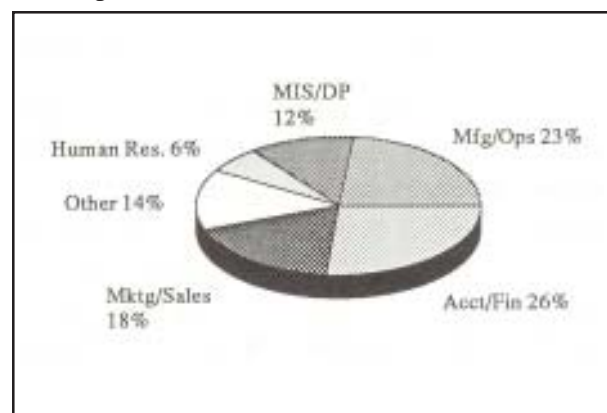


Figure 2: Management Level of End Users

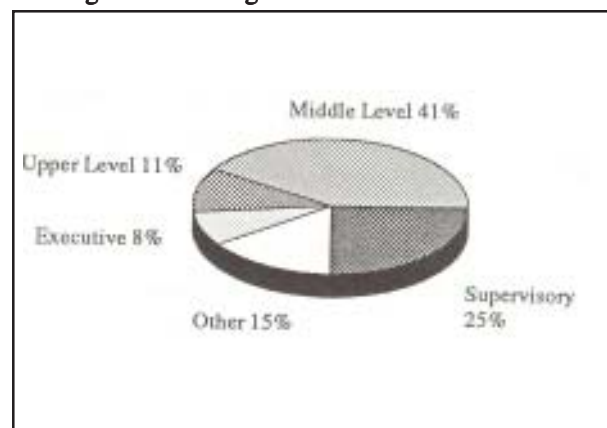
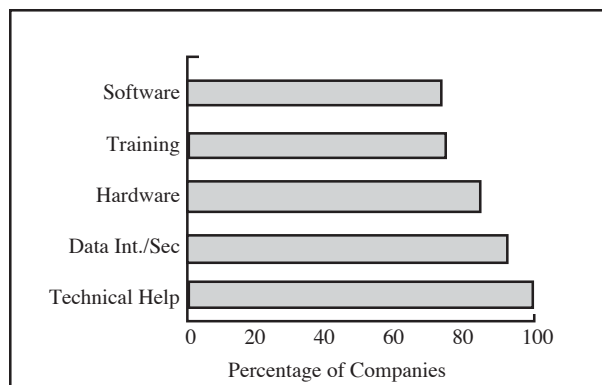


Figure 3: Information Center Activities

are encouraged to visit the IC to use the computers and ask questions.

Responses to questions regarding IC activities from the end users indicate that the majority of the centers perform the following five functions: technical assistance in the application of end user computing tools, data integrity and security assistance, coordination and control of personal computing hardware, coordination and control of personal computing software, and training in software use. The percentages of end users reporting that their ICs actually perform each activity are presented in Figure 3.

Data Analysis

To answer the major and subordinate research questions, both descriptive and inferential statistics are presented. Most of the observations were collected using a scale of 1 to 5 with a 1 indicating strong disagreement with a statement and a 5 representing strong agreement. Data from end users were dichotomized on the basis of whether the organization has an IC or not and tests of mean differences were computed. Variances were assumed to be unequal and the rejection point was set at 10%.

One set of end-user questions deals with the extent to which EUC has become commonplace within the organization. Groupings of questions in this set are based upon functional areas, managerial levels, and specific software tools. An example of a statement

Table 3: Extent of EUC Penetration by Functional Area, Type of Tool, and Management Level

	mean with IC	mean without IC	P-value
Functional Area			
Accounting/Finance	4.31	4.42	.41
Sales/Marketing	3.63	3.39	.15
Manufacturing/ Operations	3.48	3.55	.68
Human Resource/ Personnel	3.56	3.11	.005
Management Level			
Executive	2.13	2.94	.0002
Middle	3.15	3.83	.0006
Supervisory	3.69	3.66	.86
Tool			
Spreadsheet	3.79	3.48	.0076
Database Mgmt. System	3.05	2.78	.0267
Statistical Package	2.70	2.29	.0036

in this set is: "End user computing has become commonplace in the accounting or financial areas within my firm." A summary of the results from this set of questions is provided as Table 3.

In the Functional Area Section, the majority of the responses represent support for the statements about the extent to which EUC has become commonplace within the functional areas mentioned. In fact, 62% of all of the responses in this section indicate agreement with the concept of widespread EUC penetration. The Human Resources/Personnel question resulted in a significantly higher mean for end users in companies with ICs versus that for end users in companies without an IC.

Two sets of means in the Management Level section indicate statistical significance in the opposite direction. At both the Executive and Middle Level of management, the non-IC organization end users believe that EUC penetration is more pervasive than do the end users from IC organizations. No significant differences were found at the Supervisory Level of management. Only 22% of the responses indicate agreement with widespread EUC among executive level management, 59% support such use of computers by middle management, and

Table 4. Management Support of EUC by Activity

Activity	mean with IC	mean without IC	p-value
Encouraging daily use of computer	3.83	4.12	.0478
Fostering EUC without DP involvement	3.00	3.36	.0560
Fostering self-education	3.65	3.73	.6492
Providing help to computerize an application	3.95	3.95	.9702
DP personnel encouraging end user independence	2.95	2.85	.5302

66% agree in the case of supervisory management.

The section dealing with specific tools yields responses that support the positive influence of the IC. In every case, the means are significantly higher for the IC end users than for the non-IC end users.

The second set of questions addresses management support of EUC by asking for concurrence with statements about particular management activities. A summary of responses to this set of questions is found in Table 4. The first question asks if "Management encourages employees to use computing as an aid in their everyday job duties." Agreement with this statement is indicated by 80% of the responses. A significantly larger mean resulted from non-IC end users than from the IC end users. The same direction of significance exists for the second question that states: "It is a goal of the management of my firm to foster the use of computing without first interfacing with DP personnel." Nearly one-half (48%) of the responses indicate agreement with that statement.

No other significant differences are found in any of the three remaining support questions. Responses regarding the issue of the existence of encouragement on the part of the DP group to use computers without first interfacing with data processing personnel indicate agreement in only 28% of the cases while the provision of resources to foster self-education

Table 5: Effectiveness of Decision Making through EUC by Functional Area and Management Level

	mean with IC	mean without IC	P-value
Functional Area			
Accounting/Finance	4.22	4.14	.5320
Sales/Marketing	3.55	3.42	.3862
Production/Operations	3.63	3.47	.2539
Human Relations/ Personnel	3.54	3.00	.0003
Management Level			
Executive	3.09	3.33	.1731
Middle	3.80	3.79	.9497
Supervisory	3.86	3.46	.0063

yields 73% agreement.

The question concerning providing help, "If you had an application that you thought could be computerized you could find help in your firm to do it," supplies an affirmative answer in 82% of the responses. The means of the two groups are identical for this question.

The last set of questions posed to end users deals with the perceived effectiveness of decision making through the use of EUC. These results are presented as Table 5. An example of an effectiveness item is: "EUC has improved the effectiveness of decision making by Accounting/Finance personnel." The majority (60%) of the responses in this set of items affirms the value of EUC in the decision making function. Significant differences between IC and non-IC organizations exist with respect to both the Human Relations/Personnel functional area and the Supervisory level of management. In both of these cases, the mean response for the end user in the company with an IC is higher than that of the end user in a non-IC company.

Discussion

It is clear from this research that EUC has penetrated the organizations studied. In addition to penetration, there is the perception among end users that EUC results in the im-

provement of managerial decision making. Organizational support for EUC is perceived to exist with some particular areas of strength. The role of ICs is confined to certain functional areas and particular aspects of EUC.

That the existence of an IC is related to an increased penetration of EUC in only the Human Resources area may be due to the nature of the employees in that area compared with that of other functional areas. Perhaps employees who work in the Human Resource Management area are more people-oriented and less likely to dabble with computers on their own, and so thrive on the attention offered by an organization that exists primarily to provide required assistance. It may be that the Accounting/Finance, Sales/Marketing, and Manufacturing/Operations functional areas are more likely to have computer specialists within their area so that the external or specialized assistance offered by an IC is not as important.

An explanation as to the differences found in the perception of the penetration of EUC based upon management level is not obvious. Further research is required to seek reasons for this phenomenon.

The results regarding specific tools are as expected. That the majority of the information centers studied offer training on specific software tools and participate in the coordination and control of software purchases would serve to foster the perception of the pervasive use of particular tools. Centralized control is likely to imply standardization which might encourage the use of common tools such as spreadsheet, database, and statistical packages. Centralized technical help offered by ICs may also serve to stimulate use of particular software tools.

That users view management as encouraging the growth of EUC concurs with other research on organizational support for EUC (Allman & Colligan, 1987; Arkush & Stanton, 1988; Benson, 1983; Cheney et al.,

1986; Henderson & Treacy, 1986; Perry, 1987). Non-IC end users perceive a higher degree of management encouragement than do IC end users in the area of computing without interfacing DP personnel, and may be explained by the very definition of DP personnel. The majority of the ICs in the study (78%) are part of an MIS/DP organization. Any help from IC personnel may be viewed as interaction with DP personnel in such organizations. Assistance by employees from within one's own functional area or through any informal means would not be classified that way. Therefore, end users who are in organizations with ICs may feel that they are being encouraged to seek help from MIS/DP personnel while those in non-IC companies may have the impression that management is expecting them to use the computer without MIS/DP help.

Perhaps the result regarding the perception of widespread availability of help for computerizing an application can be attributed to the criteria used to identify end users for participation in this study. The company contact was asked to distribute the questionnaires to people who actually make common use of computers. People may become end users because of their inherent knowledge of computers or because of their persistence in procuring assistance within the organization. In other words, the end users did not earn that label without possessing the ability to help themselves or effectively seek whatever assistance they may need to successfully computerize a task. So the reported perception of the existence of help may reflect selection bias.

The results regarding decision making are also noteworthy. Again, in the realm of the functional area, EUC in the Human Relations sphere seems to be benefitting from the existence of an IC while in the other areas, less centralized EUC management seems to be working well. That significance is also found in the supervisory level of management, but not in higher level arenas, and merits further

investigation. Perhaps the training offered by ICs appeals more to supervisory level managers than to higher level managers. The focus on particular general purpose software tools may be more appropriate for this level of management while upper levels require packages that support more specific decision making such as specialized decision support systems and executive support systems software. Another contributing factor may be that discretionary budgets of upper level management may enable them to buy hardware and software without going through an IC procurement procedure and therefore do not benefit from such help.

Conclusion

This research supports the hypothesis that the existence of an IC has a positive impact on the assimilation and effective use of EUC for decision making within an organization in specific contexts. It is not clear, however, that the dedication of resources to the formation of such a specialized department is necessary any longer. That end users perceive as much or more support for EUC in organizations without ICs is a significant finding of this study.

Perhaps, as some of the results suggest, it is now important to focus ICs on those areas that are lagging behind in the assimilation of personal computing, such as Human Resources. Therefore, decentralizing the IC may be an appropriate next step. As hardware and software become more focused, such departmental ICs can specialize in the technology specific to departmental needs while still continuing to perpetuate the support of common software. Justification of the cost of an IC has previously been based on the need to foster the use of personal computing throughout the entire organization. With the passage of time, a stage may have been reached where functional areas such as finance and accounting do not need such support. In fact, in contacting firms for this study, it was learned that one major insurance company no longer had an IC, not

because the IC had failed, but because the organization had reached a point where most individuals were familiar with common software packages. As information technology to support decision making continues to grow, further research is needed as to the next step in the process for fostering the use of such technology.

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