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ABSTRACT

As company investment in end-user computing (EUC) grows so does the need for the organization to provide end-user support and training, to encourage resource sharing, to establish mechanisms for management and operational control over data resources, systems quality assurance, and resource acquisition. To satisfy these needs, many organizations have established information centers (IC). ICs have been shown to be very dynamic organizations which are continuously evolving and vary dramatically from company to company in terms of location, resources available, and the types of services provided.

This study surveyed 156 organizations to assess present shifts in EUC and IC activities, as well as the impact of IC performance on EUC overall company effectiveness and payoffs from EUC. The results show among other things that in many organizations the EUC support burden is being shifted to IS departments, to outsiders, and to the end-users themselves; that EUC support is indeed a requirement for overall EUC effectiveness and for the company to derive payoffs from the EUC investment.

INTRODUCTION

The proliferation of microcomputers among users who are not information systems professionals and the growth of mainframe based end-user computing (EUC) have been widely reported (Carr, 1987; Guimaraes & Ramanujam, 1986; Guimaraes, 1984; Igbaria, Pavri & Huff, 1989). When Computerworld surveyed the 100 organizations rated as having the most effective use of computerized information systems, these organizations were already found to have on the average 35 PC/workstations per 100 employees, with the top 25 organizations having an average of 44 PC/workstations per 100 employees (Sullivan-Trainor, 1988). As end-user computing becomes pervasive in most organizations, its diversity grows in terms of types of applications, types of end-users, levels of end-user computer literacy, etc. Contrary to early expectations, end-users do not become independent; instead, they increasingly demand better equipment, more training, coaching, consulting, technical support, etc.

Many authors have recognized that the expansion in end-user computing activities within large organizations requires substantial investment in personnel and facilities for support (Guimaraes, 1986; Leitheiser & Wetherbe, 1986). The large number of organizations that

have established Information Centers (IC) attests to their importance in supporting end-user computing activities. The American Management Association (1988) reported that at that time 58 percent of the large companies surveyed already had a discrete unit to support end-user computing.

Very clearly, ICs have evolved over time (Guimaraes, 1984) and are continuing to change. A survey by Crwth Computer Courseware has 65 percent of respondents reporting their IC's role changing in some way. Respondents are evenly divided about whether their IC's role is rising or decreasing. Forty percent reported some functions being shifted to other parts of the organization and that training, product specialists and application development are understaffed and overworked. Most organizations (58 percent) are keeping active IC organizations, 6 percent have disbanded their IC as inappropriate to their needs, 34 percent do not have one and presently have no plans for one, and 2 percent will establish an IC in the near future (Crwth, 1990, p. 10). Some of the burden for the end-user computing support is increasingly falling on IS and user departments, away from understaffed centralized IC (Crwth, 1990, p. 13). Similar interpretation of the Crwth survey is reported by Roberts (1991), and a dramatic impact of end-user computing on IS department objectives and organization is also being reported by others (Hildebrand, 1991; Juneau, 1991).

While the title for EUC support groups will vary from organization to organization, the term IC has become widely recognized. Despite its wide recognition, the term IC stands for EUC support groups performing a wide variety of tasks, organized as a separate organization unit or located within MIS departments or user departments. Such variety in IC deployment alternatives naturally raises several questions: How are ICs changing in terms of their size and the tasks they perform? Are ICs an obsolete form of EUC support organization with fading importance and increasing risk of disbandment? What do users think about the effectiveness of the support provided by their IC? Based on these ratings, is there a "best way" to set up an organization's IC? What are the payoffs from EUC to the organization? The major objective of this study is to address these questions based on empirical evidence collected from a broad collection of business organizations.

THEORETICAL BACKGROUND

This section outlines this study's basic hypotheses, the rationale for the proposed relationships, and the selection of measures used. The basic hypotheses are that **IC performance is directly related to overall company EUC support and management effectiveness**, and that, in turn, **is directly related to company payoffs from EUC.** The literature contains numerous reports which either implicitly or explicitly promote these hypotheses.

EUC Support and Management Effectiveness

As the level of EUC activities in an organization grows, so does the need for some types of control (i.e., acquisition policies and procedures, sharing of resources, quality of systems and information) and end-user support (Lee, 1986; Zmud, 1983; Guimaraes, 1984b; Thompson,

Higgins & Howell, 1991; Guimaraes & Ramanujam, 1986). Leitheiser and Wetherbe (1986) proposed the notion of service support levels as "formal divisions of responsibility between end-users and MIS departments" as the basis for effectively managing EUC in organizations. The idea hopefully will lead to several advantages to the organization: freedom of choice for end-user managers, focusing of IS department's attention on providing services to end-users, reduction of "finger pointing," a structured approach for supporting end-users, incentives for end-users to follow established guidelines and procedures, and better means for coordinating EUC activities.

Starting in the early 1980s and increasingly steadily, a variety of support mechanisms became available to the end-user community in many organizations, and the level of support was directly related to the level of control exercised by IS departments (Guimaraes & Ramanujam, 1986, p. 182). Information Centers were being strongly recommended as necessary for EUC management and support (Dotson, 1982; Guimaraes, 1984a, 1984b). In those days, however, less than 60 percent of Fortune 500 companies, and less than 8 percent of all US companies had "established a minimal set of microcomputer policies" (Zmud, 1983). A list of EUC support and management activities was collected from the literature to provide a measure of how well an organization is performing in this area. The items include: resource acquisition, planning, and management and control, LAN management, training, consulting, help desk, development with specific package and technical support/maintenance.

IC Performance

To provide the support needed for effective EUC, many organizations have established an Information Center (IC) (Crwth, 1990). On the other hand, in the last few years some organizations have disbanded their ICs (Crwth, 1990) thus suggesting an alternative way to managing EUC. This ambiguity needs to be promptly addressed since, as organization investment in EUC resources, activities and support increases, so does the need for assessing the IC's performance and its value to the organization. Some of the confusion is probably due to the fact that ICs have evolved over time (Guimaraes, 1984b; Magal, Carr & Watson, 1988) and can be quite different in terms of sophistication, size, location, modus operandi, and the variety of services provided to end-suers (Guimaraes, 1986; Leitheiser & Wetherbe, 1986; Carr, 1987). In this study, ICs are very broadly defined to include any formal group providing support for microcomputer-based EUC. For some analyses the characteristics of the IC and its location in the organization was considered.

The most comprehensive and well known attempt at creating a measure for IC performance is the collection of IC Critical Success Factors developed by Magal, et al. (1988). A list of 26 factors were identified from the literature and factor analyzed to produce the five factor groups shown in Table 1. As will be described later, these 26 CSFs were used to measure IC success in this study.

Table 1. CSFs Comprising the Five Factor Groups

Group 1: Commitment to the IC Concept

- Top management support
- Promote IC services
- Organizational acceptance of IC concept
- Commitment of end users to the IC concept
- Career paths for IC staff

Group 2: Quality of IC Support Services

- A competent staff
- Support software packages
- End-user training
- Reliability of applications developed
- Standardized hardware and software
- Training for IC staff

Group 3: Facilitation of End-User Computing

- Communication with users
- Cost-effective solutions
- Atmosphere for users
- Understanding user's business and problems
- Manage end-user expectations
- Liaison function with end-user departments

Group 4: Role Clarity

- Provide services to distributed sites
- Define IC mission
- User understanding of data processing
- Chargeback criteria
- Control procedures to ensure standards, policies, etc. are adhered to

Group 5: Coordination of End-User Computing

- Priority criteria for work
- Monitor and coordinate end-user applications development
- Respond to applications requests
- System performance

Company Payoffs From EUC or EUC Success

Prior research has viewed EUC success from a variety of perspectives and has used varying definitions and measures of success (Igbaria, 1990; Magal, 1991; Magal, et al., 1988; Rivard & Huff, 1988). These various definitions have described success in terms of end-user satisfaction (Doll & Torkzadeh, 1988; Igbaria & Nachman, 1990; Magal, 1991; Rivard & Huff, 1988); application level of usage (Ein-Dor & Segev, 1992; Igbaria, et al., 1989); and system effectiveness (Amoroso & Cheney, 1991; Igbaria, 1990). These measures of success focus on individual systems and, unless data can be collected on a representative set of systems per company, are unsuitable to assess EUC success from a company-wide perspective. Suitable measures for EUC's impact on the organization had to be found elsewhere in the literature.

Two concepts can effectively reflect the contribution of EUC to the overall organization and specifically to its strategic mission. One represents the extent of improvement in EUC capabilities to improve the overall strategic management of the organization. The other dimension focuses on how well EUC helps fulfill key company objectives. Both reflect the overall success of EUC in fulfilling its functions. Based on an adaptation and integration of the extensive literature on systems, Venkatraman and Ramanujam (1987) conceptualized both dimensions and used them to evaluate the success of planning systems. They rationalized the two constructs as follows: "While the degree of improvement in the system's CAPABILITIES reflects the 'means' or the process aspect of the concept of planning system success, OBJECTIVES, as a dimension, is intended to tap the "end" or outcome benefits of planning" (p. 690).

As will be discussed later, this framework has been used for measuring the impact of EUC capabilities to support the management of an organization. Individual end-users benefit from information technology to achieve both tangible and intangible objectives with a wide variety of applications. From a company perspective, the indicator for EUC success in this case is reflected in the extent of fulfillment of six key business objectives:

--enhancing management development,

--predicting future trends,

--evaluating alternatives,

--improving short-term performance,

--improving long-term performance, and

--avoiding problem areas.

It is also important to examine the degree to which EUC helps the organization's strategic management. Together with the "objectives" component, they represent the ends and means (output and process) perspectives for evaluating EUC success. Thus, following the Venkatraman and Ramanujam (1987) rationale, EUC can be seen as a company-wide system that supports efficient and effective end-user operations and the strategic management of the organization. EUC's capability to support company management along the following twelve dimensions are measured in this study:

--anticipating surprises and crises,

--identifying new business opportunities,

--identifying key problems,

--fostering managerial motivation,

--enhancing the generation of new ideas,

--communicating top management's expectations throughout the organizational structure,

--fostering management control,

--fostering organizational learning,

--communicating line managers' concerns to top management,

--integrating diverse functions and operations,

--adapting to unanticipated changes, and

--enhancing innovation.

RESEARCH METHODOLOGY

Sampling Procedure

To fulfill the objectives of this study, a commercially available mailing list of 1500 companies was the target of a mailed questionnaire. The questionnaire was previously tested for content and readability with a group of two IS managers and three IC managers and five end-users. Before the questionnaire was mailed, a postcard was sent alerting the target respondents that the questionnaire was forthcoming. Approximately ten days after the questionnaires were mailed, reminder cards were sent out in an effort to maximize the response rate. A total of 178 questionnaires were returned in time for inclusion in data analysis procedures. Eleven questionnaires were discarded, nine for being incomplete and two for being filled out incorrectly, providing a usable sample of 156 and a response rate of roughly ten percent.

As described below, in terms of industry sector, gross revenue, and IS budget, the sample contains a good representation of companies. In terms of their main job function the respondents fell into two main categories: 63 (40.9%) are IS managers and 91 (59.1%) are user department managers and others. Because of the widely held suspicion that MIS managers and end-users may have strong differences of opinion about EUC activities, problems, and benefits, the respondents were split into these two groups and all relevant variables were submitted to t-tests. No statistically significant differences were detected; therefore, it is assumed that the suspected bias has never been justified or has diminished significantly since earlier days of end-user computing.

Sample Description

The organizations in the sample represent a wide variety of business sectors: manufacturing (50.6%), financial services (10.8%), transportation (6.1%), electric and gas utilities (4.1%), insurance (4.7%), merchandising (4.7%), and others (16.2%). The organizations' gross revenues also cover a wide range and can be categorized as below 100 million dollars (11.7%), 100 to 300 million (16.6), 301 to 600 million (22.8%), 601 to 999 million (22.8), 1 to 5 billion (13.8%), and over 5 billion dollars (12.4%). IS budgets fall into the following categories: less than 5 million (15.5%), between 5 and 10 million (16.2%), 10.1 to 30 million (26.4%), 30.1 to 60 million (19.6%), 60.1 to 99.9 million (11.5%), and 100 million or over (10.8%).

Measurement

EUC Support and Management Effectiveness. As mentioned earlier, several items widely discussed in the literature as important activities for effective EUC were enumerated. These items include: resource acquisition, planning, management and control, LAN management, training, consulting, help desk, systems development with specific software tools, and technical support and maintenance. Respondents were prompted to add other items to the list and were asked to specify how well their organization as a whole had performed the particular activity using a scale which ranged from (1) extremely poorly, (2) very poorly, (3) poorly, (4) adequately, (5) well, (6) very well, and (7) extremely well. The average rating for these nine items represented the measure for organization EUC support and management effectiveness.

IC Performance. The IC level of success was measured with the 26-item scale developed by Magal, et al. (1988). The data collection instrument asked each respondent to indicate the level of their IC's performance along each of the CSFs. A seven-point Likert scale was provided, with response options ranging from (1) extremely low to (7) extremely high. The average rating for these 26 items represent the IC performance measure. According to Magal, et al. (1988), the measure of CSFs incorporates five groups of factors important to IC success: (1) commitment to the IC concept; (2) quality of IC support services; (3) facilitation of end-user computing; (4) role clarity; and (5) coordination of end-user computing. The five items in the group labeled commitment to the IC concept and role clarity group (also five items) had internal consistency reliability coefficients (Cronbach's alpha) of .74 and .75, respectively. The six items of quality of IC support services and facilitation of end-user computing had alpha reliability estimates of .86 and .90, respectively. Finally, the four items of coordination of end-user computing had alpha of .77. Table 3 presents the matrix of intercorrelations among the five factors. In view of high average correlation among the factors noted in Table 2, a second order factor analysis (Nunnally, 1978) was conducted to test for underlying homogeneity in the five factors. The results showed a single factor solution (eigenvalue of 3.79), which accounted for 75.7% of the explained variance. Therefore, the 26 items from the five factors were aggregated and averaged to create a composite measure of overall CSF for IC. The alpha reliability coefficient of the resulting 26-item scale was .98, thus confirming the homogeneity of the items and the appropriateness of combining them.

Table 2. Intercorrelations Among Rating for the Five Critical Success Factors of IC

Factor	Mean	SD	1	2	3	4	5
1. Commitment to the IC concept	4.98	0.80	1.00				
2. Quality of IC support services	4.99	0.84	0.66	1.00			
3. Facilitation of end user computing	5.23	0.86	0.55	0.84	1.00		
4. Role clarity	4.71	0.76	0.73	0.78	0.77	1.00	
5. Coordination of end user computing	5.12	0.85	0.68	0.80	0.81	0.85	1.00

All correlations are significant at $p \leq .001$.
Factor Rating Scale: (1) Extremely low, (2) Very low, (3) Somewhat Low, (4) Neither low nor high, (5) Somewhat high, (6) Very high, and (7) Extremely high.

Company Payoffs From EUC or EUC Success. Eighteen items were adopted from Venkatraman and Ramanujam (1987) to measure the two individual dimensions of EUC payoffs--capabilities and objectives. The capabilities dimension was measured by twelve items, and the objectives dimension was measured by the remaining six items. Each item in the capabilities group was measured by a five-point Likert-type scale ranging from (1) it has been detrimental to (5) great improvement. Responses to the twelve items comprising this dimension were averaged to create a scale tapping the capabilities dimension of EUC success or company payoffs. The six items in the objectives group were measured by a five-point scale ranging from (1) entirely unfulfilled to (5) entirely fulfilled. Responses to those six points were averaged to create a measure for the objectives dimension of EUC success. The internal consistency coefficients for the capabilities and objectives scales were .78 and .70, respectively.

The hypothesis that the capabilities dimension would have a direct effect on the objectives dimension is corroborated ($r=.72$, $p \leq .01$). In contrast with the suggestions of Venkatraman and Ramanujam (1987), the high correlation indicates that we should not treat them as separate constructs, and should instead be combined into one dimension. A second order factor analysis (Nunnally, 1978) was conducted to test for underlying homogeniety in the capabilities and objectives scales. The results show that one major factor (eigenvalue of 1.44) explained 72.1 percent of the variance. The high correlation and the results from factor analysis strongly support the conclusion that discrimination between the two dimensions cannot be made; therefore, the two dimensions together reflect a "super" construct and should not be considered as distinct dimensions. Also, some items in the two dimensions have shades of common meaning, so we can also argue intuitively that both dimensions are not distinct dimensions. For all subsequent analysis, the ratings on the entire set of 18 items were aggregated and averaged to produce a composite indicator of EUC success. The items were recoded such that high scores reflected

improvement in the company's performance as a result of EUC. The alpha reliability coefficient of the resulting eighteen-item scale was .68 which is barely below the commonly accepted level of .70, further confirming the homogeneity of the items and the appropriateness of combining them.

RESULTS

The IC Organizations

Most organizations participating in this study (75%) have a formally recognized group of people (Information Center or IC) responsible for supporting (training, help desk, etc.) EUC in the organization. The questionnaire used for this study explicitly defined EUC as activities of "non-MIS workers using computer facilities to support their work." The Location of the ICs varied from company to company with 63 (40%) located within the MIS department, 19 (12%) within end-user departments, 25 (16%) as an independent organization unit, and 10 (6%) have been outsourced. Of the 39 organizations without an IC, twenty (52.6%) are planning to form such a group. For the organizations with formal ICs, the following are the latter's average statistics: years in existence--6.7 years; staff size--7.5 persons; ratio of staff to users--1 to 47; yearly budget--$711,000.

Most respondents (70.2%) expect increasing budgets for their organization's ICs. For those ICs, the average yearly budget is approximately $557,000 and it is expected to increase by approximately 5.6 percent on the average. For ICs being targeted for a budget decrease, the average budget is approximately $1 million and the average budget decrease is expected to be approximately 6.8 percent. There are a few dramatic budget increases and decreases in the range of 15 to 30 percent; but, for most ICs the change is considerably milder. For approximately 90 percent of the ICs, the changes are below 13 percent.

Besides the IC staff or in lieu of the IC staff, most companies (92%) have reported other personnel informally engaged in EUC support activities. The number of people in this category varies dramatically from company to company with the average number being 21.6 with a standard deviation of 17.5 people. In most organizations (96%), the number of people is expected to increase by approximately 10 percent on the average with a few dramatic increases in the range of 30 to 40 percent.

Among others, a key IC task in many organizations is user training. The number of end-users trained monthly by the IC provides a good measure of the IC user-support activity. In 79 (74%) of the 106 organizations with a valid response for this question, the average number of users trained monthly by the IC is 32.6. This number is expected to grow by an average of 4 percent with a few respondents reporting growth expectations of 20 percent or above. In 27 organizations, the number of users trained by the IC is expected to decline. For these organizations, the average number of users being trained per month is 48 and the expected percentage decrease is 11.5.

Organization Computing Environments

Table 3a shows the average percentages of total computing applications (in terms of transactions processed, queries answered, reports produced, etc.) done by the three groups (IS

department, user departments, and individual users) on the six different computing environments or platforms available at the company. Applications under the IS department are either corporate (multi-departmental) applications or applications where the IS department is the primary beneficiary. Similar to individual end-user computing applications, end-user department applications are primarily for the direct benefit of one or two user departments and often rely heavily operationally on user department personnel.

Table 3a. Organization Computing Environments

Average Percentage of Applications by Group on Each Platform

GROUPS	COMPUTING ENVIRONMENTS (PLATFORMS)					
	Corporate Mainframes	Department Machines	Micro-Computers	LANs	Client/ Servers	Outside Services
IS Department	69.5% n=146	37.3% n=33	7.7% n=104	16.5% n=82	5.8% n=31	28.0% n=49
End-User Department	34.2% n=141	41.9% n=25	47.5% n=140	32.9% n-61	6.5% n=23	15.3% n=16
Individual End-Users	16.7% n=139	18.0% n=29	67.9% n=147	35.5% n=64	5.1% n=18	7.4% n=27

The six computing environments addressed in this study are mostly self-explanatory except for departmental machines and client-servers. Department machines are defined as minicomputers or mainframes dedicated to a particular department such as IS or a user department. The client-server environments are represented by possible combinations of microcomputers (client) and a LAN-based, minicomputer-based or mainframe-based server.

The majority (69.5%) of corporate-wide and IS department applications are run on mainframe computers. On the other hand, microcomputers are the platform for approximately two-thirds of the computing done by individual users and 47.5 percent of user department computing. While for some companies client-servers are the platforms for over 10 percent of the applications run by IS departments (as well as by user departments or individual users), on the average, in companies with client-server technology approximately only 5 to 6.5 percent of existing applicaitons for these three groups use it.

Outsourcing is a significant computing alternative to 49 of the IS departments in the sample. As the table indicates, on the average, 28 percent of IS departments' computing is done by outsiders. Not shown in the table is that approximately 15 percent of the IS departments are outsourcing at least 50 percent of their computing activities. In all cases, there is considerable differences between companies in terms of the percentages to which each group uses the various computing alternatives.

Table 3b shows the average percentage of each computing environment available in the organization being used by the three groups. On the average, over half of the mainframe processing resources are consumed by corporate or IS department applications. In the 33 organizations where departmental machines were available, IS and user departments on the average were the primary beneficiaries. In few cases, individual users consumed the lion's share of departmental machines; however, on the average for the 27 organizations reporting on this item, individual users as a group take 36.2 percent. As the table shows, that is very unlike the situation with microcomputers and LANs.

Table 3b. Organization Computing Environments

Average Percentage of Computing Environment Used by Groups

	COMPUTING ENVIRONMENTS (PLATFORMS)					
GROUPS	Corporate Mainframes	Department Machines	Micro-Computers	LANs	Client/ Servers	Outside Services
IS Department	54.0% n=146	69.7% n=31	14.3% n=109	41.2% n=82	80.9% n=32	91.9% n=49
End-User Department	20.5% n=141	62.2% n=28	35.1% n=137	43.6% n=59	65.1% n=24	72.4% n=17
Individual End-Users	29.6% n=139	36.2% n=27	59.3% n=144	45.6% n=71	32.6% n=19	59.7% n=27

In the 32 organizations currently deploying client-server platforms, on the average much of the computing activities are corporate in nature (80.9%). In the 24 organizations where user departments are involved, the latter on average consume 65.1 percent of the resources. Individual users as a group consume 32.6 percent in the 19 companies where this group uses client-server technology.

Identifying EUC Support/Management Task Responsibility

Table 4 shows the average percentage of each EUC support activity (task or service) being performed by each group. In the 141 organizations where the MIS department participates in the resource acquisition for EUC, on the average they perform approximately half of the total task (51.5%). On the average, MIS departments seem to provide a major portion of the service in the areas of resource acquisition, planning, LAN management, and technical support and maintenance. However, the IC is not far behind. For example, in the 19 companies with ICs located within user departments, on the average 43 percent of the technical support and maintenance is

being provided by the IC. For some services, such as the help desk, in the 19 companies reporting on this item, the ICs on the average deliver 87.6 percent of the help desk service. The ICs within user departments and within M1S departments also provide a major portion of this service, 81.6 and 69.9 percent, respectively. Outsiders on average perform 13.5 percent of the resource acquisition work for the 60 organizations using their services in this area, and they on average deliver 29 percent of the training for 62 of the firms surveyed.

Table 4. Identifying EUC Support/Management Task Responsibility

ACTIVITY	GROUP					
	MIS Dept.	IC within MIS Dept.	IC within End-User Dept.	Individual End-User Dept. do their own	Outsiders	Separate IC
Resource Acquisition	51.5% n=141	42.4% n=62	29.1% n=19	15.6% n=95	13.5% n=60	34.2% n=25
Planning	53.3% n=73	54.1% n=28	61.1% n=9	42.6% n=22	n=0	84.7% n=14
Management & Control	37.3% n=144	39.2% n=60	30.1% n=19	36.6% n=138	10.0% n=1	31.1% n=25
LAN Management	57.8% n=86	51.9% n=38	23.6% n=11	52.8% n=14	17.2% n=40	45.0% n=19
Training	37.9% n=125	44.2% n=56	44.4% n=18	45.9% n=48	29.0% n=62	52.2% n=25
Consulting	37.6% n=142	60.0% n=61	46.8% n=17	22.7% n=121	52.7% n=12	64.8% n=25
Help Desk	29.8% n=89	69.9% n=46	81.6% n=18	69.2% n=15	48.0% n=3	87.6% n=19
Development with Specific Package	36.4% n=140	25.4% n=60	23.3% n=18	46.2% n=137	25.6% n=8	42.6% n=25
Technical Support/ Maintenance	56.1% n=140	35.3% n=63	43.0% n=19	18.8% n=49	38.8% n=64	31.3% n=24

Identifying Shifts in EUC Support/Management Task Responsibility

Table 5 shows average ratings (5=increasing greatly, 4=increasing, 3=neither, 2=decreasing, and 1=decreasing greatly) for whether the performance of each particular activity by the different groups is increasing/decreasing. While the shifts within individual organizations is

in many cases more dramatic, on the average the primary responsibility for specific tasks is relatively stable. Nevertheless, some patterns can be gleaned from the table. MIS departments on the average are increasing the level of activity in resource acquisition (3.9), planning (3.5), and systems development with specific software packages available in their organization (3.6). User departments are also stepping up some activities such as planning (3.5), training (3.6), consulting (4.0), and systems development. Apparently, resource acquisition is on average being centralized under MIS departments and away from the other parties. The overall picture is that on average the burden of supporting and managing end-user computing is growing so fast that for some activities all groups will have increased workloads.

Table 5. Identifying Shifts in EUC Support/Management Task Responsibility

	GROUP					
ACTIVITY	MIS Dept.	IC within MIS Dept.	IC within User Dept.	Individual User Dept. do their own	Outsiders	Separate IC
Resource Acquisition	3.9 n=145	2.7 n=68	2.6 n=24	2.3 n=100	2.9 n=65	2.7 n=68
Planning	3.5 n=76	3.1 n=34	3.4 n=14	3.5 n=27	2.5 n=4	3.1 n=14
Management & Control	3.1 n=148	2.9 n=66	3.2 n=24	3.3 n=142	2.7 n=3	2.8 n=57
LAN Management	3.5 n=87	3.2 n=42	3.1 n=16	3.1 n=23	3.4 n=43	2.9 n=19
Training	3.1 n=146	3.0 n=60	3.5 n=21	3.6 n=49	3.4 n=60	2.9 n=34
Consulting	3.1 n=143	3.3 n=66	3.2 n=19	4.0 n=130	3.7 n=34	3.4 n=25
Help Desk	3.3 n=100	3.2 n=49	3.2 n=20	3.4 n=27	3.0 n=4	3.3 n=19
Sys. Dev. with Specific Package	3.3 n=143	3.2 n=64	2.8 n=23	3.7 n=143	3.8 n=26	3.4 n=25
Technical Support/ Maintenance	3.3 n=145	2.9 n=68	3.0 n=23	2.9 n=52	3.3 n=64	3.1 n=24

Assessing Company Performance of EUC Support/Management Activities

Table 6 indicates how well, on the average, the organization -- as a whole -- has, up to now, performed the EUC support/management activities. Possible ratings are (1) extremely poorly, (2) very poorly, (3) poorly, (4) adequately, (5) well, (6) very well, and (7) extremely well. Except for planning, which has an average rating of 3.7, organizations are on average performing somewhere between adequate and well on the various activities. However, the relatively large standard deviations from the mean suggest that many organizations are doing poorly.

Table 6. Assessing Company Performance of EUC Support/Management Activities

Activities	Avg	Std. Dev.
Resource Acquisition (n=156)	4.6	1.3
Planning (n=156)	3.7	1.6
Management & Control (n=156)	4.2	1.3
LAN Management (n=99)	4.4	1.2
Training (n=156)	4.0	1.4
Consulting (n=149)	4.5	1.4
Help Desk (n=112)	4.4	1.3
Development with Specific Package (n=152)	4.4	1.4
Technical Support/Maint. (n=153)	4.4	1.4

IC Performance Ratings

Table 7 shows the average ratings for the ICs' performance along each of the 26 dimensions previously defined in the literature. The following rating scale was used: (1) extremely low, (2) very low, (3) somewhat low, (4) neither low nor high, (5) somewhat high, (6) very high, and (7) extremely high. The average rating for these 26 items by respondents from companies with ICs provide the measure of IC performance used in this study. On the average, ICs are performing reasonably well but there is considerable performance differences from company to company. This suggests the need for organizations to increase training and to attempt to learn from leading organizations by joining user groups and other IC professional associations.

Table 7. IC Performance Ratings

IC Performance Dimensions	Avg	Std. Dev.
Promote organizational acceptance of IC concept	5.8	1.2
Engender top-management support	4.5	1.3
Gain end-user commitment to the IC concept	5.0	1.0
Provide adequate training for IC staff	3.6	1.3
Provide career paths for IC staff	4.9	1.1
Employ a competent staff	5.2	1.0
Define IC mission	4.2	1.1
Promote IC services	4.8	1.1
Provide services to distributed sites	4.1	1.1
Liaise with end-user departments	5.5	0.8
Provide end-user training	4.8	1.1
Communicate with users	5.2	1.2
Understand users' business and problems	5.3	1.1
Promote users' business and problems	4.8	1.1
Manage end-user expectations	5.3	1.1
Respond to application requests	4.9	1.1
Establish formal criteria to prioritize work	4.9	1.0
Create positive atmosphere for users	4.7	1.1
Monitor and coordinate end-user application development	5.5	1.0
Control procedures to ensure that standards, policies, etc. are adhered to	5.4	1.1
Develop reliable applications	5.4	1.0
Establish chargeback criteria	5.0	1.1
Standardize hardware and software	5.6	1.2
Improve system performance	5.3	1.1
Support software packages	5.4	1.1
Find cost-effective solutions	5.4	1.1

Assessing the Impact of EUC on the Organization (Payoffs)

Table 8 shows the respondents' opinions about the impact of EUC activities (payoffs) experienced by the organization along 18 dimensions previously defined in the literature. The following rating scale was used: (1) it has been detrimental, (2) no improvement at all, (3) little improvement, (4) substantial improvement, and (5) great improvement. The average payoff ratings are somewhat disappointing with all items except "fostering organizational learning" being rated somewhere between little improvement and no improvement at all. The encouraging news comes from the relatively large standard deviations showing that inter-company differences are significant, and that for many organizations, EUC activities have produced greater payoffs.

Table 8. Assessing the Impact (Payoffs) of EUC on the Organization

KEY CAPABILITIES	MEAN SCORE	STD. DEV.
1. Ability to anticipate surprises and crises	2.8	0.7
2. Flexibility to adapt to unanticipated changes	2.9	0.8
3. Ability to identify new business opportunities	2.7	0.8
4. Ability to identify problem areas	2.7	0.7
5. Ability to foster managerial motivation	2.9	0.7
6. Ability to enhance the generation of new ideas	2.8	0.9
7. Ability to communicate top management's expectation down the line	2.9	0.7
8. Ability to foster management control	2.6	0.8
9. Ability to foster organizational learning	3.2	0.8
10. Ability to communicate line managers' concerns to top management	2.8	0.8
11. Ability to integrate diverse functions and operations	2.6	0.7
12. Ability to enhance innovation	2.7	0.9
KEY OBJECTIVES:		
1. Enhancing management development	2.8	0.8
2. Predicting future trends	2.6	0.7
3. Short-term performance	2.8	0.8
4. Long-term performance	2.7	0.8
5. Evaluating alternatives based on more relevant information	2.9	0.7
6. Avoiding problem areas	2.6	0.8

Capabilities and Objectives Rating Scale:
(1) It has been detrimental
(2) No improvement at all
(3) Little improvement
(4) Substantial improvement
(5) Great improvement

The Relationship Between Company EUC Effectiveness and EUC Payoffs

To build the cross-tabulations shown in Table 9, companies were classified into low, medium and high according to EUC effectiveness, IC performance, and company payoffs. For all three cross-tabulations, the relationship between the two variables involved is statistically significant at the 0.001 level or better.

Table 9a shows a direct relationship between the ratings for company effectiveness and company payoffs. The evidence suggests that to increase the benefits from the growing invest-

ment in EUC technology organizations must continuously strive to improve performance in the EUC support and management activities outlined earlier.

The Relationship Between IC Performance, Company EUC Effectiveness, and Company Payoffs

Table 9b shows a direct relationship between IC performance ratings and company EUC effeciveness ratings. It suggests that an effective IC plays a very important role in increasing the effectiveness of EUC activities in an organization. Further statistical analysis (not shown in this report) of EUC effectiveness which separated ICs in terms of their location revealed no significant differences at the normally required significance level of 0.01. The data indicates that as long as the organization has made the commitment to support and manage EUC activities, and is doing so effectively, the level of company EUC effectiveness is on the average roughly the same.

Table 9c indicates a direct relationship between IC performance and company payoffs from EUC activities. The impact of IC performance is stronger (Pearson's correlation coefficient of 0.61) on company EUC effectiveness than on company payoffs from EUC (correlation coefficient of 0.42) probably reflecting the existence of a larger collection of factors relevant to company payoffs from EUC, besides IC and EUC effectiveness.

Table 9. The Relationships Between Company EUC Effectiveness, IC Performance and EUC Payoffs

a) Between Company EUC Effectiveness and Payoffs

	EUC EFFECTIVENESS:			
Payoffs:	Low	Medium	High	Row Totals
Low	31	12	8	51
Medium	9	13	13	35
High	6	14	37	57
Column Totals	46	39	58	143

b) Between Company IC Performance and EUC Effectiveness

	IC PERFORMANCE:			
Payoffs:	Low	Medium	High	Row Totals
Low	18	8	0	26
Medium	15	19	7	41
High	4	19	33	56
Column Totals	37	46	40	123

c) Between IC Performance and Company Payoffs

	IC PERFORMANCE:			
Payoffs:	Low	Medium	High	Row Totals
Low	21	13	2	36
Medium	8	13	9	30
High	6	18	29	53
Column Totals	35	44	40	119

CONCLUSIONS

It is widely accepted that the level of EUC activity within most organizations continues to grow. This survey shows that organizations continue to invest resources to ensure that EUC activities are properly supported and managed. Most of the organizations surveyed are increasing their IC budgets. This is particularly significant given the business recession we have lived with for the past few years.

Organizations are struggling to establish more effective ways to support and manage EUC activities. Much of the commotion may be due to the well-known need that many organizations seem to have to refresh themselves, thus, the joke goes, they are continuously adopting the latest fads or restructuring in different ways only to cycle back to something they have abandoned some years ago. The evidence from this study makes it clear that having some type of IC organization is linked to greater EUC effectiveness. However, the question of which form to implement does not seem very important. Instead, corporate managers should concentrate on the important issues presently surrounding their company's EUC activities, and their IC, in whatever form it is now implemented. ICs seem to be an inexpensive and valuable investment. The average yearly IC budget for the companies surveyed is $711,000 and that is a small price for organizations with gross revenues close to $600 million (the sample average) if it will move the company from a 3.1 (poor performance) company EUC effectiveness rating (average for companies with no IC) to a 4.2 (adequate performance) average rating for companies with an IC. This is particularly important given the significant relationship between company EUC effectiveness and payoffs from EUC.

In a large company, the IC organization represents a small island of support and management for EUC. There are many players and no one seems to have the formal authority to integrate effort, share resources, and arbitrate disputes. Organizations need an integrative mechanism which can look at EUC from a corporate perspective, look at user needs for support and training, look at resources available, establish mechanisms to share these resources and information about them, and ensure that the various support and management activities outlined in this report are being effectively performed. Managers should also look at the list of IC performance dimensions used in this study and assess their IC's performance to identify and correct deficiency areas.

After looking at the results from this survey, one should be convinced that user computing requires a great deal of support. Corporate managers can ignore the evidence presented and not establish an IC due to lack of resources or will; or for the same reasons, they can disband the IC which has already been established. However, the users' needs for effective EUC will not go away in the foreseeable future. Sooner or later organizations will have to pay for the consequences of neglecting EUC support. Later is likely to be more expensive and the costs are increasingly higher as EUC environments move from a few microcomputers to widespread networks with large numbers of workstations, servers, databases, and entrenched bad habits.

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