A Federated Model for End-User Computing Support

Chittibabu Govindarajulu
Delaware State University

End-User Computing (EUC) has been around for over 30 years. During that time, end user support has been provided by help desk, local IT staff, and in many instances by friends and/or colleagues. End users generally require support in many areas such as development and purchasing. However, which support sources best serve different types of end users for their support needs has not been studied well. A federated model for EUC support has been proposed and studied in this paper. Data collected from 409 respondents show support for the proposed model. The possible threat to EUC in the form of thin clients is also discussed.

INTRODUCTION

End-user computing (EUC) has been around for over three decades. With advances in hardware and easy-to-use software such content management systems, contemporary end users are proficient in computing technologies. While EUC is not considered to be a top information technology (IT) issue, desktop application support (DAS) call volume makes up for 5% to 15% of corporate Help Desk call volume according to PCHelps (2008). It is an issue facing IS managers and needs careful management especially when more and more firms are moving toward thin client architecture. An optimal model of EUC support has not been identified to manage it well. A recent study found that about 25% of end users can develop advanced web applications with database connectivity (Govindarajulu & Arinze, 2008) Such a trend should be carefully managed to control the risks while improving EUC benefits. IT governance models exist in various forms – centralized, decentralized, and federated. According to a Gartner study, federated IT model will emerge as the most popular IT organization (Gartner 2005). The same study predicted that by 2008, 80% of large complex organizations will move toward a federated architecture governance model. Since EUC management falls under IT management domain this study focuses on determining which EUC support services are best provided by centralized IT and decentralized support sources. End users have traditionally used many forms of support over the years with centralized help desk (also known as Information Center), local business unit (BU) IT staff support, and informal support identified as the most popular forms. Research has identified several areas of support, such as development and data support, required by end users (Govindarajulu & Arinze, 2008). But it is not clear where end users get support from for different areas of support. Data collected from 400 respondents lend support to the proposed federated model of EUC support. The future of EUC in the face thin-client popularity is also discussed.

END USER TYPES, SUPPORT SOURCES, AND SUPPORT SERVICES

Several end-user classifications exist in the literature (McLean, 1979, Rockart and Flannery, 1983, and Cotterman and Kumar, 1989). While the first two classifications are based on end-users' computing knowledge, the last one considers other key characteristics of EUC - development, operation, and control. Several EUC definitions have also consistently identified these three characteristics. The applications used (*operation*) by end users are developed (*development*) on their own with or without the help of support sources leading to control (*control*) of their own computing needs. Based on these characteristics, Cotterman and Kumar (1989) presented the following eight user types: 1. User – Developer, 2. User – Operator, 3. User – Controller, 4. User – Developer/Operator, 5. User – Developer/Controller, 6. User – Operator/Controller, 7. User – Developer/Operator/Controller, and 8. User – Consumer. The last user type will be ignored in this study as this type is not involved in any of the three activities. This type merely is consumers of the output generated by EUC applications.

End users' support needs have changed over the years. But, since IBM Canada started the concept of Help Desk in the late seventies to *help users help themselves*, help desks have stayed true to this principle and have not adapted to the changing times. As a result, decentralized IT support that exclusively helps individual business unit or units has also become popular. Local IT staff typically reports to the business unit manager and are knowledgeable of business needs of the unit. Surprisingly, even with the presence of a centralized help desk and/or localized IT staff, end users have also consistently used informal support from friends and colleagues. The centralized help desk, decentralized information center, and informal support are the primary support sources for end users today.

Research has identified various support needs of end users – Hardware, software, training & education, development, and data (Rainer & Carr, 1992). Further research has consolidated (Govindarajulu & Reithel, 1998) four distinct categories of end-user support needs (Table 1). They are:

· *General support* – that includes software, hardware, and other training related support. Networking related software and hardware support is also included in this category.
· *Functional Support* – relating to problem specification, choosing the right technique, designing & developing applications, and generating prototypes. This category is focused on support of end-user application development.
· *Data Support* – relating to locating data, data transfer, creating backup, data recovery, and all *other* data related support.
· *Purchasing Support* – relating to helping users with the purchases of standardized software and hardware.

While there is no dearth of research on EUC, it is still not clear which of the above support services are best provided by the support structures present in organizations today. IT resources that affect the entire firm can be best handled by centralized IT organization. Common knowledge dictates that any end-user support needs for corporate IT resources such as data should be assigned to centralized help desk while other needs can be supported at the local business unit level. This is the basic rationale behind the federated EUC support model presented next.

A FEDERATED MODEL OF EUC SUPPORT

Based on the premise that corporate IT resources are best managed by centralized IT organization, EUC support needs can be assigned to helpdesks and local business units as shown in Figure 1 – Federated model of EUC support. Support categories and individual items are listed in Table 1. General support category deals with hardware, software, and training. Since central IT sets the policies for standardization of hardware and software, a help desk is best positioned to provide this support. Alternately, help desk can formulate the guidelines and assign this support task to business unit IT staff.

The same can also be applied to purchasing support. IT staff in business units can assist end users in purchasing of hardware and software as per policies and guidelines set by help desk.

TABLE 1
SUPPORT CATEGORIES AND ITEMS

SUPPORT CATEGORIES	ITEMS
General Support	1.) demonstrating hardware 2.) standardization of hardware 3.) support telecommunications hardware & hardware 4.) assisting with application maintenance 5.) variety of software supported 6.) providing training in data transfer 7.) providing users with basic & advanced training
Purchasing Support	1. listing approved hardware & software vendors 2. outlining formal procedures for getting hardware & software purchases approved
Data Support	1. assisting users in locating data 2. assisting with data transfer 3. providing backup, recovery, and archiving 4. facilitating data sharing among users 5. maintaining subject databases
Functional/development Support	1. assist user in problem specification 2. assist user designing the application 3. assist user in choosing techniques 4. develop application for/with users 5. generating prototypes

All data support that involves central corporate data sources must be assigned to help desk to avoid risks to data integrity and security. End-user applications should be off-limits to central databases or should be provided very limited access. Support involving local stand-alone databases can be assigned to local IT staff. Functional or development support should be provided by local IT staff since they are more knowledgeable of business processes within the unit they support. Local IT staff should also be well versed with the specific development methodology prescribed by central IT group.

Regardless of the end-user type, the above model should provide a clear direction for organizations for end-user support. Different types of end users may use the support sources to varying degrees depending on their needs. For example, advanced users (user – developer/operator/controller) may use help desk support more for gaining access to data than other types of users who may prefer local IT staff or informal support. Similarly, user – operators may prefer local IT support over help desk. To assess the model and to understand the practices in industry a survey of end users was conducted.

DATA COLLECTION

To assess the federated model and to understand the interactions between end users, support needs, and support sources, a structured questionnaire was designed and administered online. 7,000 alumni of a

private university in the Philadelphia area who live within one hour driving distance were contacted through email to complete the survey. Approximately 2,500 emails were undeliverable and another 387 IT professionals opted out of the survey. Since the survey was primarily intended for non-IT end users, IT staff was excluded from the survey. Of the 446 responses, 37 incomplete responses where either a help desk or local IT support was absent were rejected giving an effective response rate of 10% (409 responses). Additional demographic information such as end users' computing experience and number of applications developed was also collected.

Respondents were asked to indicate on a 7-point Likert type scale how much support they received from *each* support source – help desk, local IT staff, and informal sources – for *each* support need (Table 1). A 10-item instrument (Govindarajulu and Arinze, 2008) was used to categorize end users into one of the eight user types (Table 2). Data analysis show interesting results.

FIGURE 1
FEDERATED MODEL OF EUC SUPPORT
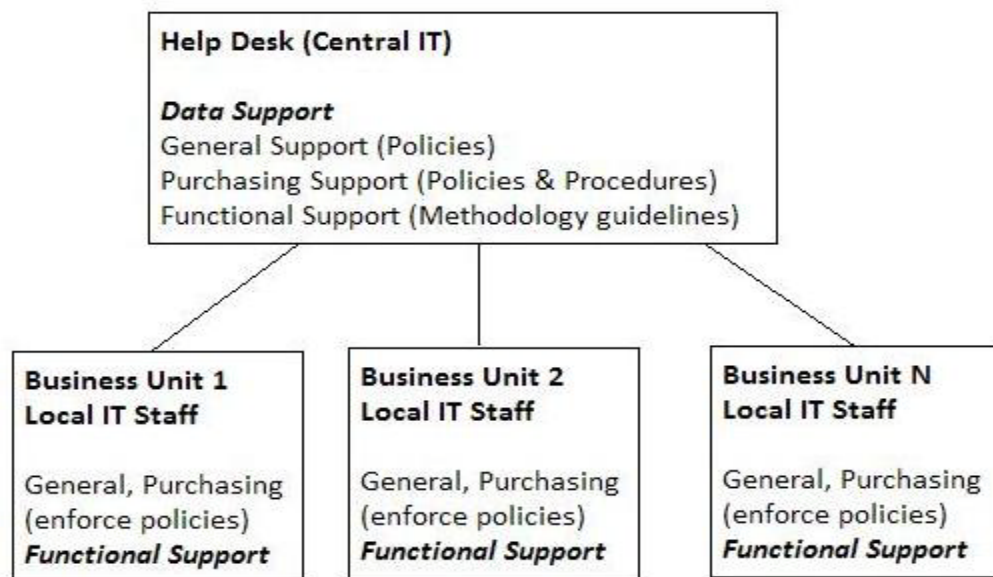
ANALYSIS AND RESULTS

To aid analysis of data, correspondence analysis method was employed. The results of correspondence analysis for each user group are presented below:

1. User type – **DCO** (12%) receive/seek no support from Local IT staff! They receive *low* levels of support from help desk and informal support sources in all areas.

2. User type – **D** (11%) receive/seek *no* support from Local IT staff and informal sources! They seek help desk support for development & data (*High*) and training & purchase (*Medium*)

3. User type – **C** (10%)
   a) *High* level from help desk – Data
   b) *Medium* level from help desk – Purchase, General, Training
   c) *Medium* level from local IT staff – Data, General
   d) *High* level from informal sources – Training

e) *Medium* level from informal sources – Development
f) Use of TWO sources for same needs

4. User type – **O** (18%) receive *low* levels of support from all sources for all needs

5. User type – **DO** (5.4%) receive/seek no support from local IT staff and informal sources. Even from help desk they receive *low* levels of support for data, purchase, & training

6. User type – **CO** (7%)
   a) *Medium* level from local IT staff & informal sources – Data
   b) *Low* level from help desk & informal sources – Development
   c) *Low* level from help desk & local IT staff – General
   d) Use of TWO sources for same needs

7. User type – **DC** (18%)
   a) *High* level from help desk – Purchase
   b) *Medium* level from help desk – Data
   c) *High* level from informal sources – General
   d) *Medium* level from local IT staff – Development, Purchase, & Training
   e) Multiple sources

From the results it is clear that
   a) advanced users (DCO) appear to be self-reliant,
   b) user types (DC, CO, C) that include *control* dimension appear to use two sources for the same support needs,
   c) help desk is popular among 7 of the 8 user types for data and purchase support, and
   d) help desk is popular among 6 of the 8 user types for training support.

TABLE 2
END-USER CLASSIFICATION INSTRUMENT

EUC Dimensions and Items on the Questionnaire	Scale		
Development Please rate:	No Involvement		Active Involvement
(1) Your involvement in the design of end user applications	1 2 3 4 5 6 7		
(2) Your involvement in the specification of end user application requirements	1 2 3 4 5 6 7		
(3) Your involvement with respect to actual coding of end user applications	1 2 3 4 5 6 7		
(4) Your involvement in the implementation of the applications developed by them and/or by others	1 2 3 4 5 6 7		
Operation Please rate the extent of your use of end user applications:	Low Extent		High Extent
(1) Developed by you	1 2 3 4 5 6 7		
(2) Developed by others in the department	1 2 3 4 5 6 7		
(3) Developed by others in the firm	1 2 3 4 5 6 7		

Control Please rate:	No Authority						Complete Authority
(1) Your decision-making authority to acquire hardware (hard disks, RAM, etc.) for the department	1	2	3	4	5	6	7
(2) Your decision-making authority to acquire software (MS Office, Corel	1	2	3	4	5	6	7
(3) Your authority to initiate, manage, and implement new end user applications	1	2	3	4	5	6	7
(4) Your authority to collect, store, and use data for the end user applications	1	2	3	4	5	6	7

CONCLUSIONS

Results clearly provide some evidence that help desk is still popular among respondents for support related to centralized resources such as data and purchasing. This lends initial support to the federated model. Further research is required to study the effectiveness of federated model of EUC support. It will be interesting to see how emergence of new computing architectures, specifically thin-client computing, would impact EUC. With growing popularity of thin-clients, computing seems to have come a full circle – from dumb terminals connected to mainframes to client-server computing, and now back to thin-clients connected to powerful centralized servers. Over time, computing power has increased, computers have become much smaller, and interfaces have become very user-friendly. Because of this seemingly migration toward thin clients that implies computing resources will again be completely under the control of IT departments, what will happen to EUC? It should be noted that EUC became popular, in the late seventies and early eighties, primarily because of two reasons: (a) availability of low cost hardware (PCs) and easy to use software, and (b) because of this end users acquired hardware & software to develop their own applications thus effectively controlling their own computing needs and freed themselves from dependence on central IT departments. With thin client architecture will central IT in large corporations still support EUC? Even if they do, will users be willing to move their applications to centralized servers that they may or may not have access to? Given the projected labor cost savings of thin-client model of computing, will there be enough support staff for EUC? Will these issues suppress employee productivity and innovation at least to a certain extent? End-user applications do help users or the whole departments perform their tasks. Hence, while EUC in larger corporations still have challenges to deal with, it may still thrive in small businesses.

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