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End User Computing Support Choices

Robin Munkvold
Faculty of Social Sciences and Natural Resources, Nord-Trøndelag University College, Norway, robin.munkvold@hint.no

ABSTRACT

This study explores how different end user qualities affect actual use of support sources in organizations. It identifies three qualities: IT-skills; Computer Self-Efficacy; IT-Involvement. Sources of support are divided in: Formal sources of support; Informal sources of support; Use of internal documentation and Use of external documentation. Hypotheses are tested empirically through a cross sectional study in a large Norwegian organization. The results show that end user qualities in varying degree may affect the end users' choice of different support sources. The study also shows that access to a computer expert and giving collegial support might be important factors for explaining the variation in the end users' choices of support services.

INTRODUCTION

Support services are central elements of any organization. To be competitive, organizations need to optimise the use of the IT-resources. The problem is, however, that end users tends to spend a lot of their working hours fixing IT-related problems that has nothing to do with their actual work assignments. The employee's expertise and skills in using computer systems have become a critical factor for successful use of information technology in organizations (Cheney et. al 1986; Nelson & Cheney 1987; Mirani & King 1994). Gartner Group found that about 60 percent of the time end users spend in front of a computer will be to make it work satisfactorily and to learn how to use different programs (Kirwin 1995). The solutions for solving these problems usually are to offer the employees training, education, assistance or guidance. Do these solutions solve our problems?

Some IS researchers have studied the antecedents of variation in the support needs of end users so that these needs can be better explained, predicted and fulfilled (Mirani & King, 1994). Maybe one should look at the end user's actual use of support and make this the basis for figuring out ways to make end users more effective in their daily work?

Why do end users choose different support services? Is it due to variations in end user qualities (i.e.: skills, self-efficacy, involvement, etc.)? Is it the qualities of the actual support (context, vicinity, sources, etc.)? Or could it be a result of the end user's relation to the support personnel or the competence of the support personnel that makes the end user choose his source of support? These questions are many that must be answered when searching to find causes of variation in the end user's use of different support sources.

Most literature view End User Computing (EUC) support from an overall organizational perspective. Information Centre (IC) approaches generally do not take into account differences among users when designing and providing support services. (Mirani & King 1994). To make end users more effective, a useful approach could be to map the causes for the end user's need for different kinds of support. By finding these causes one could improve end user qualities and thereat increase effectiveness. My focus is on end user qualities, and I aim to find out whether basic end user qualities can affect the way end users choose sources of support or solve their IT-related problems. That is, *are there any basic end user qualities that can be of significance when they choose their sources of support?*

The objective of this study is to identify end user qualities (variables) that may be important for explaining differences in usage of different support sources. I will address three different qualities that might be of significance when end users solve their problems. These qualities are: IT-skills; Computer Self-Efficacy and; IT-Involvement.

THEORY, RESEARCH QUESTIONS, CONCEPTUAL MODEL AND HYPOTHESISES

End User Computing Support

To measure the use of different sources of support, EUC needed a more precise definition. Many studies show different perspectives on EUC support (Winter et al. 1997; Arnoudse & Oulette 1986; Larsen 1989; Doll & Torkzadeh 1993; Bruton 1995; Smith 1997; Heie & Heistad 1998).

Through a thorough analysis of the different perspectives on EUC support, a partitioning of EUC support was needed. Doll & Torkzadeh (1993) divides EUC support into three categories. These are:

- Consultation
- Training
- Documentation

This survey seeks to measure ad hoc support needs. The category *Training* is therefore irrelevant. *Consultation* and *Documentation* were singled out as the types of EUC support that would be tested for in this survey. Further analysis showed that Consultation and Documentation could be divided in formal vs. informal sources of support and personnel vs. impersonal sources of support. This resulted in four different types of EUC support sources.

- Personal and informal consultation with colleagues
- Personal and formal consultation with computer experts
- Use of external documentation (Impersonal and informal)
- Use of internal documentation (Impersonal and formal)

Table 1: EUC support categorization

EUC support	Informal	Formal
Personal	*Consultation with colleagues, or other non professional IT workers*	*Consultation with IS-professionals*
Impersonal	Use of *external documentation* not developed by the local IC. This could be manuals, periodicals, etc.	Use of *internal documentation* developed by the local IC

Through this review EUC support was defined to be:

All sorts of IT-help that an end user receives or uses in his work to solve arising problems or acquire expertise and skills within IS-use so that they easier can achieve organizational goals

This definition limits the perspective on EUC support and makes it somewhat easier to measure.

End User Qualities

As the purpose of this study is to find out whether different end user qualities can explain the differences in their choice of support sources, it is equally important to find these qualities.

There exists some literature on EUC support, but not very much on the end user's choices of support depending on his basic qualities (i.e. skills, etc.). Winter et. al (1997) concluded in their survey that even though training and support could have improved the end user's computer knowledge, it is clear that is has not lead to high computer knowledge. Their opinion is that it is important for the support personnel to have some knowledge about the end user's computer skills to

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give them proper support. It then seems reasonable obvious that *computer skills* might affect the end user's choice of different support services. I therefore ask:

Does IT-Skills influence the end user's choice of support services?

One would believe that end users with low computer knowledge and skills would need more support that those with high computer knowledge and skills. Øystein Sørebø wrote a paper in 1996 called: *"End-User Computing and the perceived need for support services: Toward an explanation of the independent-user paradox"*. The qualities he believed to affect the perceived need for support services where: IT-Involvement; Computer Self-Efficacy and; Informational influence (from colleagues).

Sørebø questions whether the end user's *IT-Involvement* might have a significant influence on the perceived need for support services. Earlier studies have shown that Involvement affects information searching (Zaichkowsky, 1986; Laurent & Kapferer, 1985). Finding the solution to computer related problems (through the use of different support sources) can easily be compared with information searching. Zaichkowsky (1986) also points out that an individual's attention towards and experience of what's important in relation to the execution of a specific behaviour will vary with the individuals Involvement. In this context, execution of a specific behaviour can be compared with the use of different sources of support and the individual's involvement could be different aspects of the end user's involvement towards the computer.

On these basis one could ask:

Does IT-Involvement influence the end user's choice of support services?

Computer Self-Efficacy is an important end user quality. Compaeu & Higgins (1995) argues that this special psychological state will affect the end user's belief about his need for support services. Belief about the need for support services and actual use of different support services are clearly related topics, and therefore my question is:

Does Computer Self-Efficacy influence the end user's choice of support services?

Now I will turn to a more detailed description of each of the three explanatory factors.

IT-Skills

The concept IT-skills is not easily defined. IT is widely used, but often without providing a precise definition. Much work is done on the related concept End User Computing Sophistication. The reason why I haven't used the concept End User Computer Sophistication is that different authors have defined it differently in different surveys (Rockart & Flannery 1983; Huff et al. 1992; Marcolin et al. 1993; Blili et al. 1994; Zinatelli 1996;). It would be difficult to compare the results from the different surveys because of the variations in the definition of the concept.

The subject *skill* is often connected to the subject *ability*. Research on end user ability is conducted only by a few researchers (Cheney & Nelson 1988; Koohang et. al 1993; 1992; Marcolin et. al 1996). Both Marcolin (1996) and Koohang (199x) has used Cheney & Nelson's instrument for developing their instruments on end user abilities. Cheney & Nelson identified three clear factors of end user computing abilities: *technical abilities, modelling abilities and application abilities*. Technical abilities apply to programming, the use of hardware and managing operating systems. Modelling abilities apply to software engineering. Application abilities apply to skills that are most typically associated with the use of applications systems. All these factors are important for measuring an end-users' computing ability. The aim of this study was however to measure work-relevant IT-skills. The measures of technical and modelling abilities were therefore less interesting. On this basis I defined IT-skills to be:

To what degree a person manages to solve different problems with help from different work-relevant information system tools.

IT-Involvement

Earlier research on IT-Involvement has mostly been about participator behaviour within IS-development (Ives & Olsen 1994). The psychological dimension of this participation has been brought to focus in the later years. In spite of Barki & Hartwick (1989), Kappelman (1990) and Kappelman & McLean (1993, 1994) trying to establish a conceptual partitioning between *participation* and *engagement* as two aspects of involvement, it is still common to use End User Involvement as a description of participant behaviour (Igbara & Guimaraes 1994; Doll & Torkzadeh 1994). A solution to this partitioning of behavioural and psychological involvement is to denote them both End User Involvement, and to distinguish between the two components *situational involvement* and *intrinsic involvement* (Jackson et al. 1997). One can further divide intrinsic involvement in *a psychological condition* and as *involvement towards information technology, the computer and software or involvement towards a process*. My aim with **IT-involvement** is to measure *involvement towards information technology, the computer and software*. The table below shows the partitioning of the concept.

Table 2: End user involvement partitioning

End User Involvement	Related to the phenomenon	Can be divided into:
Situational involvement (End user participation)	Behaviour	Process participation or System usage
Intrinsic involvement (End user engagement)	Psychological state	**Involvement towards information technology, the computer and software** or Involvement towards a process

With basis in the work of Barki & Hartwick (1989) I have defined IT-Involvement as follows:

The importance and personal relevancy an end user attaches to a computer and the use of it.

Computer Self-Efficacy

Compeau & Higgins (1995) did a survey on the concept of self-efficacy to prove its usability in the attempt to understand individual behaviour towards computers. The term self-efficacy is future-oriented. It does not deal with what a person has done earlier, but rather with a persons beliefs of what can be done in the future (Compeau & Higgins, 1995b: 192).

It is "borrowed" from social psychology, where self-efficacy is said to be the user's beliefs about his capability to organize and execute the courses of action required to manage prospective situations (Bandura, 1996).

Self-efficacy has its origin in the writings of Albert Bandura (1986; 1995). He defines it to deal with: "*peoples judgement of their own capabilities to organize and execute cources of action required to attain designated types of performance. It is concern not with the skills one has, but with the judgements of what one can do with whatever skills one possesses"* (Bandura 1986:391). Thus Computer Self-Efficacy represents an individual's perception of his ability to use computers in the accomplishment of a task (Compeau & Higgins 1995a).

The concept has three dimensions (Compaeu & Higgins 1995a; 1995b). These dimensions are: *magnitude* – the level of computing task difficulty the user can attain; *strength* – whether the conviction regarding magnitude is strong or weak and; *generalizability* – the degree to which the expectation is generalized across different software packages and different computer systems.

End users with a high magnitude of Computer Self-Efficacy might judge themselves as capable of operating with less support and assistance than those with lower magnitude of self-efficacy (Compaeu & Higgins 1995a; 1995b).

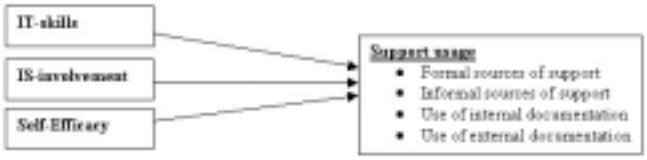
Compeau & Higgins (1995b: 195) show that support was negatively related to self-efficacy with a regression coefficient of –0,16. The survey thereby showed that the more support given to the end user the less computer self-efficacy he possessed.

Following these research questions, conceptual definitions and discussions I will utilize the following model:

Hypothesises:

H1 – The end user's IT-skills will covariate with their respective source of support choices

Figure 1: Research model



H1a – High IT-skills is negatively related to the use of formal sources of support
H1b – High IT-skills is positively related to the use of informal sources of support
H1c – High IT-skills is negatively *related to* the use of internal documentation
H1d – High IT-skills is positively related to the use of external documentation
H2 – The end user's Computer Self-Efficacy will covariate with their respective source of support choices
H2a – A high degree of Computer Self-Efficacy is negatively related to the use of formal sources of support
H2b - A high degree of Computer Self-Efficacy is negatively related to the use of informal sources of support
H2c - A high degree of Computer Self-Efficacy is negatively related to the use of internal documentation
H2d - A high degree of Computer Self-Efficacy is positively related to the use of internal documentation
H3 - The end user's IT-involvement will covariate with their respective source of support choices
H3a – High IT-involvement is positively related to the use of formal sources of support
H3b – High IT-Involvement is positively related to the use of informal sources of support
H3c – High IT-Involvement is positively related to the use of internal documentation
H3d – High IT-Involvement is positively related to the use of external documentation

RESEARCH METHOD

With basis in the requirements to causal research models (Bollen 1989; Churchill 1995; Frankfort-Nachmias & Nachmias 1996) a quantitative approach was chosen, with a cross sectional design. To answer the research questions a questionnaire was developed to measure the different variables. It was important to find a setting where one would surely find variation in end user's choices of different support sources. It was also important to find a setting that was homogeneous. Homogeneity will diminish the danger with alternative predecessors that might create spurious relations (Mitchell 1985). To ensure a homogenous setting and variation in the end user's answers, a large organization in Norway was chosen (more than 800 employees).

IS-professionals were not included in the survey. The reason was that most IS-professionals seldom utilize support personnel. The population was therefore selected to be all non-IS-professionals in the organization.

The Independent Variable (Support Usage)

Through the studies of Lee (1986), Larsen (1989), Delone & McLean; Compeau & Higgins (1995b); Blili et al. (1997) I found three different aspects on the measure of usage: *Time spent*; *Frequency* and; *Exploitation ratio*.

To measure time spent one must be sure that the respondents' records the time they spend on support usage for a specific period of time. Most end users don't want to be bothered with these things and their answer to such a survey would probably be an estimate anyway. Exploitation ratio measures if a support service is of any use to the respondent. It will not measure to what degree the respondents utilize different support-services, which was the aim of this study. Therefore *frequency* seemed the best measure to use. Blili et al.'s instrument was changed to fit the aims of the study. The measure used was: *How often do you utilize different support sources when using your computer?* Different sources were divided in: *Informal support sources*; *Traditional support sources; Internal documentation* and; *External documentation*. Frequency was measured with five categories, from *less than once a month* to *several times a day*.

Since there is limited research on support usage, and since this instrument never had been tested before I chose to develop an alternative instrument. This alternative instrument tested for different error situations and asked the respondent *which support source would be his first choice if a specific problem were to arise*.

Pre-tests and later factor analysis showed that the alternative instrument was the better, and this instrument was chosen to measure the end users' use of different support sources.

Computer Self-Efficacy was measured with Compeau & Higgins's (1995b) instrument. The different items focus on the degree to which the respondent masters the use of new software with different levels of support.

An instrument on IT-Involvement developed by Barki & Hartwick (1994) was pre-tested in the organization. The scale was difficult to translate to Norwegian and the items that where chosen to measure different aspects of the concept were quite similar. A newly developed instrument developed by my mentor Øystein Sørebø was adopted. This instrument measured the importance and personal relevancy an end user expresses towards the computer and use of it.

The IT-skills instrument was developed based on Cheney & Nelson's (1988) instrument. The respondents where asked *to indicate to what degree they used different software* and *to indicate their level of skill within the different types of software*.

In addition to the variables chosen for measuring different end user qualities, three control variables were included. These were *Giving collegial support*, *Direct access to IS-professionals* and *IC relationship*. The variable *giving collegial support* measures to what degree the respondent gives collegial support to fellow workers. *Direct access to IS-professionals* shows if the respondents have direct access to IS-professionals in the same office location. *IC relationship* defines the respondents' relationship to the information centre on a scale from very good to very bad. Further reviews (through test-respondents) showed that the questionnaire was missing an alternative choice in problem solving. This was *Solving the problem themselves*. I therefore added this dependent variable to the questionnaire.

The questionnaire was sent to 670 employees. 277 usable questionnaires were returned, which gave a 41,3% response rate.

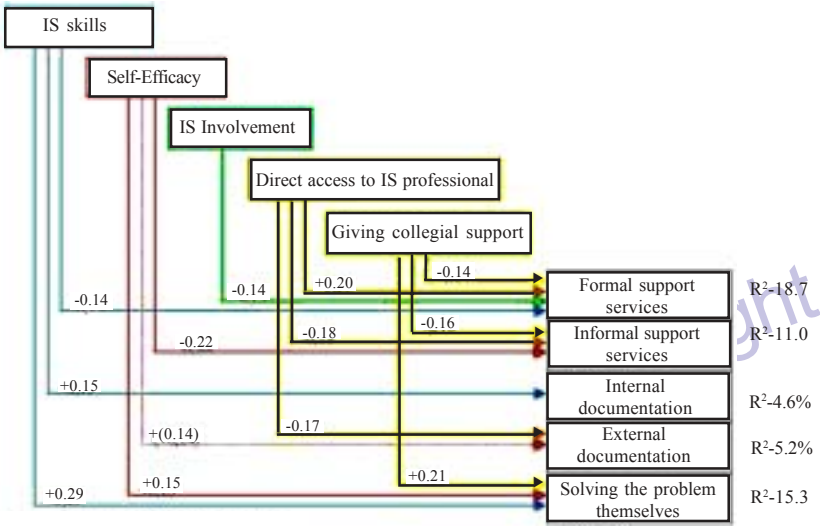
RESULTS

The various sets of variables that are included in this survey have gone through to factor analysis to filter unwanted items that does not measure the variables well enough. Through convergent and divergent validity analysis some items were rejected. This has contributed to ensure the lack of non-redundant concepts.

The results from the analysis supports the following hypothesises: H1a, H1c, H1e, H2b, H2d, H2e and H3a. In addition *Direct access to IS-professionals* seems to correlate positively with the use of *Formal support services*, negatively with the use of *Informal support services* and negatively with the use of *external documentation*. Also *Giving collegial support* correlates negatively with the use of both *Formal* and *Informal support services* and positively with the added dependent variable *Solving the problem themselves*. The figure below summarizes the results of the analysis:

The beta (multiple regression) values that are indicated along the arrows apply to the covariance after the inclusion of the control variables. The dashed arrow between Computer Self Efficacy and External Documentation point out that there was covariance between the to variables, but this covariance disappeared when the control variables was accounted for. R^2 states explained variance in the dependent variable(s).

Figure 2: Summarizing the results



IMPLICATIONS, CONCLUSION AND RECOMMENDATIONS

The results show that IT-skills might be of importance for the use of Formal support services. The negative covariance indicates that Formal support services first of all would be of use for the novice end users. Earlier discussions points out that end users might demand more and better services from the formal support sources the higher the IT-skills. My survey does not support these viewpoints. One could expect that the enquiries from expert end users would be of such specific nature, that the formal support service wouldn't be competent enough to solve such problems. Since I don't have a measure on the actual qualifications possessed by the formal support services in the organization, the answer to this anticipation seems very uncertain. But it might indicate that one by increasing support qualifications naturally will be able to help a bigger group of end-users.

The results also show that there is a negative covariance between IT-skills and the use of Internal documentation, i.e. the higher IT-skills the less the use of Internal documentation. This could imply that the quality of the internal documentation is not good enough. Maybe most internal documents are made for novice users, explaining basic use of different software. The quality of the internal documentation is not measured in this survey, and therefore it will be difficult to point out that documentation quality would impact (indirectly) on the end users use of internal documentation. Later studies on the subject should therefore contain a measure on the *perceived quality of internal and external documentation*.

An indication that shows that the data collected is quite reliable is the result that shows a positive covariance between high IT-skills and the variable *solving the problem themselves*. This covariance is expected and any other result would be suspicious. Another result that indicates reliability is the result that shows that the end users giving collegial support negatively covariates with the use of formal support sources.

The hypotheses regarding Computer Self-Efficacy shows a negative covariance towards the *use of informal support sources* (H2b), and a positive covariance towards the *use of external documentation* and towards *solving the problem themselves*. This could imply that end users with a high degree of computer self-efficacy basically want to solve the problems themselves, either by using external documentation and / or by solving the problems without the use of any support sources. That indicates that these end users probably have such high beliefs about themselves that they don't see themselves as people that need any help from others. They would expect that no others could solve the problem any faster than themselves anyway.

It is important to notice that when the control variables are included, Computer Self-Efficacy is no longer a valid factor in explaining the use of external documentation. That might indicate a spurious connection. By testing covariance between Computer Self-Efficacy and *Access to a computer expert* I found no covariance. That again might indicate that the strong covariance (beta value: -0.17) between *Access to a computer expert* and the *use of external documentation* confounds the effect of Computer Self Efficacy. I would therefore suggest to test for this in future surveys to clarify the uncertainty around the model.

The results regarding IT-involvement only show covariance with the *use of formal support sources*. Another survey conducted at almost the same time as mine shows the exact same result (Haukedalen 1998:65). This indicates that *end users with a high degree of IT-Involvement use formal sources of support more*. The reason why might be that these end users show a bigger interest in computers and computer technology and therefore eager to solve IS-related problems. The formal support source might also work as an information channel for these end users. As their involvement towards IT is higher, they show more general interest for IT and therefore have the need to get answers regarding Information technology.

The results of this survey clearly indicate that specific end user qualities affect the end user's choice of support source. I therefore recommend organizations to improve these basic qualities of the end user, instead of only providing the traditional support services. Not only should the employees attend training courses to improve these basic qualities. One should also seek to improve the end users' Self-Efficacy and Involvement towards computers and computer technology. By increasing IT-Involvement one will make end users contact the formal support services more often, which may lead to more effective employees. One must take into account that although an end-user has high IT-skills and a high degree of computer self-efficacy, it doesn't automatically mean that he will solve IT-related problems faster than the formal support group can. For example, if end-users feel they are sufficiently qualified to solve IT-related problems, they may well spend days doing exactly this, whereas calling the IT support staff could have solved the problem within minutes.

By increasing end users IT-involvement and by improving quality and increasing availability of the IT support staff one would more likely make the employees more effective in their everyday work.

In addition, support personnel ought to aim to provide the end users relevant knowledge every time they need help to solve a problem. Bento (1996) talks about *doers* and *facilitators* when speaking of different types of support personnel. It is not enough that support personnel just solve the problem and leave (doers). They must also transfer the knowledge to the end user, so that the end user more easily can confront the next problem situation that will appear (facilitators).

It is nevertheless important to notice that this survey has been done with data from a single Norwegian corporation. The results from this survey may therefore not be generalized to other organizations. To make such generalizations, more research is needed.

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