The Impact of Purposeful End-User Computing Activities on Job Performance: An Empirical Investigation

Ø. Sørebø

Buskerud University College, Faculty of Education in Business Administration
Bredalsveien 14, 3511 Hønefoss, Norway
Email: oystein.sorebo@hibu.no

G.E. Christensen

Norwegian School of Economics and Business Administration, Department of Strategy and Management
Breiviksveien 40, 5045 Bergen, Norway
Email: gunnar.christensen@nhh.no

T.R. Eikebrokk

Agder University College, Department for Information Systems
Service Box 422, 4604 Kristiansand, Norway
Email: tom.eikebrokk@hia.no

It is generally agreed within information systems research that end-user computing (EUC) among professionals is critical to their job performance. The main assumption among IS-researchers is that software usage contributes to improved performance. This study suggests that end-user computing may influence job performance in a more comprehensive way than earlier assumed. To address this issue, a set of purposeful core activities in EUC has been identified. The influence of these EUC activities on job performance is tested in a study of 328 professionals. The results demonstrate that the activities "job-task specific computer utilisation", "non-job task specific computer utilisation" and the "providing of support to colleagues" have impact on professionals' job performance. Our findings have important implications for management of EUC and for research in the area of EUC. To that end, we offer directions for future research.

ACS categories: K.6 (Management of Computing and Information Systems), K.8 (Personal Computing)

1. INTRODUCTION

From its start in the late 1970s, end-user computing (EUC[1]) has evolved tremendously. The ratio of computers to white-collar workers in some industrialised countries is now approaching one to one (see e.g. European Telework Development, 2001). The dissemination in computer usage is a global phenomenon, occurring in the US as well as in Europe, Asia and Australia (Woodall, 1996).

[1] EUC describes job situations in which white-collar workers utilise computers as supporting tools.

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Reasons for this worldwide dispersion of desktop computers in companies are manifold; among these are: pressure to cut costs, pressure to produce more without increasing costs, and simply to improve the quality of services or products in order to stay in business (Legris *et al*, 2003). Hence, the main reason for such investments is the belief that access to computers will increase the productivity of white-collar workers, and finally, enhance organisational performance.

When IS researchers investigate this assumed computer-productivity relationship at the individual level, they normally focus on software usage per se. They typically investigate the relationship between usage and/or user satisfaction and performance (e.g., Mahmood *et al*, 2001; Gelderman, 1998; Pentland, 1989). Implicitly, there is an assumption about software usage being the crux of the matter in EUC. Undoubtedly, this is a reasonable assumption as long as the aim is to investigate the effects of usage on job performance. However, access to computers typically involves users in more activities than just software usage. In fact, a number of studies have demonstrated that end-users are engaged in various purposeful activities, e.g., seeking support and/or providing support to co-workers (e.g. Shaw *et al*, 2002; Govindarajulu and Reithel, 1998; Larsen, 1991). Our presumption is that such additional activities may have a profound impact on how well workers' professional jobs are performed.

Unfortunately, the literature is scarce on findings and information related to core EUC activities. Consequently, the development and evaluation of frameworks within which such purposeful activities could be described and structured, is called for. This is the first main objective of this research. The second main objective is to investigate the effects of core EUC activities on the job performance of office workers. Consequently, this research is focusing on purposeful EUC activities, i.e., tool utilisation and support behaviour that support professional performance, and is therefore preoccupied with the issue of how each of the activities actually influence professional performance.

2. CORE ACTIVITIES IN EUC

End-user computing is becoming more accepted. It is one of the more common and widespread activities carried out in organisations today. As pointed out by Igbaria and Guthrie (1998): "*We are entering an age when every business transaction begins and ends with a computer operated, of course, by an end user.*" Hence, the term *end-user computing* describes job situations in which (white-collar) workers utilise computers as supporting tools. By definition, IS professionals are not part of the end-user community.

Generally speaking, research contributions in the EUC area tend not to discuss the nature of EUC in much detail. Therefore, we lack knowledge about EUC activities and how they are performed across organisations and types of end-users. We note, however, three research contributions in which the potential *core elements* of EUC are described and discussed. Table 1 summarises these findings.

Author(s)	The tool-related element	The support-related element	The role-specific element
Larsen (1991)	hands-on use	use of support functions	delegation of computer tasks
Brancheau and Brown (1993)	tool utilisation	EUC support options	development process
Speier and Brown (1997)	user application characteristics	end-user support usage	end-user awareness of policies

Table 1: Core elements of end-user computing

The most common elements appear to be *tool-related* and *support-related*. Rephrased as activities (or behaviour), these two groups of elements can be referred to as *tool utilisation* and *support behaviour*. In contrast to the behavioural concepts of tool utilisation and support behaviour, the *role-specific* element represents the actual type of end-users (e.g. managers). Hence, tool utilisation and support behaviour as general behavioural elements represent what we consider to constitute the core activities of EUC. The concepts of tool utilisation and support behaviour will be further explored and conceptualised in the remainder of this work.

2.1 Tool utilisation

Tool utilisation is basically what EUC in a wider sense is all about, namely the utilisation of different computer applications. More precisely, it can be described as a matter of utilising software to solve the different job tasks or job problems with which the user is confronted with. However we believe that tool utilisation is much more than simply solving job tasks. As Guthrie and Gray (1996) and Markus (1994) have observed, information technology can be used or utilised in both appropriate and inappropriate ways. Hence, in our efforts to conceptualise tool utilisation, we think it is important to distinguish between *job task-specific utilisation* and *non-job task specific utilisation*; we term these concepts as *task-specific utilisation* versus *non-task specific utilisation* hereafter.

Task-specific utilisation would be strongly related to professional task accomplishment. IS researchers typically assign this meaning by implication to all kinds of utilisation without questioning it any further. Thompson *et al* (1994) conceptualise utilisation in this manner when they describe it as a matter of intensity (i.e. minutes per day), diversity (i.e. number of packages) and frequency (i.e. how frequently it is used).

In contrast to task-specific utilisation, non-task specific utilisation is a type of behaviour that goes beyond regular job-task accomplishment, such as personal Internet use. However, there exist some borderline cases, and hence, it is usually difficult to sort out behaviour that fits directly into one particular category (Guthrie and Gray, 1996). Too much emphasis on document format in word processing may be a good example of this. In one respect, this may be considered an integral part of task accomplishment but in another respect it may turn into a behaviour that goes well beyond task accomplishment. Guthrie and Gray (1996) term this "junk computing". It is important to remark here that Guthrie and Gray (1996) mean that employees should be allowed to spend some time on non-productive tasks since any experience in computer use may increase a person's computer literacy and general ability to take advantage of IT.

In order to make the distinction between task-specific and non-task specific utilisation clearer, we shall distinguish between utilisation in conjunction with specific job tasks (i.e., communication and decision analysis) and non-task utilisation as the exploration of facilities and functions embedded in software. The latter refers to a kind of *experimental behaviour* while the former refers to *purposeful job-behaviour*, i.e., assuming that "doing the job" is equivalent to performing work tasks. Hence, non-task specific utilisation essentially is unproductive time spent by users tinkering with the application software. Task-specific utilisation is regarded as a rational activity and can be defined as productive time spent by users.

2.2 Support Behaviour

Support behaviour is closely related to tool utilisation and specifically refers to the need for help or assistance in solving an emergent software problem or the need for information about software functions or facilities. When a need for assistance arises within the context of EUC, the role of the end-user can be twofold. He or she is either *seeking support* or *providing support*.

Research has shown that end-users seek support from a number of internal and external sources (George *et al*, 1990; Shaw *et al*, 2002). However, as Speier and Brown (1997) have pointed out, internal sources are the predominant sources of support in the context of EUC. These findings are corroborated by research on IT diffusion (Brancheau and Wetherbe, 1990). Consequently, this research limits itself to internal support sources.

End-users have potential access to a number of internal sources for support. According to Bowman *et al* (1993), end-users would (listed in order of frequency and importance) contact co-workers, read instruction manuals, visit help screens, and contact computer center staff. Frequently, the motivation for doing a search, beyond that of solving a problem, may be to increase the user's expertise. As demonstrated in marketing research, a result of extensive search for information may be an "information bank" which may constitute a potential source for dissemination to peers (Block *et al*, 1986). This leads us to the other support role of the end-user, i.e., that of providing support.

The informal role of support provider in the context of EUC is well known within IS research (George *et al*, 1990; Shaw *et al*, 2002). Recent research has demonstrated that most end-users evaluate informal support as particularly important and useful (Govindarajulu and Reithel, 1998). One reason for this is that such "super users" or colleagues typically have the requisite business and computer knowledge and therefore are in an ideal position with regard to providing business-related computer support to others. Research in the organisational behaviour area has found that as much as 75 to 90 percent of all consultations between organisational members are initiated by the person who seeks help and not by the support provider (Kaplan and Cowen, 1981). As a consequence of this, the support seeking end-user not only initiates consultations but also maintains an informal network primarily as a precautionary measure. This behaviour has in fact been used effectively in managerial initiatives that use functional unit personnel for "first line support" and even training (Fitzgerald and Cater-Steel, 1995; Nilsen and Sein, 2002).

3. HYPOTHESES

Both tool utilisation and support behaviour are secondary activities for white-collar workers who are not IS professionals. The primary activities are those that are directly related to the performance of professional work. Depending on how purposeful they are, tool utilisation and support behaviour as secondary activities may or may not support professional performance.

Task-specific tool utilisation serves as a background operation for the execution of core tasks. Therefore, high levels of task-specific tool utilisation reflect high levels of computer usage in conjunction with core tasks. As task-specific tool utilisation is assumed to be an economic activity, it is expected to have a positive effect on job performance. More precisely, end-users who commit a lot of work time and energy to such EUC activities are expected to perform better than end-users who do not throw in the same amount of time and energy. Hence, the following hypothesis is offered:

H1: *End-users' task-specific tool utilisation has a positive effect on their professional job performance.*

Non-task specific tool utilisation refers to a type of utilisation that does not directly advance job performance. On the other hand, such utilisation has the potential of satisfying individual curiosity and a desire to explore things (Guthrie and Gray, 1996). However, our purpose is to investigate how non-task specific tool utilisation effects professional job performance. Non-task specific tool utilisation means using time to explore software facilities and functions and therefore reduces the time that could be spent on task-specific activities. As such, non-task specific tool utilisation is inappropriate because it consumes a lot of end-users' available work time and energy at the cost of more important, job related activities. Therefore, we expect that non-task specific tool utilisation, at least in the short run, would have a negative effect on job performance. The following hypothesis emerges:

H2: *End-users' non-task specific tool utilisation has a negative effect on their professional job performance.*

Support usage refers to the end-users' utilisation of intraorganisational sources in the event of hardware or software related problems. The most obvious measure of support usage is the *intensity* of search activities, i.e., the total amount of information acquired. However, support usage is not only a matter of information quantity. It is also a matter of diversity, i.e., the number of various sources from which information is acquired. Thus, there is a clear distinction between two dimensions of support usage, one related to the amount of information acquired and the other related to the end-user's choice between sources. In short, support usage can be expressed in terms of the *intensity* of search and the *direction* of search, respectively.

We believe that the direction of search is the most critical aspect of support usage. This is because we expect a one-source approach to be mainly directed toward colleagues while a multi-source approach includes a number of non-personal sources which tend to be quite time consuming to use. An end-user that simply asks a colleague or calls the company's help desk, normally gets a quick answer. On the other hand, an end-user who takes advantage of the help menu or acquires information in a "trial and error" fashion usually has to spend a lot of time before arriving at a solution. Our hypothesis is:

H3: *End-users' support seeking via non-personal sources has a negative effect on their professional job performance.*

As pointed out in the previous section, support behaviour is not only a matter of seeking support but also a matter of providing assistance to co-workers. Time estimates reported by Gibbs (1997) indicate that non-technical support providers spend from 4 to 10 percent of their time at work assisting co-workers solving computer problems. Therefore, providing support to co-workers consumes time at the expense of the support providers' own professional job tasks (Kirwin, 1995). A consequence, according to Gibbs (1997), is that the annual costs associated with using a PC could be doubled. Hence, there are good reasons to believe that support providers commit a lot of their work time and energy to support activities at the expense of their own professional activities. Therefore, we offer the following hypothesis:

H4: *End-users' provision of computer-related assistance to co-workers has a negative effect on their professional job performance.*

4. METHODOLOGY

The site was a large oil company with approximately 17,000 employees located in a Scandinavian country. By selecting one organisation, we sought to account for the potential impact of organisational factors, and thus, improve both internal validity and statistical power. The company has the stated aim of being a leader in utilising IT within all types of work processes. Consequently, over the last decade, it has invested a substantial amount of resources in its application portfolio and

IT infrastructure. As an example, the company was among the first organisations in its country to buy and deploy home computers for its employees, approximately 15,000 in total.

The company can be characterised as an IT-mature organisation. Personal computers have been used since the beginning of the 1980s, and at the time of data gathering, the ratio of computer to administrative employees was one to one. Accordingly, we expected sufficient variance in the independent variables, utilisation and support patterns, especially in view of the fact that we are dealing with a mature user context with a large number of end-users at various levels of the organisation.

Using a simple random sampling procedure, we selected a sample of 500 administrative workers. We excluded both IS professionals and managers from the sample set. IS professionals were left out because they are not real end-users by definition. Managers were left out because we did not expect that they would have time to fully participate. We thus sought to minimise the risk of unsatisfactory low response rate.

To collect the data, we developed a questionnaire. When feasible, the statements in the questionnaire were based on established measurements scales from the IS-research (see next section). Prior to administering the questionnaire, we tested and refined the measurement scales through semi-structured interviews and a subsequent pre-test among ten end-users in the company. The semi-structured interviews resulted in important insights and knowledge about the company's IT practice, application portfolio and end-users' support preferences. The pre-test led to some minor adjustments of the measurement scales. The process of scale improvement resulted in satisfactory content validity for all scales.

Questionnaire distribution and returns were by ordinary mail and 328 usable questionnaires were returned, for a response rate of 66 percent. Thirty percent of the respondents were women and the remaining 70 percent were men. The average respondent was 40 years old, held a university degree, and had 11 years of prior experience using computers.

4.1 Measures of Core Activities in EUC

A scale developed by Igbaria and Iivari (1998) was applied. The measure consists of four dimensions: actual daily use (time), frequency of use, use of different software packages, and use for different business tasks. The last dimension consists of eleven items and was consistent with the conceptualisation of task-specific utilisation.

No validated measurement scales exist for non-task specific utilisation. As mentioned earlier, however, the main feature of the concept is software exploration, i.e., experimenting with functions, menus and facilities in available software. Based on this, four indicators or items were formulated.

Two relevant and validated scales for measuring support usage were found in the IS literature (Bowman *et al*, 1993; Govindarajulu and Reithel, 1998). The main focus of these two scales differs somewhat. Bowman *et al* (1993) call the variable "Type of support preferred" and measure perceived importance of different kinds of assistance across a set of applications. Govindarajulu and Reithel (1998), on the other hand, call the variable "Support" and measure support received from a particular source in conjunction with different problem categories (e.g., hardware and data support). In our opinion, the former scale measures an attitude, not genuine usage, and therefore does not serve our purpose particularly well. The latter scale requires 23 items per source. If we include at least four sources, the probability of a low response rate will most likely increase considerably. Hence, none of these scales were found to be appropriate for our present purposes.

To measure the usage of various sources, a two-dimensional scale was developed. The first dimension is problem-related (technical vs. software) while the second is related to support source (IT expert vs. the help menu in the software). Semi-structured interviews with end-users, together with interviews with IS staff, revealed quite a few common support problems within the company. In addition, the interviews identified four common support sources: help desk, colleagues, help menus and "trial and error". Based on these insights, a measurement scale was developed (see Appendix).

No measurement scales exist for colleague support in IS-research. However, a measurement scale from research on opinion seekers (i.e. Flynn *et al*, 1996) was adopted and adjusted to the end-user context.

4.2 Measure of Job Performance

A subjective self-report of overall job performance was employed in this research. Self-reports of this kind are relatively easy to administer and have been used successfully in a number of research studies (e.g., Babin and Boles, 1996; Sujan *et al*, 1994). It is important to note here that all responses to the questionnaire were anonymous. Therefore, we will assume that end-user respondents had minimal motivation to inflate the ratings of their own performance. More on this issue follows in Section 7. Four indicators, based on Babin and Boles (1996), were formulated for the purpose of measuring job performance.

5. RESULTS

To test the four hypotheses presented earlier, data from 328 valid questionnaires were examined by structural equation modelling. In our analysis, a two-step approach was followed, as recommended by Anderson and Gerbing (1988). The first step includes the analysis of the measurement quality of the data. This step should be completed before the next step is carried out. The second step is the test of the hypothesised relationships between variables.

5.1 Measurement Quality of Data

The initial measurement model was evaluated using the guidelines provided by Anderson and Gerbing (1988). To meet the requirements of unidimensional measures, some items were deleted from the analysis. Deleted items are indicated in the Appendix with an asterisk (*).

Since the model has significant factor loadings for all the indicators (cf. Table 2), no cross-loadings, and no justified correlated error terms, the measures in the model have acceptable unidimensionality (Anderson and Gerbing, 1988). Accordingly, the re-specified model meets the requirement of convergent validity.

The reliability of the research instrument is assessed by three measures: item reliability, composite reliability and average variance extracted (Bagozzi and Yi, 1988). Table 2 presents the results of these three tests. Eight out of twenty-two item reliabilities were lower than the 0.50 cut-off value recommended by Bagozzi and Yi (1988), although all paths had significant T-values. Particularly, the support usage construct did not pass the 0.50 test. However, even if almost all items of the support usage scale missed the ideal cut-off value, one should be careful not to jump to conclusions.

It is in fact quite common to find that several measures of an estimated model have squared factor loadings below the 0.50 threshold. Particularly, when new items or newly developed scales are employed, a more suitable cut-off value may be 0.16 or 0.25 (Hulland, 1999). Additionally, the composite reliability tends to increase and, hence, measurement error decreases as the number of items in a combination increases (Churchill, 1979). The latter is evident if we regard the composite reliability value for the support usage construct, which is considerably above the 0.70 cut-off value recommended by Nunnally (1978). Therefore, all items for the support usage scale, despite "modest" item reliability, were kept in the model to maintain the domain width of the construct.

	Factor loading	T-value	Error term	T-value	Item reliability	Average variance ext.	Composite reliability
Task-specific utilisation:							
Item 2	0.60	11.54	0.64	12.09	0.36	0.52	0.86
Item 5	0.82	17.55	0.33	10.08	0.67		
Item 6	0.91	20.70	0.17	6.65	0.83		
Item 7	0.78	16.44	0.39	10.72	0.61		
Item 8	0.53	10.03	0.71	12.29	0.29		
Item 9	0.62	12.00	0.62	12.01	0.38		
Non-task specific util.:							
Item 1	0.90	20.41	0.19	7.72	0.81	0.77	0.91
Item 2	0.92	21.00	0.16	6.78	0.84		
Item 4	0.82	17.68	0.33	10.53	0.67		
Colleague support:							
Item 1	0.86	19.21	0.26	10.28	0.74	0.77	0.93
Item 3	0.83	18.11	0.31	10.88	0.69		
Item 4	0.90	20.67	0.19	9.00	0.81		
Item 5	0.91	21.27	0.16	8.22	0.84		
Support us.:							
Item 1	0.60	10.60	0.64	10.96	0.36	0.34	0.75
Item 2	0.76	14.22	0.43	8.30	0.57		
Item 5	0.63	11.35	0.60	10.58	0.40		
Item 7	0.48	8.16	0.77	11.83	0.23		
Item 8	0.50	8.71	0.75	11.67	0.25		
Item 10	0.49	8.40	0.76	11.76	0.24		
Job perfor.:							
Item 1	0.90	20.03	0.19	6.55	0.81	0.75	0.90
Item 2	0.85	18.29	0.28	8.97	0.72		
Item 3	0.84	18.19	0.29	9.08	0.71		

Table 2: Reliability information and test of convergent validity

Table 3 shows the correlations among the different constructs in the measurement model. Also, it reports the squared correlations. The right hand column in Table 3 shows the average variance extracted for each construct. A comparison of the average variance extracted against the squared

	Task-specific utilisation		Non-task specific util.		Colleague support		Support usage		Job performance		
Task-specific utilisation	1.0	–	0.33	*0.11*	0.38	*0.14*	0.23	*0.05*	0.47	*0.22*	0.52
Non-task specific util.	0.33[a]	*0.11*[b]	1.0	–	0.63	*0.40*	0.54	*0.29*	0.22	*0.05*	0.77
Colleague support	0.38	*0.14*	0.63	*0.40*	1.0	–	0.47	*0.22*	0.13	*0.02*	0.77
Support usage	0.23	*0.05*	0.54	*0.29*	0.47	*0.22*	1.0	–	0.13	*0.02*	0.34
Job performance	0.47	*0.22*	0.22	*0.05*	0.13	*0.02*	0.13	*0.02*	1.0	–	0.75

[a]: correlation   [b]: squared correlation

Table 3: Test of discriminant validity

correlation of the remaining constructs indicates adequate discriminant validity because each squared correlation is lower than the average variance extracted (Fornell and Larcker, 1981).

5.2 Test of Hypotheses

The results from the test of the structural model with its four relationships are shown in Table 4. Overall, this research does not provide empirical support for the research model as defined by the proposed hypotheses. However, all goodness-of-fit indices have values within the suggested margins for satisfactory fit. This suggests that the structural model makes sense.

Goodness-of-fit indices:
Chi-Square = 236.24 (p=0.036)
Degrees of Freedom = 199
RMSEA = 0.024, p(close fit) = 1.00
NNFI = 0.99
CFI = 0.99

	Task-specific utilisation	**Non-task specif. utilisation**	**Colleague support**	**Support usage**	**Squared Str. Correlation**
Job performance	0.48[a] (7.07)[b]	0.15 (1.80)	–0.15 (–1.98)	0.01 (0.15)	0.24
Significance level[b]	p<0.001[c]	p<0.05	p<0.025	n.s.	

[a]: Standardised regression coefficient. [b]: T-values. [c]: One-tailed test.

Table 4: Structural model

Three out of the four hypothesised paths have significant T-values. Task-specific utilisation has a significant and considerable effect on job performance (0.48, p<0.001), and is consistent with what was expected from Hypothesis 1. Non-task specific utilisation has a significant effect on job performance (0.15, p<0.05), but this effect was contrary to what we expected and, hence, the test does not provide support for Hypothesis 2. Colleague support has a significant but modest effect on job performance (-0.15, p<0.025). This finding supports Hypothesis 4. Finally, support usage seems not to have any impact at all on job performance (0.01, n.s.) and, hence, Hypothesis 3 is not supported. In summary, only Hypotheses 1 and 4 are supported. Our findings will be discussed in more detail next.

6. DISCUSSION

It is common within the IS field to regard use of software as the only aspect of end-user behaviour to have a direct influence on job performance. This study has demonstrated that this probably is a too narrow view and that it should be extended to account for the fact that EUC is more than just software utilisation. Our analysis produced several statistically significant relationships between the four core elements of EUC and job performance that lends support to such an extended view.

The positive relationship between task-specific utilisation and job performance supports the common beliefs within the IS field about the contributions of personal computing in job contexts (Pentland, 1989).

The positive relationship between non-task specific utilisation and job performance came out contrary to what we expected. Because of the unproductive nature of non-task specific utilisation, we expected it to be negatively correlated with end-users' professional performance. While there may be several explanations for our counter-intuitive finding, a particularly plausible explanation is that non-task specific utilisation stimulates learning processes and the user's level of confidence with computer usage (cf. Guthrie and Gray, 1996). This means that the exploration of facilities and functions in software leads to improved software knowledge which in turn may lead to more effective utilisation of software in the long run.

The negative relationship between co-worker assistance and job performance suggests that co-worker assistance may be a particularly ineffective support function viewed from a firm level perspective. Such a view is supported by time estimates that demonstrate that non-technical employees spend 4 to 10 percent of their time helping co-workers solving computer problems (Gibbs, 1997). Hence, this may be a very expensive support function, particularly if professionals such as economists or lawyers take on the role of support providers. Therefore, this kind of informal support consumes work time at the expense of the providers' professional task execution (Kirwin, 1995).

Overall, our findings shed light on how purposeful EUC activities may affect job performance. However, the findings should be viewed in light of prior writings on the productivity paradox[2], where PC usage circumstances like so-called “futzing” and “underground support” is seen as potential productivity obstacles (Gibbs, 1997; Kirwin, 1995; Guthrie and Gray, 1996). As discussed above, our data demonstrates that co-worker assistance may eats away at productivity benefits. Even if we should be careful with generalising such a finding, it demonstrates clearly that productivity obstacles may be present in some EUC contexts. In spite of this evidence, the question of how successful or unsuccessful this particular support function is may be dependent on the stakeholder’s you put the question to (Seddon *et al*, 1999). As an example, IS managers may look at help provider behaviour as synonymous with success, because this lowers the burden on the help-desk. On the other hand, line managers may look at end-users who take the role of support provider to coworkers as ineffective since the time taken away may be from their professional tasks. Hence, it may be that the latter is correct, i.e. as our data demonstrate, but replications are necessary to tell if the findings from our study also hold across different EUC contexts.

7. LIMITATIONS

The findings from the present study must be considered in light of the study’s limitations, in particularly the use of cross-sectional survey data. As is well known, the correlation design lacks the possibility to explicitly test directionality. However, this does not imply that the supported research model is completely devoid of support on causal relationships. Both the logic of the proposed theory and the application of SEM analysis provide support for causal relationships. In spite of this conclusive statements about causality cannot be made since alternative explanations cannot be ruled out. At least one cannot disregard the possibility of reciprocal interaction among the factors studied. Further research, in particular experimental and longitudinal studies, is clearly needed to address these issues.

A second limitation in our study is the measurement of self-support and non-task specific utilisation. We treated these two variables as unidimensional phenomena. Both may have a potential for further improvement. These variables may well be multidimensional in nature. For example, we defined non-task utilisation as unproductive time spent by users tinkering with software. This definition may be too narrow, especially since it ignores aspects such as utilisation of electronic mail for personal purposes or unproductive Internet surfing. Further research, in particular exploratory studies, is needed to address these issues.

[2] In this connection productivity paradox refer to the idea popular in the late 1980s that office productivity was not improving despite massive investments in desktop computing (cf. Panko, 1991).

A third limitation is connected to our use of a subjective self-rating scale of overall job performance. Self-reports of this kind may be biased. This is because the employees tends to only take into account the perceptions of what he or she does well, instead of making a general and more balanced judgement of his or her job performance (Behrman and Perreault, 1982). Another possible concern with self-rating scales is that people may tend to be overly generous when rating their own performance (ibid.). However, the administration of the questionnaire ensured that each end-user was anonymous, and hence, there are good reasons to assume minimal motivation among the respondents to give inflated ratings. To overcome potential weaknesses of subjective self-reports, future studies should focus on objective performance ratings (if possible), or at least other types of subjective performance ratings (e.g. using supervisors or peers as evaluators). Another angle of incidence may be to choose a more homogenous job sample (e.g. salespersons) and employ a job specific measurement scale (c.f. sales performance scale by Behrman and Perreault, 1982).

The omission of managers from our sample may limit the possibilities to generalise the results to the entire end-user community. However, replications are necessary to tell if the findings from this study also hold as a general theory across different categories of end-users.

8. CONCLUSION

This study offers a framework for our understanding of how core activities in EUC influence job performance. The empirical test of the proposed framework provides the basis for several conclusions and recommendations for the management of EUC in organisations. In sum, the message to managers would be that EUC is more than just straightforward utilisation of computer resources by individuals. They should be aware that EUC implies activities that may increase, as well as decrease, professional job performance. Managers should especially recognise that co-worker assistance might have a negative effect on the support providers' professional job performance. However, our knowledge about the effects of EUC is still too limited to draw clear conclusions and, hence, there is an obvious need for further research in this area. As indicated previous, it may turn out that our findings from one particular organisation are context specific and therefore not possible to generalise to other contexts. Furthermore, it would be interesting to know if the negative effects of providing support to co-workers may be influenced by computer training and better institutional support.

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APPENDIX: ITEM LIST USED FOR DATA COLLECTION

Task-specific utilisation: Compared with my colleagues I use my computer more frequently than them to: (1) Communicate with others*; (2) Plan various activities; (3) Identify problems/ alternatives regarding decisions*; (4) Look for trends/tendencies within my field of responsibility*; (5) Make revisions and control various circumstances; (6) Control and rule activities; (6) Make decisions; (7) execute budgeting; (8) Write documents, reports, and so on; (9) Make presentations*; (10) Schedule meetings*; (i.e. from "a poor description" to "an excellent description"; seven points)

Non-task specific utilisation: (1) I frequently experiment with the various functions in the software that I utilise (e.g. testing different layout alternatives in Freelance or WordPro); (2) I frequently try unknown functions in the different software packages that I utilise (e.g. the drawing function or the table function in WordPro/AmiPro); (3) I invest a lot of hard work in the experimentation of a suitable layout when I am writing a document in WordPro/AmiPro (or when I am making a presentation in Freelance)*; (4) I frequently experiment with the different menu facilities within the different software packages that I utilise; (i.e. from “a poor description” to “an excellent description”; seven points)

Colleague support: My colleagues: (1) Sometimes ask me about help in connection with their use of the computer; (2) Sometimes ask me about advice and ideas when they utilise one or more software applications*; (3) Ask me frequently about technical questions regarding their computer usage; (4) Use me sometimes as an adviser regarding their utilisation of the computer; (5) Regard me as a reliable information source when it comes to software usage; (6) Approach me frequently to obtain assistance regarding their usage of the computer*; (i.e. from “a poor description” to “an excellent description”; seven points)

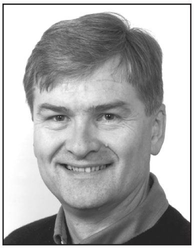
Self-support: What do you do when: (1) You don’t know how to send or receive an attachment through electronic mail; (2) You don’t know how to copy a table from word processing (or spreadsheet) to the presentation program Freelance Graphics; (3) There is enough paper in the printer, but you don’t receive any copy*; (4) your computer doesn’t boot*; (5) You don’t remember how to utilise a particular function (e.g. the table function in WordPro/AmiPro); (6) You don’t get access to a file or a catalogue in Lotus Notes*; (7) The mouse doesn’t work, e.g. you press the button and nothing happens; (8) You wish to auto-correct a word in WordPro/AmiPro, e.g. you wish that “sumer” should automatically be corrected to “summer”; (9) You wish to delete documents or catalogs that you don’t need any longer*; (10) You wonder how a software package (e.g. a spreadsheet) can be used to solve a new problem (e.g. a “what if” analysis); (11) You receive a document as an attachment through electronic mail, and run into problems with converting it to your own word processor*; (i.e. get in touch with the help-desk, get in touch with a coworker, utilise the help facility in the actual software, experiment on a solution)

Perceived job-performance: Compared with my colleagues: (1) I am more productive than the most of them; (2) I manage my work time in a more efficient manner; (3) I am more focused on the job I perform; (4) I invest more effort in doing my job as well as possible*; (i.e. from “a poor description” to “an excellent description”; seven points).

BIOGRAPHICAL NOTES

Øystein Sørebø received his PhD in strategy and management from the Norwegian School of Economics and Business Administration, Bergen, 2000. He is currently an associate professor at the Faculty of Education in Business Administration at Buskerud University College in Hønefoss, Norway. Dr. Sørebø’s main research interest is in end-user computing and information systems success. His publications are found in conference proceedings including IRMA International Conference and European Conference on Information Systems. His professional memberships include IRMA and AIS.

Øystein Sørebø



Gunnar Christensen

Gunnar Christensen holds a Ph.D. in Management from University of California, Los Angeles. He is currently associate professor of Information Management at the Department of Strategy and Management, Norwegian School of Economics and Business Administration (NHH). Christensen has extensive teaching experience from NHH, University of Bergen, University of California at Irvine and Warsaw University of Technology. Christensen has been the principal investigator or co-investigator of projects financially supported by The Research Council of Norway, EU/ESPRIT, and the OECD, among others. He has consulting experience from private and public enterprises on IT, strategy, organisation, implementation, change management, business process reengineering, and electronic commerce/business.

Tom Roar Eikebrokk

Tom Roar Eikebrokk received his Ph.D in strategy and management from the Norwegian School of Economics and Business Administration in 1997. He is currently associate professor in information systems at Agder University College in Kristiansand, Norway, where he teaches evaluation of IT investments, business process management, and health informatics. Dr. Eikebrokk's main research interests are information systems success, e-business, and adoption of information systems. His publications can be found in conference proceedings including IFIP and European Conference on Information Systems. His professional memberships include AIS.