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2009

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On-line support - a virtual treasure trove for end-user developers in small organisations?

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ABSTRACT

End-user development of spreadsheet applications or models is both a problem and opportunity for small organisations. In an educational programme aimed at small-business owners, we have observed the problems end-user developers in small organisations are facing. They lack essential basic computer skills, yet when they have been taught these they will soon find that their ideas for further development outstrip their actual skills. The problems are similar to those that other end-user developers face with one additional factor: in small organisations access to the traditional sources of support are limited or even nonexistent. In an explorative study we try to pinpoint what, if anything, the participants feel about on-line support and if they use it to solve problems. It seems that in this case while Internet is recognized as a source of information for work related problems this does not extend to computer related problems.

Keywords

End-user development, support, community of practice, SME.

INTRODUCTION

Small-business owners (SBOs) need access to information systems to support their daily work allowing them to focus more on important tasks, such as developing their businesses (Packalén, 2008). Often there are no suitable solutions, or they are not aware of any so they will adapt something they know to do the job instead. In most cases SBOs will have access to basic software such as office suites e.g. Microsoft Office or similar packages. Thus SBOs need support that would allow them to utilize these better, e.g. learning to create templates for billing or simple analysis models for budgeting or inventories. How can SBOs get help with the creation of such templates and tools? SBOs do not have the same access to traditional support methods as employees of larger organisations do. One solution is going to the SBOs and teaching them how to use the tools. This is very resource intensive and support cannot be made available indefinitely this way.

In the fall of 2007 a research institute at a Finnish university conducted an educational programme (the Project) aimed at SBOs and municipal employees, in two municipalities in the Finnish archipelago. The original objective was to give the participants insights into and practical skills in new mobile and web-based technologies. However, it was found that they lacked basic computer skills, so the objective was altered and instead focused on teaching the participants to use the Microsoft Office package. Additionally further instruction concerning specific software was made available. The majority of the inquiries regarded Microsoft Excel, which suggests that enhanced spreadsheet knowledge and skills are important to SBOs. All in all, there were 17 SBOs taught as well as 18 municipal employees. The SBOs were from various industries ranging from farming to graphic development. Most however, were from the tourism industry, as it is a major part of the economy in the Finnish archipelago.

During the Project we noted how SBOs would quickly outstrip their development skills in seeing possibilities for improvement in efficiency and automation. E.g. having created templates for invoices and bills in Excel SBOs wanted to connect these together instead of copying or manually typing the information from one into the other. This shows how incremental development can turn a simple idea into fairly advanced information systems. Often without the developers realising how advanced what they are trying to accomplish actually is. However, the (now) end-user developer will just as quickly run into stumbling blocks. Creating an interface and some basic calculations in Excel is easy; trying to take the next step can be insurmountable. There is a need for a method where the SBOs can access the knowledge they need in a cost and time effective manner. We believe on-line support can be a solution.

The aim of this paper is to explore how these potential developers viewed different sources of support. We also want to investigate whether the possibilities of Internet support was recognized among this segment of users. Our basic assumption is that users would turn to the Internet, but it seems lack of computer knowledge can be a key limiting factor. People would need to be comfortable with computers and using the Internet and search engines (Liaw, 2002). As was show in the Project, the participants had a limited computer literacy. We wanted to find out if the participants recognized that the Internet was a source for information they could use. Our research questions are as follows: what are the current modes of support among SBOs, do they recognize Internet as a potential source of support? If not, what issues need to be solved?

While we refer to end-users in a wider more general setting in some instances, the emphasis in this paper is on SBOs and members of small organisations working as end-user developers. For the purpose of this paper the end-user developers (EUDs) are considered novices in the chosen tools, often also to computing in general. While no assumption was originally made in regards to development tools used, in practice in this paper end-user development (EUD) means creating spreadsheets in Microsoft Excel.

The structure of the paper is as follows: next we will describe EUD support briefly, and then we discuss Communities of Practice, followed by a section on EUD and Internet. After that we describe our study and discuss the results and some implications for on-line support which are then summarized in the concluding section.

SUPPORT FOR END-USER DEVELOPMENT

Traditionally support for end-users is divided into two categories: formal and informal support. Formal support consists mainly of help from an IT department and the helpdesk. Other formal support include manuals or vendors. Informal support usually consists of a user's social network in the form of colleagues or friends and family. Additionally one should consider local IS/IT staff, a practice sometimes referred to as super users, power users or similar connotations. This form of support can be formalised to various degrees, often combining some of the best aspects of formal and informal support. Local IS/IT staff are people from the IS/IT departments placed in various other departments or business functions to provide local support. The so called super users are people who as part of their work tasks provide support for other people, as they are recognized experts e.g. on certain applications (Nardi, 1993).

The main problem in the context of SBOs is that they have few formal support methods to turn to and what little they have is not always suitable. There is usually no helpdesk available for micro enterprises or other small organisations. And the availability of vendor support tends to be limited, mainly as manuals and in-system/application help. While in a wider context colleagues or local IS/IT support has had some success from a satisfaction perspective few small organisations have the mass or resources to support either.

Manuals and in-system help can be technically oriented and can require an understanding of programming to correctly apply, e.g. the VBA language help found in Microsoft Office. Also in-system help function examples are often generic and brief. End-users may have troubles adapting examples for their own use, something we noticed during the Project. As does Ko and Myers (2005) regarding end-users' adaptation of example code.

It cannot be expected that SBOs will be able to rely on their social network for technically reliable advice in all situations. It is likely that it will be on par with the user in terms of knowledge. This is an important issue as the social network can be their only source of support.

The requirements for support seem to vary by the characteristics of the users themselves. Some users, presumably less knowledgeable users, will emphasize friendliness and good communication skills while others, possibly the more experienced users seem to favour a high degree of knowledge. This seemed to be the case in (Mitrusevska and Pettersson, 2005). Also such factors as gender and computer self efficacy are likely to influence the choices of support source (Nilsen and Sein 2004). Proximity, both mentally and physically, to the user is also an important factor (Mitrusevska and Pettersson, 2005; Nilsen and Sein, 2004). Considering formal support requirements differ according to characteristics of users these requirements will be important for determining the effectiveness and desirability of on-line sources of support.

COMMUNITIES OF PRACTICE

A definition of Community of Practice (CoP) is, according to Lave and Wenger (1991) an activity system that brings together individuals who are united in action and in the meaning the action has for them and for the larger collective. A CoP is described as an entity having an informal structure, based on the connections that exist between the members. Lave and Wenger highlights shared problems and areas of interest as key to a CoP. This also corresponds in great detail to definitions

of Virtual Communities, which usually mention a common objective or background as the basis for the Virtual Community, see e.g. (Rheingold, 1993; Hagel and Armstrong, 1997). Success factors of a CoP are, according to Ardichvili, Page and Wentling (2003) its members' willingness to both contribute to the community and its knowledge base and their willingness also to use it as a source for information and knowledge.

In this paper we will use the term CoP as the general term for communication and collaboration utilizing the Internet, whatever communication media or tool used. A CoP can be formed in the real world as well as virtually. We do not propose either way as the norm, other than suggest the suitability of CoPs. However, the virtual CoP has potential of being an effective way of reaching experts, as SBOs are affected by various boundaries. E.g. in the Project physical boundaries were important due to the geography of the archipelago.

The participants of the CoP will have a common interest as the definition of CoP states. However, the participants usually have slightly different approaches, as a result of having different backgrounds and possessing different knowledge, connections and expertise. This interplay of competences is essential to CoPs (Wenger, 2000). Another potential with CoP include that a knowledge base, highly accurate and rich of information, presumably can be produced when a critical mass collaborates in the creation. In a utopian CoP, everybody should be able to focus on what they know best, and contribute with this knowledge, while receiving help with other, less familiar topics.

Ardichvili et al. (2003) mention that people, experienced with a CoP, have learned who is knowledgeable about what and can pinpoint questions to that expert. This increases the chance of getting accurate answers by relatively short notice.

END-USER DEVELOPMENT & INTERNET

We believe the potential of the Internet sources in providing help for end-user development are considerable. Especially on-line discussion forums can have a significant impact on the end-user development, by providing accurate and adequate support for EUDs. Such on-line discussion forums, focused around a specific topic are CoPs. The CoP has several characteristics that are suitable for EUDs especially in the SBO context. It can also compensate to some degree for the education that we found SBOs needed during the Project.

Internet as a source of support

Many people use the Internet for help and information (Estabrook, Witt and Rainie, 2007). Thus it should form a recognized source for information and even support on various topics. This is suggested by the many Internet forums where a variety of people come to together to discuss a multitude of subjects. EUDs will probably not differ from other people in this regard and Ko and Myers (2005) mention EUDs using the Internet as a source of support. Thus we expect that EUDs will look to the Internet for help, whether they are SBOs or part of a larger organisation.

Internet as a source of support can be important in bridging the gulf of knowledge separating many end-users from what they need to know. Research within end-user spreadsheet development shows a lack of knowledge and understanding about the dangers and problems inherent in this activity among many EUDs, e.g. (Panko, 2007). Since search engines range far and wide users are bound to find information they didn't know they needed. However, recognizing it and actually applying it remains an issue.

All traditional sources of support in one form or another can be found on-line. Formal support would include software libraries and vendor sites, while informal support is mainly represented by the different kinds of CoPs. Manuals and technical information as well as software (if applicable), are increasingly found on-line. The helpdesk can be found on-line in many companies. And finally family/friends/colleagues can be reached on-line or take the form of a virtual community. Part of the strength of the Internet as a medium for support is that it contains something for nearly everyone.

The first and probably the most important step of getting support through the Internet is usually the search engine which forms a natural starting point for any information retrieval. As EUDs need to find information this most likely means involving a search engine.

For the end-user, context is important as often the grasp of the development environment can be lacking. EUDs often know what they want to do, but are constrained by the how. As the development effort is often a secondary activity to the end-user, attention is not focused on the specific implementation used by the environment (Ko and Myers, 2005; Nardi, 1993). Formal support methods, foremost manuals and software help functions, rarely provide context to the help, when they explain how to implement a function to print text it will be done as an isolated example. Some formal support methods can require a fair amount of previous knowledge to apply correctly. Any example code will most likely need to be modified to fit into an user

developed application, which is something EUDs are not very good at (Ko and Myers, 2005). Context is also important as a motivating factor. An end-user developer will need to be able to recognize a future benefit so as to motivate the development effort (Blackwell and Green, 1999). Another aspect of context is that creating the application has little value in of itself; the end-user exerts the effort primarily for whatever value can be gleaned from its use.

Nardi, in conjunction with other researchers, presents the importance of cooperation for successful development in spreadsheets and other EUD. These findings show that developing spreadsheets is often a collaborative work effort rather than individual effort. (Gantt and Nardi, 1992; Nardi and Miller, 1990; Nardi, 1993)

In both (Nardi, 1993) and (Ko and Myers, 2005) the importance of interactivity in end-user development is mentioned. The developer can see what happens as they are not very good at anticipating actions occurring in the future. Arias, Eden, Fischer, Gorman, and Scharff (2000) note the importance of the ability to act for EUDs. Also in (Ko and Myers, 2005) the users' wish to act or react to the situation at hand is mentioned. These factors (listed in table 1) are all in one form or another available in various support sources found on-line. However we have found that one source seems to show more promise than the others: Internet forums, a form of Community of Practice.

Factors important in end-user development	Papers discussing the factors
Context	(Blackwell and Green, 1999)
Cooperation	(Ko and Myers, 2005; Nardi, 1993)
Interactivity	(Ko and Myers, 2005; Nardi, 1993)
Immediacy	(Arias et al., 2000)

Table 1. Important factors for EUD where Internet sources can be especially influential

METHODS AND RESULTS

The study was conducted as a questionnaire with both open-ended and multiple-choice questions and sent to all participants in the Project. Two sets of questionnaires were sent, one to entrepreneurs and the other to the employees in municipalities. They were functionally identical only certain wordings were changed to reflect the difference in recipients. In total 35 questionnaires were sent, 17 to SBOs and 18 to municipal employees. The initial response rate was 53% for SBOs and 61% for municipal employees. One response from a municipal employee was discarded so the final response rate was 56%.

We asked respondents to mark sources they use for solving work-related problems, and the same question was asked with regards to computer-related problems, results listed in table 2.

For problems related to work/computers, I…	Work-related problems*	Computer-related problems*	Factors supported†
…ask someone I think can help	79%	79%	C,Co,In,Im
…search the Internet	58%	21%	C
…use trial and error	26%	47%	In,Im
…look on an Internet forum	16%	16%	C,Co,In,Im
…look in books	11%	16%	Im
…use the windows/application help function	N/A**	26%	In,Im

*percentage adds to more than 100% as multiple answers were possible; **question was not asked in conjunction to work-related problems; †C=context, Co=cooperation, In=Interactivity, Im=Immediacy

Table 2. Percentage of users that said they used a certain source of support

Personal contact was the most popular source of support with 79% mentioning it. Though one weakness is that we can't say how often personal contact is used compared to others, as respondents were only asked if they use a certain mode of support

or not. This needs to be accounted for in the future. The other problem is helpdesks. We did not know that some of our sample included employees of a small local branch of a national bank. These all mentioned contacting the bank's helpdesk for computer related questions. Nor did we expect these small municipalities to have a helpdesk. Yet it seems that the employees at least one of the municipalities may have had access to some sort of tech support/helpdesk function as at least three persons mentioned calling "this person who knows everything and helps us". Thus at least some of the personal contacts are helpdesk related. Personal contacts have aspects of all the factors in table 1. They are cooperative and interactive, and answers can be gotten immediately. It is also possible to apply context to the problem at hand when explaining it in person. In that light it is unsurprising personal contacts are so popular.

We find it encouraging that 58% used Internet for work-related problems, as it suggests they at least recognize that various types of information can be found on-line. It is however interesting that so few rated Internet the same for computer-related problems. It seems trial and error and the system/application help is used instead of checking on-line and presumably the existence of helpdesks explains much of this for those that had one available. Perhaps some explanation can be found in trial and error being an immediate and interactive approach whereas searching the Internet is more time consuming and static. The responses indicating time and effort as limitations certainly indicate this. One respondent mentioned not knowing how to find help on the Internet, and expecting it to take too much time to figure it out would call someone who could help instead. On the other hand one of the most computer skilled respondents was instead very Internet savvy and used forums and search engines frequently to solve problems, mentioning the following: "on forums you can find someone who has had the same problem and usually a solution". While Internet searches would provide context it seems other factors have more weight in this situation. On the other hand it cannot be said trial and error lacks context as any trial and error will be performed on the artefact being developed.

Clearly factors are influencing the user's choice to find support for a computer related problem from other sources than those on the Internet. This could be a result of the users' generally low to average computer skills. In (Mitrusevska and Pettersson, 2005; Nilsen and Sein, 2004) it seemed less experienced user favoured personal contact. Some respondents indicated a lack of skill as a reason for not using Internet sources.

The existence of a helpdesk for many of the respondents clearly is an incentive not to try and solve problems for themselves. Six persons stated they had used Internet for solving computer related problems, but didn't say anything beyond mentioning that they had managed to solve their problems. 12 reported they had not used Internet for this and of these, one respondent mentioned the helpdesk while three mentioned lack of interest, knowledge and especially lack of time as a reason for not using the Internet. These three respondents made the connection between time spent finding solutions versus the ease of calling someone they expected to solve the problem. Thus it is likely municipal and bank employees had less incentive to find other methods of support. Indeed, only 1/14 did search the Internet for computer related problems whereas 4/5 SBOs had used a search engine or Internet forum to find a solution. This suggests that EUDs could be more likely to turning to Internet sources as they lack formal sources.

Interpreting the survey results in light of the factors in table 1 we suggest the following. The popularity of personal contact indicates that cooperation and interactivity in the support process is important. It also ties in with context. Several responses expressed the sentiment that it was "easier to explain things to someone". The importance of timeliness to some respondents suggests immediacy will be important.

Answering our research questions we find that SBOs use personal contacts to a large degree for all types of problems. The other common support sources were the Internet and trial and error, though used in an unexpected way. Internet is not used for computer problems and it seems SBOs fall back on trial and error instead.

COMMUNITIES OF PRACTICE – POSSIBILITIES FOR END-USER DEVELOPERS

Our view is that CoPs, i.e. Internet forums, by supporting the factors important to end-user development, can be a very important source of support, both in general and in the context of SBOs. CoPs can be an effective tool for problem solving, enabling, in theory, anyone to receive help from experts specialised in specific areas (Ardichvili et al., 2003). CoPs come with the benefit of being interactive and potentially intelligent. As they are formed by actual humans the CoP will be able to interact with the EUDs in need of support. This helps counteract one of the biggest problems with many support methods, applying knowledge in the context appropriate for EUDs.

One of the strengths of a CoP is the interactivity which means EUDs can go through several iterations to solve the problem or refine the solution often while still working on a spreadsheet. The interactivity also enables a form of cooperative development, which is considered a key activity in end-user development (Gantt and Nardi, 1992; Nardi and Miller, 1990).

This interactivity also support immediacy, EUDs can get help and feedback almost immediately, at least in theory, to their specific problem. Personal contacts and timeliness both seemed to be important to our respondents.

Nardi and Miller (1991) mention more advanced users contributing code to less experienced users, thus teaching less experienced users. In their example this happens inside the same organisation. However the CoP extends this behaviour outside the boundaries of the EUDs' immediate environment allowing a much broader base of experts to be contacted easily. Ko and Myers (2005) mention these "informal apprenticeships", and suggest that systems could help users and experts to come together. The CoP performs exactly this function, yet it avoids the need for specialised software and agents, allowing for an easier and more anonymous first contact with a CoP.

A CoP is also able to provide context, working with the EUDs real problem which was important to the Project's participants. As one respondent noted, it is possible to find someone who has already experienced the same problem on-line. Also, during the Project problems were usually framed in the context of the developer. While the EUDs vocabulary might not be the same as that used on the CoP, at least initially, the interactive aspect allows the EUDs and CoP to work towards a common understanding of the problem (Arias et al., 2000). Unlike some formal support methods, e.g. books and manuals, that are static in their information content, the CoP has a living knowledge content (Wenger, 1998), which can also adapt to the EUDs specific context. In this way context is very much present and this task specific help will likely be very useful for EUDs. The CoP has features which support all four important factors, i.e. context, cooperation, interactivity, and immediacy. It also supports them concurrently, providing much of the same benefits as having an actual co-developer present.

LIMITATIONS

Limiting factors include the small sample size and that all participants live in the same geographic area which limits generalization of our findings. In the archipelago means of communication, both physical and telecommunication (including Internet) are less developed than on the mainland. This means the usage of Internet is potentially lessened due to technical barriers.

We didn't explicitly ask for end-user development related problems as at this stage we wanted to explore how well people connect problem searching and computer related problem searching to on-line sources. Also for many of our respondents this would have been their first contact with any kind of end-user development activities.

DISCUSSION

There are many end-user developers (EUDs) who are in need of support. We believe that Communities of Practices (CoPs) found on the Internet have the potential to play an important part in providing support for EUDs. Examining the literature on end-user support and development we have identified several factors important to EUDs. We propose that CoPs fit many of these aspects and should thus be well suited to providing support.

Having worked with several rather inexperienced computer users, who nonetheless were working hard at development activities, we conducted a survey. It suggests that despite using Internet for some problem situations this does not extend to computer related problems. We have some possible explanations for this, namely helpdesks and the low skill level of the users. Among the small-business owners, who did not have a helpdesk, Internet was used more often for support. However, there are other potential barriers as well, such as language and the vocabulary problem.

It is puzzling that the seemingly well suited CoPs were not used more for support by the respondents. We intend to further investigate the link between users' characteristics and ability to use on-line sources of support to determine why some use on-line support and others do not. And more specifically what CoPs can and can't bring to the equation.

ACKNOWLEDGEMENTS

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