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# End-user Support: A Necessary Issue in the Implementation and Use of EPR Systems

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**Abstract**

*A successful integration of an IT-system is dependent not only of the quality of the information and the user interface features of the system but also of the organizations ability to support the users learning process. As IT is becoming more and more pervasive in the Health Care sector as such there is a need for a systematic approach to the question on how to support end-users. Based on an empirical study of an implementation process in a Danish Primary Health Care Services the concept of end-user support is discussed and it is argued that there is a need for a distinction between different kinds of support depending of the type of activity involved. First the organizations strategy for learning when the system was implemented is described. The evaluation of the learning strategy revealed that there was a need for different kinds of knowledge involving qualitatively different kinds of learning. Second the area of end-user support is discussed and it is argued that the common understanding of end-user support as something provided by DP staff, vendors or manuals are to narrow. Third a more differentiated way of thinking of support that link the need for different kind of knowledge and learning processes to different kinds of support is proposed. Finally Activity Theory is put forward as a possible basis that provide the opportunity of discussing issues belonging to different kinds of end-user support within an integrated framework.*

***Keywords:***

End-user support; Human-Organizational issues; Electronic patient record systems

## Introduction

The work described in this paper is conducted within the framework of a research project, SIOL (a Danish acronym for HealthCare Professionals, Information Technology and Organizational Learning) at Aalborg University. SIOL is included in and financially supported by a Danish national research program "Human resources I working life". As a part of the SIOL project we have cooperated with the IT office for Primary Health Care Service in the city of Aarhus, Denmark. The IT office had the responsibility of implementing an electronic patient record (EPR) system aimed at obtaining a higher level of documentation, a stronger control of the resources, and a better communication between different part and different groups of personnel in the organization. The Primary Health Care Service in Aarhus is organized in 37 local units and all in all about 1500 people had to learn to use the EPR system. The IT office developed a learning strategy that would support the health care personnel in the learning process. We conducted an evaluation of the learning strategy in order to explicate whether the users need for knowledge and support were fulfilled by the strategy. The evaluation is described elsewhere [1, 2] and in this paper I will, with an outset in result from the evaluation, focus on the more general discussion of the end-user support needed in an health care organization relying heavily on the use of information technology. End-user support has traditionally been focused on making people understand the functionality of the system. The focus has been on supporting the initial learning process and on manuals and documentation. This is of course important but in our investigation of the learning strategy used by the IT office in the Primary Health Care Service in Aarhus we found that learning the functionality of the system was only the first step in the learning process. As IT is becoming more and more pervasive in the Health Care Sector as such there is a need for a systematic approach to the question on how to support end-users. I want to contribute to this necessary discussion by proposing a framework for dealing with problems in end-user support. I start by summing up the study from the Primary Health Care Service in Aarhus.

## Case study: evaluation of a learning strategy

The Primary Health Care Service in Aarhus is organized around 37 local units and the main purpose with the EPR system is to improve the documentation, communication and the control over the resources. A system and a vendor were selected. The IT office of the Primary Health Care Service worked together with the vendor in customizing the system. The customizing work consisted of e.g. the development of 30 use cases and of a development of a common language to describe both the services and the needs and abilities of the individual person. This work was

conducted in close cooperation with representatives from the 37 local units. Thus a lot of people working in the Primary Health Care Service were involved in customizing the system.

***The learning strategy***

About 1500 persons had to learn to use the EPR and the IT office decided on a highly decentralized learning strategy. Thus each local unit was asked to select among themselves a teacher and one or more persons to act as local experts and sparring partners for the teacher. The teachers and the local experts then participated in a 3 days training program arranged by the IT office. At the first day the future teachers and local experts were given a general introduction to the EPR system and some exercises in using it to set up a journal for a client. Then there was a period where the participant were supposed to work on their own and for this purpose an exercise database was set up, the so called Donald Duck base, to allow the future teachers and experts to get more familiar with the EPR. After one week the trainees were gathered again and this day was organized around questions from the participants based on their experiences with the exercise database. The third day was for the future teachers only. Half of the day was used for introducing and discussing how to teach and the other half for planning the training program that each teacher had to set up for the staff in their own local unit. Besides from this activity, to educate a group of people who could educate the rest, the IT office recommended the local units to allocate some time for the personnel in the Primary Health Care Service to try to fill in a paper version of the EPR system before it was implemented. These paper versions of existing records then functioned as the outset for using the system when it finally was applied.

***The evaluation***

In our evaluation we used an explorative and qualitative approach, as we first of all wanted to identify the kinds of learning processes and the types of knowledge the staff in the Primary Health Care Service needed in order to be able to use the EPR. Only after identifying the needed knowledge we could examine to what extend the learning strategy planned by the IT office actually provided the staff with that knowledge. To get some background information of both the customizing process, the implementation process and the learning strategy we conducted 2 interviews with the person responsible for these matters at the IT-office. We participated as observers in the above mentioned 3 days training program and we conducted interviews with 5 representatives from different groups of personnel all belonging to the same local unit. The purpose of the qualitative interviews was to gather as rich and differentiated a description as possible of each individuals understanding, experiences, and expectations to the EPR. In our questions we focused on the contextual *when* and *where* issues trying to relate the customizing and implementation of the journal to the individuals everyday working life. Other questions concerned the interviewee role in the customizing and implementation process and the knowledge end experience with computers. We also tried to identify problematic moments and particularly difficulties experienced by the person interviewed. The interviews revealed different reflections and perspectives on the EPR. In our interpretation of the interviews we especially focused on what kind of knowledge the interviewee had on the EPR, how they had obtained it, what they found was difficult, and how they solved the problems they encountered.

***The results of the evaluation***

On the basis of our investigation we suggest that a successful use of the EPR system involve 3 qualitative different knowledge types: Object knowledge, tool knowledge and praxis knowledge[1].

**Object knowledge** refers to a concrete knowledge concerning software and hardware. It is an explicit, rule based, factual knowledge of the device. It is general knowledge, independent of time and place and it is very suitable for teaching in courses and for distribution through manuals.

**Tool knowledge** refers to skills in using the electronic journal, which is to say not only knowing the functionality of the system but also knowing how to use it properly in a work situation. The EPR system reflect the work in the health care sector in new ways and the personnel have to integrate these new ways in their ordinary working praxis. This integration process is obtained by exercises, experience with the tool in everyday working situations, and by peer learning.

**Praxis knowledge** refers to the values, norms, and criteria for proper use that have to be developed in the organization. It is about concrete actions and the day-to-day construction of reality in the organization. It is about developing the organization and the basic ideas about how to deliver good care in continuity with already existing knowledge, values, and goals. Praxis knowledge is found on all levels in the organization but often as an implicit, tacit kind of knowledge and only discussed explicitly at the management level.

To sum up the 3 kinds of knowledge can be understood as answers to different kinds of questions to the EPR. Thus object knowledge is about **what** the system can do, tool knowledge is about **how** to use the new artifact properly, and praxis knowledge is about **why** you should use the EPR to deliver good primary health care. I am going to use these different questions to propose a more differentiated discussion of the concept of end-user support.

## End-user support

Traditionally IT staff has provided end-user support, which in a way is natural as it is obvious that support requires

[1] The knowledge types are inspired by Aristotle's distinction between episteme, techne and pronesis knowledge. This is further elaborated in [1, 2].

some technical understanding of the system. That kind of support is typically focused on what the system can do, what kind of functions the system provide, how to use the interface, in short how to help the user understand the conceptual model of the system.

This understanding of end-user support is too narrow for several reasons. One reason is because end-user support is not primarily about helping people understand the system but about helping people further their goals. The possible goals of the users are not foreseeable by the designers and implementers or even by the users themselves. Another reason then is that a system should not be understood as something in it self and independent of the use of it. Systems are dynamic and shaped by use - support most somehow embrace this dynamic aspect of system use.

One way of focusing on end-users need in contrast to the functionality of the system was proposed by J.M. Carroll and his group, who in the mid 1980s, investigated more informal and exploratory modes of learning. Initially they analyzed the learnability of office systems in situation where novice users were given no training or coaching. They discovered that most users were willing and able to learn by exploration, but also that novices attempting to explore a totally new system often made major and unrecoverable error [3]. Carroll proposed a **minimalist approach** to training that is characterized by focusing on real task, reduction in the written learning materials, and support for error recovery and recognition. Besides the minimalist training model is meant to maintain high motivation, promote active learning and make the environment safe for the learners in the sense that they can try out features without making real errors. The approach showed highly successful in bringing new users to speed up the learning process and many users expressed a preference for this kind of guided exploratory learning [4]. The minimalist training model emphasizes the necessity to build upon the learners experience and it grew into a framework for the design of instruction, especially training materials for computer users [5].

Another approach also aimed at helping users to achieve their goals is the **gardening approach**. Whereas the minimalist approach are particularly helpful in focusing the initial training program and the manuals and documentation the gardening approach concentrate more an the need for continuous support thus including the dynamic aspect of system use. To understand user support, as gardening is an idea that comes from Bonnie Nardis study of use spreadsheet and Computer Aided Design systems [6]. Nardi argues that in settings where a program is widely used local developers seem to emerge spontaneously. Local developers are domain experts who have a natural affinity for computers and develop deeper expertise in specific application programs. Gardeners then are local developers or super users that are given recognition, time and resources to support their fellow employees so that they can perform as effectively as possible. An important characteristic is that gardeners work in the domain and know the frustration and problems of the work from the inside. Gardeners should posses both technical and social skill and be able to provide a bridge between system administrators on the one side and workers in the domain on the other side. In an ethnographic study of how IT technical support people work Christiansen also use the metaphor of a gardener [7] and in her study she specifies it even further by describing the work of the support people in four distinct areas. Thus, there is the area of cultivating the technical equipment, program and infrastructure, the area of nursing users, the harvesting area which is concerned about presenting high quality product, and finally the composting area which is making sure that parts of all kinds are kept for potential reuse. Both Carroll and Nardi and Christiansen's conceptions of end-user support are suggestions to answers to the **how** question.

As for the third question, the **why** question, we move form the tool perspective, understood as device-used-by-an-individual-to-get-something-done[2], and to a level that explicitly include the meaning of the collaborative work practices, why this something had to get done. I call this the **collaborative development approach.** This approach is about using the technology in the further development of the organization and the organizations knowledge, goals and values. The support needed at this level has to do with understanding the implementation of an IT system as an organizational change process and in general there should be a close relation to the management level.

***Different levels of support***

I suggest that user support consist of 3 distinct but interrelated activities, as answers to 3 different kinds of questions: The what, the how and the why question.

The question of what the technology can do represent the traditional approach and the typical form of support is manuals, help functions and courses given by the IT staff. The focus is on understanding the structure of the system, the interface and the functionality and it is often expressed as step-by-step instruction.

Support on how to use the technology is represented by the gardener approach mentioned above. An important characteristic of this kind of support is that it operate from "the inside" and is carried out by people who come from the domain themselves or know the work in the organization very well. The focus is on how to use and solve problems with the tool in the work situation.

To work with the technology in the broader context of the meaning and development of the collaborative work demand another kind of support, a kind that is enabling for instance the constructions of new tools, the reorganization of the work, the negotiation of rules and norms, and learning and reflection with respect to the whole work situation in the organization.

[2] This formulation is borrowed from Bonnie Nardi who use it in an explanation of the tool metaphor in [8]

*Table 1- Different Kinds of support*

| Learning need: | Kind of support: |
|---|---|
| What can the system do | Focusing on the functionality of the system.<br>Courses, manuals, step-by-step instruction |
| How to use the system | Focusing on user experience and motivation.<br>The minimalist approach<br>The gardening approach |
| Why use the system | Focusing on values and purpose<br>The collaborative development approach |

In table 1 the end-users different learning needs is linked to the corresponding kind of support.

**Activity Theory as a framework for end-user support**

The distinction between the 3 questions corresponds to the distinction between different levels in human practice identified within the framework of activity theory. Activity Theory has gained a lot of interest in the area of human computer interaction lately [9]. It is a framework for studying different forms of human practice as developmental processes, where both the individual and the social level are interlinked. Work is understood as a goal-directed activity, driven by needs and mediated by artifacts.

A key idea in activity theory is the idea of mediation by artifacts. Mediation can be understood as way of representing how history and culture, through artifacts interact with the present and affect human action. The term "artifact" includes both tools and symbols that are both abstract and physical entities. And as Nardi points out, recognizing the central role of mediation in human thought and behavior may lead us to a better understanding of the object of the work with information technology - the design of information technology is the design of computer-mediated activity, a term that imply a focus on the activity. That of course also play and important role in the understanding of how to support the use of information technology. The activity then is the basic unit of analysis and the activity can be understood in 3 levels: Activity, action and operation. As Kuutti [10] explain activities are longer terms formation that consist of several step or phases, activities consist of actions or chains of actions, which in turn consist of operations.

*Table 2 – relationship between levels*[3]

| | |
|---|---|
| Activity Level | Inventing/explicating a common work language |
| Action level | Agreeing on definition and relationship between terms |
| Operation level | Selecting the appropriate term in the work situation |

There is a dynamic relationship between different levels of activity. Activities are always under development and the development is taken place at all levels. Thus new operations are formed from previous actions, new actions are invented and experimented with as responses to new situations and the whole activity is reflected and questioned in reaction to changes. In table 2 the selection of the appropriate term is placed at the operational level and that is where it hopefully goes when the staff in the Primary Health Care Service get used to the new way of expressing their work. When we conducted our investigation the selection of appropriate terms were still on the action level.

The main point here however is that you cannot properly understand the problems with the use of a tool, as the EPR system, if you do not understand the kind of activity the end-users are trying to pursue with the tool. Systematic end-user support then work on all 3 levels

## Concluding remarks

On the basis of our study of the learning process in connection with the implementation of an EPR system I have argued that there is a need for a distinction between different kinds of support depending on the activity involved. I have identified 3 kinds of questions, the what, the how and the why questions, that should be "answered" in the support of the system. The first question is answered by courses, manuals and step-by-step instructions, the second is answered by people from the inside that know both the work and the tool and the third question point at a need for explicating and discussing the norms and values of the organization. In the work with support and in the literature discussing it the focus is mainly on the first question, there is a rising recognition of the importance of answering the second, whereas the third question is very seldom discussed. I have proposed Activity Theory as a possible integrated framework for working with the what, the how and the why questions in end-user support.

[3] Example inspired by [10]

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## References

[1] Wentzer, H. & Bygholm, A.: IT - implementation as an organizational learning process Evaluation of the learning strategy at the implementation of the EPR in the municipality of Århus. Technical Report, No 00-3, ISSN 1397-9507, V-CHI, Aalborg Universitet, (forthcoming)

[2] Wentzer, H.: Technology Development and Implementation in the Public Health Institutions: A strategic and pedagogical task for the learning organization. In Hasman A. Blobel, B., Dudeck, J., Engelbrecht, R., Gell, G., & Prokosch, H. U. (eds.) Medical Infobahn for Europe. Proceedings of MIE 2000 and GMDS 2000, Amsterdam, IOS Press, 2000, p. 264-270.

[3] Carroll, J.M., Mack, R.L., Lewis, C. H., Grischkowsky, N.L., and Robertson, S.P. 1985: Exploring a word processor. *Hum. Comput. Interact.* 1,3 1985, p.283-307

[4] Carroll, J.M.: The Nurnberg Funnel: Designing Minimalist Instruction for Practical Computer Skill. MIT Press, Cambridge MA, 1990.

[5] Carroll, J.M. (ed.): Minimalism Beyond the Nurnberg Funnel. MIT Press, Cambridge, MA, 1998

[6] Nardi, B. A.: A small matter of programming – perspectives on end user programming. MIT Press, Cambridge, MA, 1993

[7] Christiansen, E.: Gardening: A metaphor for sustainability in information technology-technical support. In Berleur, J. (ed.) An ethical global information society: Culture and democracy revisited. Proceeding from the IFIP WG 9.2 Conference, Corfu, May 8-10, Chapman & Hall, 1997.

[8] Nardi, B. A. & O'Day, V. L.: Information Ecologies – Using Technology with heart. MIT Press, Cambridge, MA, 1999.

[9] Nardi, B.A. (ed.) Context and Consciousness. Activity Theory and Human-Computer Interaction. MIT Press, Cambridge, MA, 1996.

[10] Kuuti, K.: Activity Theory as a Potential Framework for Human-Computer Interaction Research. In Nardi, B.A. (ed.) Context and Consciousness. Activity Theory and Human-Computer Interaction. MIT Press, Cambridge, MA, 1996. P. 17-45.

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