Actability Evaluation: an Exploratory Study

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ABSTRACT

In this paper, we discuss an evaluation of a computerized information system in an elderly care unit. The evaluation is based on the concept of actability, which is a combination of theories from Human-Computer Interaction and the Language Action Perspective. The reason for uniting different theories is to obtain a more holistic evaluation model. The findings show that the evaluated system has a low degree of actability, and the users had a positive attitude towards the system. One explanation could be that we, as evaluators, reviewed both structure and content, whereas the users saw only the content of the information system (i.e., its functions) as the most important aspect.

1. INTRODUCTION

Evaluations of computerized information systems (ISs) are often carried out as a way to learn about the workings of these systems, as well as a means of learning how the systems could be designed to increase an organization's efficiency and quality in products and services. Another purpose of evaluations is to gain knowledge about the effects of introducing ISs into organizations. Computerized ISs are expensive and organizations need to know that they are a worthwhile investment.

Evaluations of ISs are often based on theories and models from human-computer interaction (HCI), where the goal is to develop usable systems focusing on the interaction between user and computer (see, e.g., Löwgren, 1993; Preece et al., 1994; Treu, 1994), or on the more traditional systems development model, which concentrates on the functionality of the system. We believe that it is not enough to study a system's technical capabilities and/or usability[1] if we want to create high-quality information systems that improve the quality of products and services in an organization. Instead, we use the concept of 'actability' (Cronholm et al., 1999). 'Actability' combines the more interface- and cognitive-focused theories of HCI, with the language action perspective (LAP) (e.g., Goldkuhl & Lyytinen, 1982; Winograd & Flores, 1986), where information systems are seen as communication systems used as a means to act within the organization. Functionality of an IS is also an important part of actability.

This paper addresses several objectives: firstly, we want to illustrate an evaluation performed in a geriatric care unit; and secondly, we argue that, by using actability as a theoretical framework, we can study ISs from a more holistic perspective that covers more aspects than do earlier approaches (e.g., HCI).

The paper is organized into eight sections. In the next part, Section 2, we discuss and define actability, and in Section 3 we present the system and its users. In Section 4 we discuss our evaluation method, and in Section 5 we present the findings. In the next part, Section 6, we briefly discuss from whose viewpoint the evaluation was carried out. We discuss and reflect on our findings in Section 7, and finally, Section 8 concludes our paper with a summary of our findings.

2. ACTABILITY EVALUATION

A traditional requirements' specification usually consists of a description of an IS' functions that expresses what a user should be able to do with the system. However, the concept of

"function" is limited as it mainly connotes the technical implementation and ignores the system's social, cognitive and organizational effects.

To analyse an IS' actability we used a general framework (Shackel, 1984) which we believe covers most use-situations. The framework consists of four components—user, task, tool and environment, which should be studied in relation to each other (see Figure 1). The components are not three isolated relations, but focus on different things in an evaluation or design situation.

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User --- Task
     \     /
      Tool
  Environment
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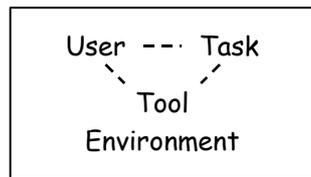
Figure 1. The four components of an IS use-situation (Shackel, 1984)

HCI and the concept of usability have mainly contributed with knowledge on the user–tool relation. Less work has been done on the relation between tool and task (Cronholm et al., 1999). The concept of actability focuses the IS as a tool for acting in the organization. However, the actions need not be limited to user–user, or user–tool actions only. Actions can be carried out automatically by the system or outside the system by a user who uses information derived from the system. This perspective on action and information systems comes from LAP with its focus on action and communication (e.g., Goldkuhl & Lyytinen, 1982; Winograd & Flores, 1986). Information systems are viewed as communication systems. The LAP emphasizes what users *do* while communicating through an IS.

It is obvious that the LAP is less useful when studying cognitive and human factors. LAP is therefore not sufficient when analysing different interaction styles (e.g., the user–tool relation). Within the HCI field, on the other hand, these aspects are discussed frequently (e.g., Norman, 1988). We therefore see HCI and the LAP as two complementary theories.

Actability is defined as: *An information system's ability to perform actions, and to permit, promote and facilitate users to perform actions via the system or act on the basis of information from the system, as a means to improving the organization's efficiency and quality.*

3. THE SYSTEM AND ITS USERS

During the autumn of 1999 we evaluated an IS in a geriatric care unit run by a medium sized Swedish local government. The evaluated system – CareSys (a pseudonym) - is a standard program used to support the administration, organization, registering and use of historical data concerning the care of senior citizens who receive daily or weekly help in their homes from a nursing home. This home is run under the auspices of a local government. The purpose is to make it possible for the elderly to live longer in their own houses or apartments. The help covers areas such as daily hygiene, cleaning, doing laundry, shopping, etc. In order to communicate information and organize their work, the staff use CareSys and several hand-written, locally-devised as well as pre-printed forms (e.g., journals, diaries, note pads, schedules, etc.).

CareSys includes functions that support the invoicing, scheduling and administration of the clients (senior citizens who need help). CareSys also includes other features to do with the administration and organization of elderly care (e.g., transport service for the disabled) and there is also a function for the administration of personnel. CareSys is a standardized IS that each local government has adapted, developed and changed according to its own needs and conditions. It is built up around modules with specific profiles and functions and is used nationwide (60 local governments in Sweden are currently using this system). A user can choose which modules to use. A brochure issued by the company that distributes and develops CareSys describes the system in the following way (our translation):

> CareSys is a system created for supporting the daily work of administrators and managers in local government care… Not only is [it] a system that meets the needs of an organization's daily tasks, but managers on different levels can also use the system to gain access to current data for follow-ups and evaluations. This increases the possibility of taking part in the development of the organization.

CareSys is planned to be used by different groups of users within healthcare: caregiving nurses, managers, administrators and others. Within the local government involved in this study they plan to make the nurses in the different units the primary users of the system. The nurses can use the system for administrating their schedules, keeping journals and as a way of creating the basic data for issuing the clients' invoices.

The users of CareSys are receptionists, nurses and care unit managers. There are currently six persons using CareSys in the unit under study: two managers, two nurses and two receptionists. The users can be categorized as novices because they have not used an IS before. In other words, their level of expertise is low.

4. EVALUATION METHOD

The evaluation was carried out in three steps. Firstly, we interviewed all users in this particular unit of the local government involved in this study. The purpose was to learn about their work and how the system supports them. The questions revolved around topics such as "What does a workday look like for you?", "What tasks do you perform?", "When and how do you use CareSys?", "Do you like CareSys?", "Is there anything you perceive as problematic?", "Has anything in your work changed since the introduction of CareSys?", etc. The interviews were semi-structured (Patton, 1990) and analysed using the graphical notation of action diagrams and problem diagrams. The action diagrams illustrate the actors, the tasks, prerequisites and results (Goldkuhl, 1992), and problem diagrams illustrate and relate problems to their causes and consequences (Goldkuhl & Röstlinger, 1993).

In the second step we carried out an expert evaluation (Preece et al., 1994) of CareSys, e.g., we, as more experienced users, evaluated the system by trying to anticipate problems with CareSys's actability. The findings were analysed and documented using the graphical notation of problem graphs. Finally, we carried out two telephone interviews with a constructor and a seller of the system. These interviews were performed to enrich earlier findings. In the evaluation we focused on the relations of user–tool, task–tool and user–task (see Figure 1). Some of the questions we asked were:

1. User–Tool: Is CareSys easy to use and learn? Does the user like working with CareSys? How experienced with computers are the users? Is it possible to interact with CareSys in

different ways? Is CareSys communicable? Does the user understand the representations, the concepts and what action they communicate? How does the user navigate in CareSys?

2. Task–Tool: How flexible is CareSys? How comprehensive is CareSys's action potential? Does CareSys support the tasks? Can the user choose his or her own way of working with the tasks in CareSys? What functions does CareSys include? What functions do the users use? Why? What functions do they not use? Why? Has CareSys changed the type and nature of the users' tasks?

3. User–Task: What tasks do the users perform? What does a workday look like? What kind of prior knowledge is needed to solve a task? How often and in what order is a task carried out? What language/concepts do the users use?

5. FINDINGS

The users from the unit claimed that CareSys provided them with good support for their work with the administration and organization of the care of the elderly, but at the same time they also said that new users have difficulties learning how to use CareSys. CareSys is hierarchical and built up around a number of "images" connected to certain functions, and new functions have been included in a linear fashion by adding a new image. Concepts and images are not used in a consistent manner—the same concept can refer to different things depending on its location, and different concepts can refer to the same thing. Help texts are almost non-existent and the concepts used in the system are different from the language used by the staff in their daily work. These factors contribute to a difficult and confusing system. One user said:

> [it is] a roundabout system and one has to go in and out of the images. In order to get access to the statistics one has to get in to three or four images. One has to go back and keep a lot of information in one's head in order to know how to get to the statistics. [One] gets very far down the menus so it is hard to remember how to get back.

CareSys decides how a user should act when using CareSys; there is very little freedom of action or flexibility. One user expresses this as *"...the way to the image is fixed"*. The users expressed, in spite of all the problems, a positive attitude towards CareSys. They said that it was fun and instructive to work with CareSys. There are many functions implemented in the system and different user groups feel that CareSys can support them in their work. The users (especially the nursing staff) feel that using CareSys has increased their knowledge about administrative routines for payment and invoicing and they have thus improved their understanding about the organization and how it works. They can, to a greater extent than before, answer questions concerning payments and invoicing from the clients and their families.

Our negative attitude towards CareSys is a combination of our expectation that the system would conform to certain standards as well as being designed to help a novice user of the system to understand how to interact with the system. Only a limited number of the functions in the system are used—either because the users do not know the others exist, or they ought not and/or cannot access these functions. No doubt, the system has a rich functionality, but there is very limited use of this functionality. The users mentioned that they thought the system was "messy" and hard to learn. This could contribute to the users' limited use of the built-in functionality. The main menu consists of six modules, but only two of these are used in their entirety. The users use only functions that were covered during the training. That they do not experiment with new functions on their own might be related to the difficulty of

understanding, initially and without training, how to interact with the system. The system thus displays a low degree of actability. In addition, some of the functions were seen as superfluous.

5.1 System Properties and Actability

We found that there are several features in the system that contribute to the system's low degree of actability:

The user–tool relation:
* inconsistent or non-existent grouping of information
* help texts are vague and hard to understand
* feedback is inconsistent, hard to understand, or non-existent
* inconsistent or non-existent use of standards
* no adaptation of functions conforming to different groups of users.

The task–tool relation:
* inconsistency in the use of concepts and representations
* the system suffered from a linear and hierarchical system interaction (the users have to go far down the hierarchy to be able to perform certain tasks)
* the user must perform the tasks as they are predefined by the system—it is not possible to change the order of tasks or to choose how to perform them.

The user–task relation:
* unclear and vague use of concepts in everyday language and documents
* *ad hoc* creation of documents decreases the quality of the elderly care and makes it more difficult to diffuse knowledge in the organization
* it is hard for new personnel to understand the workings of the organization and how to work with elderly care.

CareSys's low degree of actability makes it hard for the users to understand how to use the system and it also increases the users' cognitive load, which affects the users' ability to intuitively use the system and hinders them when trying out new functions.

6. EVALUATION— FROM WHOSE VIEWPOINT?

We find the large discrepancy between the evaluators and the users very interesting. It raises the question about different worldviews and for whom we evaluate computerized information systems. It also raises questions about who takes precedence over the interpretation—the users or the evaluators?

Pinch (1993) proposed that, when a technology is well established and part of society we expect it to act in a certain way. Certain standards are developed and the technology and its design is obvious and taken for granted. We, as experienced users, take the technology for granted, and expect it to behave in a certain way and have certain properties that we no longer question. One reason we saw this system as highly problematic was that we expected CareSys to meet certain usability metrics (e.g., Faulkner, 2000) and conform to at least some standards developed within the field of HCI as well as standards set by Microsoft when developing the Windows system. A design as well as an evaluation from the perspective of HCI, actability or traditional systems development usually work with a set of standards or metrics to help the users use their previous knowledge in this new situation. However, the users in the study did

not have any prior knowledge about computers, and naturally did not know how an IS should behave. They had not yet developed any prior knowledge about the behaviour of information systems and therefore they perceived CareSys as less problematic than we did, even though they also saw the system as illogical and difficult to use.

7. DISCUSSION

The actability model builds on previous work and general knowledge, where we have decided in advance what comprises a good system. This follows the "normal" logic on how science develops and, by building on and expanding previous work, we can say something about the reality. We as scientists and analysts decide beforehand what is valuable. Another way of doing research is to try to say something about the issue at hand without explicitly using earlier knowledge as a building block and analytical framework. Instead, we abstract knowledge using the local case, and the knowledge and values from the people we study as a basis, rather than previously developed scientific knowledge (a method closely related to the Grounded Theory; e.g., Strauss & Corbin, 1998). Using this latter strategy we are more apt to view the phenomena we study more clearly and truthfully without the risk of being coloured by an existing theoretical framework (although we always carry with us our prior knowledge which influences the way we see things). An analysis that does not use a strong theoretical framework will, on the other hand, have more problems generalizing the results. Our evaluation, like more traditional usability evaluations, reviewed both the relevance of the functions and a number of *a priori* criteria about the system's actability. Whether a computerized IS is working depends on its usability or actability, and the working of the system is not seen as a consequence of the users' actions toward the system, but is assessed according to criteria worked out in advance. Perhaps a more inductive approach or an approach that to a higher degree combines *a priori* criteria with more local deduced criteria, could work as a good basis for evaluations.

We also need to refine our evaluation methods, with theories from whose viewpoint the evaluation is carried out, and from what perspective. The user? The constructor? The management? Do we want to combine all of these somewhat different worldviews or perhaps it is better that we choose one and are clear on what view we take? Löwgren and Stolterman (1999) stated that *"Methods are bearers of historical knowledge and professional skills"*, but that is not all: a method also includes and carries its social, cultural, political and economic context (Pinch, 1996). If we want to use criteria and earlier knowledge in the form of methods when we evaluate IS, we need to be very clear on the origin of the underlying perspective and for whose viewpoint the evaluation is done. Although we worked with individual users in our interviews, perhaps our study of the system's actability did not take into sufficient account the specific users and the use-situations. The evaluation model was constructed using general theories and models, and might not have considered, to a sufficient degree, the individuals in specific situations.

8. SUMMARY

The results from the user interviews can be characterized as being positive overall, but our analysis of the system can be characterized as being mostly negative. A closer look at the differences shows that one reason for the users' positive attitudes could be a consequence of the users' focus on the system's functionality (the content) as well as CareSys as a learning experience. The introduction of this system made it possible for caregivers to not only increase their knowledge about computers, but also to learn new tasks. The caregivers using

the system have duties different from their colleagues, and they have learned more about the overall structure of the organization and have a better understanding of the workings of the organization. They say that they can now answer questions from the elderly and their families about, for example, invoicing, about which they earlier had very limited understanding. CareSys has somewhat changed the caregivers' profession from a more internally administrating and caregiving profession to a career that also includes working with administration beyond the immediate boundaries of the organization.

We believe that the evaluation model, combining theories from two research fields, has helped us to present a richer picture of the studied use-situation. Theories and criteria from the HCI-field contributed to identify deficiencies in the user–tool relation and theories from the LAP helped us to identify deficiencies in the tool–task relation. LAP also helped us to better focus the user–task situation. The use of multiple theories as a basis for an evaluation increases the possibility of reaching a better understanding and applying a more holistic perspective.

Acknowledgements

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[1] Usability often focuses on criteria for the system's functionality (e.g., relevance of functions), efficiency, effectiveness, whether it is hard to learn and use, and the users' attitudes toward the system (see e.g., Löwgren, 1993; Preece et al., 1994). The international organization for standardization defines usability as *"...the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"* (ISO 9241-11, 1998).

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