

DOCUMENT-DRIVEN SYSTEMS DEVELOPMENT - AN APPROACH INVOLVING NOVICE USERS

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ABSTRACT

This paper suggests a document-driven information systems development (ISD) approach. The reason for this approach is to find better ways to communicate with novice users. We have based our research on two principles: start with what is known and shift between abstractions and concretions. The concept “what is known” means that we have used existing familiar documents as a starting point. When modelling IS we always make abstractions. One way to confirm that we have made the right abstraction is to relate it something that is concrete to the user. We have used a shift between the abstract and the concrete in order to help the users to understand particular phenomena. We have experienced that this is especially important when developing IS that involves novice users. Our conclusion about the work practice is that document-driven systems development has led to improvements in the work practice. The approach has resulted in improved conditions for communication between the users, conceptual improvements and structural process improvements. Using the latter of the two principles means that the researchers/ISD professionals should be sensitive for when to make abstractions and when to make concretions. Using existing documents as starting point means to start with what is known. Our experience from this is that users have participated in a natural way during the analysis and design work.

1. INTRODUCTION

The research question we try answer in this paper reads: How should information systems development (ISD) be carried out when novice users are involved? When planning an ISD project you have to consider lot of things such as: time limits, which project members shall participate and if they are available, are there some feasible support such as methodologies and computer support. You must also consider the type of project and the experience of the project members. There is a need for characterising the project conditions.

Members of an ISD project can have different degrees of experience. Nowadays many users are well experienced in relation to computer usage and ISD, due to high IT maturity in organisations. This is, however not always the case. There are still situations where novice users are participating in ISD projects. This means that they have a low degree of experience from interacting with computers and no

experience from participating in ISD project. In this research we address the problems of involving novice users in ISD projects.

There are a lot of competitive methodologies telling us how we should develop information system (IS). Sometimes these methodologies even tell us why we should act in one way or another. One of the most popular methodologies today is the object-oriented approach Rational Unified Process (RUP), (e.g. Kruchten, 1999). We think that such standardised ways of performing ISD must be used in respect to their feasibility for the project conditions. What such methodologies do not tell us is how to perform ISD when project members are novices. Introna & Whitley (1997) claim that there is a risk for an exaggerated belief in using methodologies. Further, they claim that methodologies can't bring light to all characteristics in of the situation that need to be discovered. We think that when developing IS in close collaboration with work practice actors or end users, who has no or little experiences from using computers and participation in ISD projects, this type of methodologies are too complex and abstract.

Advocates behind participatory design have paid a lot of attention to user influence in the ISD process. Followers argue for a broad and genuine participation aiming at agreement of IS and work (e.g. Hägerfors, 1994). Carlshamre (1994) claims that participatory design is more of a philosophy than a methodology. Although it includes some techniques to facilitate ISD it lacks the procedural description of how and when to apply these techniques.

Vonk (1990) and Ågerfalk (1999) claim that there is a communication gap between the professional systems developers and users. Vonk (1990) means that the main problem is that the two groups use different languages. In order to minimise the gap pictures should be more used during the ISD process. Vonk (1990) prefer a prototyping approach that will put more attention to the user interface than traditional ISD methodologies do.

The challenges to create a good communication between designers and novice users have led us to develop and use a document-driven approach in a participatory design spirit. The purpose of the research is thus to develop and to try out a document-driven approach for ISD involving novice users. The purpose of the paper is to give a short presentation this approach accompanied with experiences from using this approach in a case study.

2. TOOLS FOR NOVICE USERS INVOLVEMENT

The document-driven approach to ISD has been developed within an action research based case study (e.g. Gummesson, 1988). The case study context – development of an IS within a home care unit for elders - is briefly described in sec 3 below. We have based our ISD approach on two fundamental pillars:

- start with what is known
- shift between the abstract and the concrete

“Start with what is known” means to start with what is familiar in the work practice. Examples of what is familiar can be the work practice language and existing documents. Such phenomena have been used as means for understanding, reconstructing and developing the work practice. This pillar can be seen as a reaction against the Business Process Reengineering argumentation about starting development with a “clean slate” (Hammer & Champy, 1993). In order to create radically new business process one should, according to classical BPR, think away the current processes. We doubt that this is a proper approach when involving novice users. Instead we argue to start with “the familiar”. In a familiar situation the users would not be novices; they would be experts.

In order to analyse “what is known” and to capture the communication in the work practice it should be possible to use existing documents as a starting point. The purposes of documents are often to transfer knowledge between personnel and to ensure that commitments between producers and clients are performed. Arguments for choosing existing documents as a starting point in this situation were:

- the work practice has a large amount of document types
- a major part of the language/concepts used should be represented in the documents
- the documents works either as a condition for or as a result from an action
- the language/concepts in the work practice documents is familiar to the users

Documents are produced, used and changed. To create a document (or parts of it) is to be seen as performing a communicative act. An actor in the work practice does not only represent something in a document. He creates certain relationships (commitments, expectations etc) to other persons when writing something in a document. We here follow speech act theory (Searle, 1969; Habermas, 1984) and how it has been adopted in the IS area (e.g. Goldkuhl & Lyytinen, 1982; Winograd & Flores, 1986). Documents have important characteristics that distinguish them from oral utterances. Documents have persistence. People can read them and save them and read them again. Documents can also be changed. A person can add something to an existing document or change something in it. This means that documents can be results of several communicative acts, which also can be performed by different people. Documents (forms etc) in a work practice play important roles when used as communication instruments for performing the work practice. Such documents represent important acts in the work practice and they are also used to externalise work knowledge and thus being a collective external memory for the work practice. The documents are also bearers of the work language of the practice. Being representations of actions, knowledge and language in the work practice, documents are not only instruments for performing the work practice, they are also instruments for constituting the practice. Because of these fundamental characteristics, we believe that work practice documents are important means for studying and understanding a work practice.

We have also based our ISD approach on the pillar “shift between the abstract and the concrete”. When modelling IS one must always make abstractions. One way to confirm that a proper abstraction is made is to relate it to something concrete (some example). Alterations between the abstract and the concrete help the observers/participants to understand a phenomenon. We think this is especially important when developing IS that involves novice users.

Nielsen (1993) discusses novice and expert users and claims the importance of identifying the users’ pre-knowledge when designing IS. Nielsen means that the most important issues for designing usable IS are the users’ tasks and their individual characteristics and differences. Three main dimensions are utilised in order to describe users’ experiences. The dimensions are experience with the system, with computers in general and with the task domain. Classifying the users in the chosen ISD project according to the dimensions gives that the users are novice users of the system (the system is not running yet), they have a very low degree of general computer experience and they have high degree of knowledge about the domain. We agree with Nielsen when he claims the importance of identifying the user pre-knowledge when designing IS.

Novice users, as in our case home care assistants, are not experienced in working with abstractions like business and IS models. Instead there is great need to be more concrete. One way of supporting the more concrete is to use prototyping or iterative design. Seeing prototypes means that the users can relate themselves to something concrete (Carlshamre, 1994). We have chosen iterative design for two reasons: First, instead of using more abstract notations of ISD methodologies we wanted something more concrete. Second, using something more concrete means that the users should be able to more easily criticise the evolving IS. In this study we have used both lo-fi and hi-fi prototypes (e.g. Löwgren, 1993; Monk et al, 1993).

In order to perform “what is known” and “shift between the abstract and the concrete” we used a question based analysis. Every researcher is concerned about how to ask “good” questions. We needed to formulate an inquiry. Inspired by Strauss & Corbin (1998) our inquiry consists of questions like: why and how is this document used, what is the meaning of this concept, why is this information represented in this document, for what purpose is this information used, what do you need in order to produce this information and to whom do you communicate this information. The purpose of these questions was to see if they improve the conditions for communication in the design process.

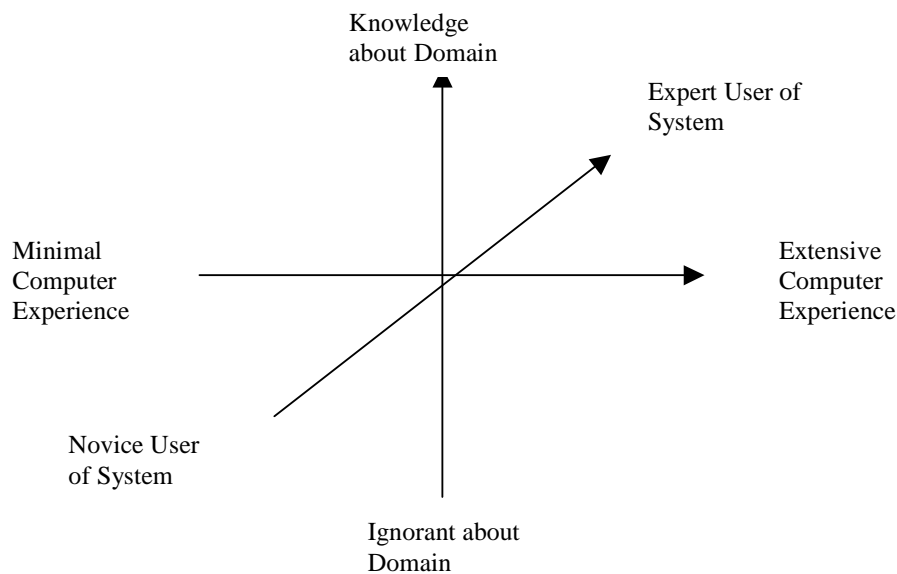


Figure 1 The three main dimensions on which users' experience differs (Nielsen (1993))

We see “what is known”, “shift between the abstract and concrete”, “use existing documents as a starting point”, “prototyping” and “question based analysis” as tools for how to develop IS when novice users are involved. The relations between the tools should not be seen as sequential. They should be seen as complementary tools that could be used in an alternating fashion. The two first tools should be seen as the basic pillars that answers the question “what to do?” The latter three should be seen more as tools that answers the question “how to do?”.

3. SHORT DESCRIPTION OF THE CHOSEN WORK PRACTICE

The ISD project was performed in a home care unit for serving elder people in a medium sized Swedish local government. The work practice can be characterised as complex with a high degree of communication needed. The major tasks of the home care is to help the elders with daily hygiene, minor medical tasks, cleaning, doing laundry, shopping etc.

In order to communicate information and structure their work the home care assistants use a number of self-made as well as pre-printed documents (e.g. journals, diaries, note pads, schedules etc.). These self-made documents are used for planning and carrying out tasks. The documents are also used for transferring knowledge between the home care assistants.

Each client has individual needs and therefore the tasks that will be performed for each client varies. A work practice goal is that a maximal individualisation of care could be given. The personnel consist of two home care managers who are responsible for the care unit and a number of home care assistants. The home care assistants are responsible for the daily work with the elders. Four researchers and two home care assistants and two home care managers participated actively in the ISD project.

4. EXPERIENCES FROM DOCUMENT-DRIVEN SYSTEMS DEVELOPMENT

We have used the described approach above (sec 2) in the home care project. We describe some experiences from using this approach below. The findings will be presented according to the two

pillars and three complementary tools: “What is known/familiar”, “shift between the abstract and concrete”, “use existing documents as a starting point”, “prototyping” and “question based analysis”.

Base the ISD process on what is known/familiar

We have experienced a high degree of activity among the users. The reason for this is that the users were placed in a familiar situation. The language, concepts and documents used were “things” that they have used on a daily basis for several years. This has meant that we (the researchers) had to learn the language in the work practice instead of force a professional ISD language to the users. Another condition for the users’ commitment is that the familiar documents used were often developed by the users themselves. The users felt responsible and they had knowledge about why the documents were designed in a certain way. Starting “with what is known” does not mean that we have been uncritical. We have often questioned the existing “things” and the users had to explain and argue why things worked as they did. We claim that using “what is known” as a starting point creates a good base for discussing, questioning and analysing.

Shift between the abstract and the concrete

The participating users had little experiences from working with computers and they had no experience from participating in ISD projects. These circumstances forced us as designers and action researchers to be very concrete and to avoid too much abstract reasoning. In order to develop a well designed system there is a need for documentation and the use of ISD methods. We do acknowledge this need and we have used methods in the process. In order to arrive at a system well adapted to users and the work practice we have used the IS actability approach (Ågerfalk, 1999). The methods have, however, not been so visible to the users. We have mainly used them “by ourselves” and as quality assurance instruments.

When designing a complex artifact like a computer-based information system, there is of course a need for abstractions and reflections. Abstractions cannot be avoided in the participatory part of the design process. At least partially, the users must be involved in some abstract discussions. There has been a challenge to pursue open reflective discussions in the project sessions together with the novice users. The key to succeed with this challenging endeavour was to consciously shift between the abstract and the concrete. As described above and below we started with the familiar documents used in the current work practice. These documents were concrete for the users. When discussing different concepts of the documents – sometimes criticizing these concepts in abstract discussions – we always connected these reflections to the well-known documents and the related actions.

When we turned to the design phase using prototypes of new IT based documents, this was even a harder challenge. These new screen documents and the accompanying concepts were clearly related to existing documents and work procedures in order to establish some concreteness of this new design. The design process (which is partially movements in abstractions) were taken very carefully and in small steps. Sometimes the discussions felt too abstract to the users (i.e. when the users tend to be passive and dissociated from the discussion). We needed to be sensitive to such expressions of non-participation. When we discovered this low-participatory mode of the users we tried to move back to the concrete, i.e. to the familiar documents and the different types of actions performed within the work practice.

Use existing documents as a starting point

The use of existing documents as a starting point is in line with “base the ISD process on what is known”. The documents have acted as a base for a conceptual analysis. We have reconstructed concepts, meaning of concepts and relation of concepts. The conceptual analysis has resulted in new concepts, refinement of existing concepts and changed concepts. We have identified both synonymous and homonymous concepts.

For some documents new rubrics have been suggested. We identified problems when the users referred to the home care journal. The name “home care journal” referred either to a folder with several integral documents or just to the folder itself. In order to use a unique reference we had to develop a new concept for the folder.

Another situation that needed development of a new concept was when home care assistants planned their commitments to the clients. When analysing the planning situation it became obvious that one task consists of several parts. For example one task could be “morning help”. “Morning help” could consist of parts such as help with dressing, making the bed, making breakfast etc. Some parts should be performed every day and some parts should be performed just on particular days in the week. In other words the different parts of the task have different properties such as when and how they should be performed. Obviously, there was a need for a corresponding concept to the parts of a task. We chose to use the concept “effort” when referring to parts of a task.

Some concepts have been refined. For example, there was a planning document on a more detailed level. This document shows which home care assistants who should work with a specific task for a certain day. This document had no name. The users referred to the document simply as the “planning document”. Since there exist other types of planning documents, personnel planning document and week planning document, the naming was not exclusive enough. We suggested referring to this document as “the day planning document”.

There were also synonyms. Home care managers referred to some documents with other names than the home care assistants. For example the home care assistants used the name task plan when the home care managers used a synonym. The local government used the name client when the home care assistants used elders. In order to avoid misunderstandings in the communication the project group had to agree upon naming.

Several concepts have also been changed. For example, in the work practice language there exist a concept called “alarm number”. The concept was used in several documents. When asking what this concept was used for, it became clear that it was a reference to the client residence address. The alarm number was used to locate the client. Since all clients don’t have an alarm number and there actually have residence (an address) the natural choice was to use the address instead of alarm number.

To conclude, we claim that using documents as a starting point has resulted in a careful concept analysis with a high degree of user involvement. We have been discussing and analysing the documents and the work practice vocabulary that follows with the document.

Question based analysis

A major part of the ISD has been formed in dialogue with the users. The dialogue has been driven by questions aiming at understanding, reconstructing, analysing and developing a work practice supported by a IT-system. For each document we have asked a battery of questions. The questions asked and reasons for asking the question are:

- Why is this document used? This purpose of this question is to understand the purpose of the document and how the identified activities contribute to work practice as a whole.
- How is this document used? This question aims to identify what information is needed when using the document.
- When is this document used? This question was asked for identifying adjacent activities and to identify the document as part of the work process.
- What is the meaning of this concept as part of the document? We used this question in order to understand the concepts used in the document and to be able to relate different concepts to each other.
- Why is this information represented in this document? How do the receivers act differently when they get to know what is communicated? The purpose of this question is secure that information needed for action is represented and also to avoid unnecessary information.
- What do you need in order to produce this information within a document? This question aims to identify what bases are needed to work with the document and what output will be produced.
- To whom do you communicate the information. This question aims to identify the receiver and the following activity in the process. The answer also contributes to identify the output needed.

Our experience from using these questions is that they have helped us to drive the ISD process forward. The questions contributed to identify the meaning of concepts and they have improved conditions for communication. The questions have been a catalyst for collective reflection and improvement of part of the work practice language within the project group.

Prototyping

We have made prototypes for the new IT-based screen documents. Several of the earlier informal documents are proposed to be substituted by screen documents and electronic storable documents in a database. Our experiences from prototyping in the project are mainly positive. When we started to design the first prototype the users reacted in a rather passive way. We discovered that users did not recognise common interaction elements such as lists or combo boxes. We had to explain how the elements worked. This was a passing problem. The users were quick learners and soon they were able to criticise solutions that we have suggested. The users even suggested improvements. During the prototype development we have viewed the users as co-designers.

A disadvantage in this phase was that it was time-consuming. We had to develop several prototypes before the final ones were accepted. The reason for this is that we were very careful in order to design an easy-to-use IT-system and tried to avoid as much ambiguousness as possible. The amount of prototypes also led to a lot of re-programming.

5. SUMMARY AND DISCUSSION

There are two types of conclusions that can be drawn. First, there are conclusions about the work practice. How did our approach affect the work practice and the users? Second, there are conclusions about the document-driven systems development approach. We can conclude that the document-driven systems development approach has led to improvements in the work practice. The approach has resulted in improved conditions for communication between the users, conceptual improvements and structural process improvements. We can also conclude that the users have a better understanding of the whole work practice and a better understanding of how different activities and documents relate to each other. We claim that the approach has contributed to better conditions for knowledge transformation between the users. For example, refinement of documents has increased conditions for the users to have access to updated information about clients. This is one of the most important conditions for reaching the goal that maximal individualisation of care could be given.

This approach has been guided by two basic principles: Base the ISD process on what is known/familiar and shift between the abstract and concrete. We claim that these two principles have contributed to the communication quality between us (the researchers) and the users. Using the latter of the two principles means that the researchers/ISD professionals should be sensitive for when to make abstractions and when to make concretions. Using existing documents as starting point means to start with what is known. Our experience from this is that users in a natural way participated in the analysis and design work. One of our students made a follow-up interview and asked one of the users the following question: "Was there any difficulties in communicating and did you experienced some cultural problems between you and the researchers?" The user answered: "We had to explain quite a lot, but it was OK. Often we had to explain things as we understand as obvious. It was very fruitful to analyse the work practice and the routines from scratch".

The approach is also in line with what often is called participatory design (e.g. Ehn, 1993; Greenbaum, 1993). Participatory design means that people destined to use the system play a critical role in designing it. Easy to use IS does not just happen. It requires focusing on the systems potential users from the very beginning. In every phase in the development model the users have participated. They have played an active role in order to be sure that they will be comfortable with the final design. We can conclude that using familiar work practice documents, rather than more abstract object-oriented models as instruments for communication, has contributed to high activity among the project members. The users have participated as active developers rather than passive information deliverers. They have participated as co-designers.

We are not saying that a document-driven systems development approach always should be used. Rather we are claiming that one should consider the type of work practice and the pre-knowledge of the project members and that a choice should be made according to these considerations. We think that often are different standard approaches used without reflection of the information system development context.

Our conclusions are based from one case study. Despite this, we think that it is possible to make some generalisations. We think that our approach should be considered in every context where there are novice users. Further, we think that our question battery (see section 4) is not context dependent. It can as a whole or partly be used in most ISD situations.

The significance of this research is that we presented an approach for how to perform ISD when novice users are involved. A future possible research direction is to follow up effects in the work practice from the implementation of the developed prototype. Has the conceptual development made it easier to communicate and is it easier to give maximum individual care?

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