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Users, Not Necessarily Choosers

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Raija Halonen is currently serving as an assistant professor in the Department of Information Processing Science in the University of Oulu, Finland. She received her M.Sc. in 2002 in the same department and has worked as a designer in a private IT services company. She is currently preparing her dissertation which reflects upon the implementation of a nation-wide student information system.

This paper discusses role of users in the conduct of an information system implementation project in the mid 1990's. The project included designing, developing, and taking the developed system into use. Of particular interest is the user group that took part. The users were people who could not choose whether to be users or not.

This user group consisted of factory workers in the machine-coating hall of a cable manufacturer. They represented a small, but pivotal group in the company's operations. The brief was to design a new computer-based information system and to train workers in its use. This involved a number of challenges: the factory hall was crowded with noisy machines, large reels and other material containers; the workers were unfamiliar with micro-computers; but most of all, the push for the new computer-based information system came entirely from management. Organisational changes at the managerial level led to a new emphasis on quality control. Also, customers were wanting more information about the manufacturing process of the cable and coating, especially from a quality point of view. A computer-based information system was seen as the way to meet these new demands.

But the workers in the factory hall had no reason to change from their existing paper-based system of information recording.

The data of the study consists of material collected by interviews and observations made by the author during implementation. The factory environment was totally unfamiliar to the designer and she needed a lot of expert knowledge from the workers during the whole process. The role of users in every phase of the project was essential to the new information system.

The Work Environment

The organisation in question designs and manufactures cables for the global telecommunications industry. The workers in the cable-coating section were middle-aged men whose educational level was comprehensive school or vocational training. The coating was executed with large, noisy, cable covering machines in the industrial hall.

The manufacturing process was as follows: uncoated cable was fed into one end of the machine and run via several barrels containing liquid materials such as rubber and insulation materials. During the coating process, the rubber and insulation material were hardened, so that at the other end of the machine the cable emerged fully coated with the specified material. The temperature in the machine varied according to the coating material, being extremely hot in certain points. There were many machines serving different cable lines for e.g., copper optical, cellular and data cable.

At times when the coating process was excessively noisy, the workers wore ear protection. There was also some heavy work, such as lifting full and empty cable reels at the beginning and end of runs, and moving material storage barrels. Sometimes the coating phase would last for many hours and the shift would change during the prevailing coating. In those cases, it was especially important to distribute information about the coating to the next shift. During one shift it was also possible to execute several consecutive coatings in cases when the amount of cable for a particular kind of coating was small.

The number of customers was limited, so that the workers generally knew which kind of cable each customer needed. Sometimes customers ordered exactly the same type of cable; sometimes the order differed from the previous order. There might be changes in cable thickness or coat thickness and in the length of the cable but usually the workers knew exactly the cable type. With their tacit knowledge, they were professionals in their job.

The coating information was stored on A4 sheets that could be found in files on shelves or on tables. The exact information was hand written with a lead pencil or ball-point pen and when there were changes to be made the old information was wiped away or the new information written with a thicker pencil onto the old information. The information sheets were impossible to read by

anyone other than the workers on that cable line. The workers knew how to coat cable and were used to these messy A4-sheets.

The Old Information System

A simple information system consists of three elements: a user, a data warehouse and a tool to insert data into the data warehouse. Using this model, the information system for cable coating consisted of files with sheets of paper, workers using it and a pen or pencil to enter the data. The problem appeared when management perceived this system as lacking in 'quality'. In this case, the manual information system was used only by a very limited amount of users. The managerial level did not use the system in any way. The original information system included information about the coating phase of preparing cable; handwritten parameters concerning a certain cable type for a certain customer at a certain time; and variations in the process. Information was retrieved when the same customer wanted to order the same kind of cable. The interval between orders for the same customer could vary from weeks to years. Sometimes the information was used as reference information for another type of cable.

The information was almost impossible to retrieve when needed, but the workers did not see any need for a new information system. Later on, the information began to have more importance when it was also to serve the quality purposes of the organisation. The former information system was good enough for its original purpose. However, it was not useful to give information about the production of cable to be used by management. The user group of the information system had grown much larger during the 1990's, consisting now also of people from the managerial level.

The New Information System

The managers wanted to make the coating process visible and make sure that the cable was coated properly. They wanted to be able to track the process – seeing the outcome was no longer enough. The new information system was to collect all the data about the production of coating.

User participation in information system development has been seen as contributing to successful implementation. Newman and Noble describe in a case study that the contribution is not always evident and that the user participation is only weakly associated with the success of implementation.[1] They define user involvement as a process of interaction between systems specialists and users or their representatives. According to Larsen and Myers, it is not, however, easy to define if a project is a success or a failure.[2]

The design process began with calling for volunteers to assist the designer in developing the new information system. None volunteered and the manager had to nominate some participatants. In the first phase two men were nominated – a foreman and a

line worker – and after nomination they were very eager to participate in the project. Because the factory environment and the coating process was totally unfamiliar to the designer, the worker representatives were in key roles. The first phase was to clarify the requirements for the new system. The system specialist of the factory participated in the requirement specification. The nominated workers guided the designer to the factory hall and explained the workflow in the coating. The cable line was the outermost in the factory hall and the shelves and tables full of papers and files were beside the line. All the men working there were very eager to explain the different phases and terms used in the coating. It seemed like the workers were only too happy about somebody being so interested in their jobs! The noise made it difficult to hear and increased the difficulty of understanding the coating process.

The workers wanted the new system to look similar to the old paper sheets. Even the textboxes had to be found exactly on the same places as they were on the old A4-sheets. The designer obtained several A4-sheets that contained information about coating over several years. They were old, dirty and difficult to read. The designer needed plenty of help to understand the markings on the papers because they were handwritten, with some on the sides of the paper. It seemed that the designer should have been able to read the information even under the text despite new thicker writing over it. Extra difficulty came from erased and several times re-written information on the sheets.

The senior EDP (electronic data processing) designer in the factory had decided that the application must be carried out by Microsoft Access tool. The first prototype of the coating information system was demonstrated to the users in the designer's workstation in her office. The users were asked to deliver their impressions and to question freely. The prototype helped the prospective users and the designer to better understand each other. It was very difficult to understand the importance of the many phases in the coating and to understand all the parameters that had to be known to get the right type of cable. The prototype also showed misunderstandings that troubled the workers. When presenting the characteristics of the prototype the designer used terminology unfamiliar to the workers – like "space bar", "field", "parameter", "menu", and "window".

Besides having difficulties with computer terminology there were difficulties with the information in the database. Because of not knowing the exact names or thickness of the cable types, the designer used fictitious names and parameters in the prototype. This was a mistake because the users concentrated on this information, not on the user interface and the actual application. They argued about the impossible coating material name or that this specific customer never orders such a cable type. This misunderstanding increased the workers' resistance and and decreased their trust

in the competence of the designer. The elimination of this distrust demanded several discussions and talk sessions with the users, but the irritated climate was cleared by an open attitude and willingness to learn especially from the designer's side.

Culture

There were large gaps of understanding between the parties in the project. The coating was diversified work and its terminology was very different to that which was familiar to the designer. On the other hand, the terminology associated with software and computers differed too much from that used by the workers in the factory hall.

Additionally, computerisation could have had negative associations for many workers. this dating back to the introduction of computers into manufacturing processes, which had initially increased unemployment in the industrial branch.

Noble describes a similar history from the aircraft industry and reports on the conduct of a project in the late 1960's.[3] Despite the decades between them, there are many similarities in the two projects. Automatic industrial control mechanisms for measuring and adjusting variables like temperature, pressure and flow rates during production had long been used in the batch processes of e.g. rubber and paper industries. Likewise, the coating machine was a long horizontal engine with several automated controls along the line. Workers monitored different measures and from time to time made adjustments according to their knowledge about the current type of cable on hand. They made records of such adjustments on the paper sheets. Sometimes there were other problems with the coating and reports also had to be made about these. All this information was hand-written on the same paper sheets as it had been written for years. Over the years, the workers had accumulated much knowledge about coating and were the only people in the factory who had that knowledge. Not every word or adjustment had to be written down – the senior workers knew also without advice how to adjust the parameters. An important aspect of the new information system, was that they had to distribute their knowledge to others in the organisation. It is possible that the workers felt this as a threat.

Microcomputers were unfamiliar in this work environment. The coating machine had embedded software but it did not look like a computer. After necessary modifications to the prototype, the pilot version of the information system was taken into use by the users. A new microcomputer was purchased for the coating line. It was placed next to the coating machine so as to limit the steps needed to be taken to enter the information. The senior designer covered the machine in plastic to keep it clean in the dirty environment. At the very beginning only two workers used it. The user interface was very unfamiliar, with a mouse and several tabs and keys on the

keyboard of the workstation. To help the users to use the mouse, the designer installed the game 'Solitaire' on the computer. There were pauses during the coating process and in this respect the playing did not delay the working in any way. This had to be justified in depth to management. The idea was to increase the motivation to accept the new application. The game was popular, and in fact was removed a few weeks later because workers from other lines came to play. The designer had to use all her skills in explaining the importance of motivation and usability issues to management before the game was given back.

The old information system with files and sheets of paper was very practical from the worker's point of view. Information could be found very quickly by browsing the files or just knowing the right table where the current sheet was located at that time. With the new computerised system the information had to be strictly formal, written in the very same way as the information was inserted into the system. The users found that very annoying. They could no longer make spelling mistakes when entering the data, because this would mean that the information could not be retrieved. On the paper sheets the misspellings did not bother anyone. Noble mentioned the same thing in his study, stating, "man is programmed by the language we design for him to use, since the only way he can get the system to perform is to express his wishes in the specified language form."[4]

This coating line was the first line in the industrial hall to adopt a computerised information system with a database of coating information. The computerisation of the information concerning the production of cables was to be spread over all the lines. The current line was the envy of the other lines because of the possibility of playing games during working hours. However, this was not sufficient, as the application slowly fell out of use and the workers went on using the sheets of paper on tables and shelves. Later in the same year the application was updated to a newer version of Access. Later still the information system was taken into use (this happened after the designer of the system had left the organisation and is beyond the scope of this paper).

Discussion

From a pragmatic viewpoint, a process can be considered more important than the structure of the process or the immediate functional outcomes. The experience gained in this information system project has influenced future actions. For example, it showed that the nature of the interaction between users and designer cannot be underestimated. Hidden meanings behind wrong words or points of discomfort should be identified and changed to language that all parties understand.

The approach of the users and the designer differed in 'concrete vs. abstract' concepts. The users were used to handling concrete

things like sheets of paper that they could browse by hand instead of finding information from a screen. In addition, they wanted to design the information system with actual information including valid names and parameters. The designer was used to abstract concepts, paying less attention to the validity of customer names or accurate cable specifications. This difference impeded the design process at the beginning.

The road from an informal paper-based information system to a formal computerised user interface can be rocky and long. Safekeeping of data was the biggest difference between the old and the new system. The workers did not see any reason why old information was worth saving. But this safekeeping enabled people other than the workers themselves to read information about the progress of coatings. It is possible that this is one of the reasons for resistance to change at the very beginning of the project. The old way was to erase the old information and to write new information over it. The database enabled the old information to be retrieved afterwards and that was a major reason why the new information system was designed.

The implementation project seemed to be a failure. The need for the information system came from the managerial level, not from the users. The use of the system was compulsory and the users could not choose whether they wanted to be users or not. Was the support from the managerial level strong enough? What was the role of the designer? Despite the actions of the designer, resistance to change was too big to be prevented. Solitaire was installed and re-installed so that the users could pleasantly learn the user interface of the computer. The information in the prototype was changed to match the proper information, instead of fictitious customer names and parameters. The designer spent days with the workers interviewing, talking with them and trying to get acquainted with the coating process.

According to Larsen and Myers it is not easy to define the final estimation about an information system being a success or a failure.[5] This project carried the workers to the wider-ranging computer supported production control that has been implemented in more recent years. It seems that the Access application served as a concilliator and step towards a more comprehensive ERP (enterprise resource planning). The information system project was economically very humble because of the limited costs and resources spent on it. From this viewpoint, it was no risk and the organisation could only benefit from getting experience and introducing new technology to the workers. During the subsequent years the Access application was replaced by an Excel application.[6] Currently the Excel data is being transferred to a third software (Raksu). The organisation has implemented SAP R/3 as its organisational level ERP and links have been under construction to enable SAP R/3 to see the production data from Raksu.(As said, these later phases are beyond the scope of this paper).[7]

This case with its direct negative results confirms the opinion expressed by Noble:

> It matters a great deal, in terms of what actually gets designed, whether or not the designers and users are the same people, whether or not they know each other, whether or not they view each other as equals, whether or not they have power over each other, whether or not they are friends. On the whole, technical people come to share the perspective of those who wield power rather than those over whom the power is wielded, with managers rather than labour, with officers rather than soldiers. This happens simply because technical people do their work almost exclusively with the former rather than with the latter, and come to share a world with them.[8]

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Notes

1. Michael Newman and Faith Noble, 'User Involvement as an Interaction Process: A Case Study'. *Information Systems Research*, 1990, Vol 1, Issue 1: 89–113.
2. Larsen and M.D. Myers 'When success turns into failure: a package-driven business process re-engineering project in the financial services industry'*. Journal of Strategic Information Systems*, 1999, Vol 8: 395–417.
3. David F. Noble *Forces of Production* New York: Oxford University Press, 1986, 278–323.
4. Ibid., 208.
5. Larsen & Myers *op cit*.
6. The senior designer, who worked in the organisation during the implementation project and still works there, provided oral information about the later phases of the information systems concerning coating.
7. An integrated production control system SAP R/3 is the main product of a global company named SAP that produces 'collaborative business solutions' for all types of industries.
8. Noble *op cit*, 45.