



Problems, Their Causes and Effects in the Use of Information Systems: A Case of a Scientific Library

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EXECUTIVE SUMMARY

Information technology (IT) has radically improved many aspects of organisational activities. Computer-based information systems (CBIS) are constantly developed more effective and efficient. Development of a new CBIS is justified by higher quality of work, more efficient work processes, and more flexible work practices. However, introduction of the new IS can produce a variety of problems.

This paper describes the problems observed in the use of a library CBIS in a Finnish scientific library. The results of the study illustrate well the environment which should be understood by the designers of computer-based information systems. One important prerequisite of good (re)design is a wide understanding of the problems that may prevent effective use of a CBIS. In this study we introduce a classification based on the problems which were found in the case. The classification describes the causes and effects of the observed problems.

BACKGROUND

The study was carried out in a scientific library which hierarchically is a special unit of the University. The library is administrated by a chief librarian and governing board, consisting of the chief librarian, one member appointed by the rector of the University, and six members appointed by the Council of the University.

The library is organised into 11 departments. Four departments deal with administrative and acquisition related tasks. One of the departments is the central library which is in charge of the general collections. The remaining six units are faculty libraries (mathematical and natural sciences, humanities, education, medicine, law, and social sciences), which are responsible for specialised collections.

In general, the activity of a library is characterised by two different work processes. The goals of these processes are different and, in some sense, also conflicting. On the one hand, the library increases and maintains its collections. On the other hand, the library serves the customers by lending volumes from the collections. From the first point of view, the situation would be ideal when

the collections are complete and all the volumes are in the shelves. For customer services, it is important that the volumes are borrowed by the customers. In an ideal situation, all volumes would be checked out. For the organisation as a whole, the most important thing is to achieve both goals in an optimal way.

The main stakeholders of the library's activity are different types of customers, publishers, brokers, bookstores, other national and international scientific libraries, Customs, and university administrative bodies. Typical customers are university researchers, teachers and students. The library's work practices are partly defined by the nationwide community of scientific libraries in Finland. Publishers, brokers, bookstores and Customs are related to the acquisition process of the library.

The library has 118 employees (see Table 1). Half of the employees hold a university degree which suggests that the organisation has a strong expert flavour. The organisation is female-dominated, and consequently the wages are low.

There are five main professional groups in the library. The largest group consists of assistant librarians. They are employed in almost all the departments, they are a little younger than the other employees, and about 40% of them are doing either their professional training period, civil alternative service, or government supported work period because they had been unemployed. Assistant librarians work typically in customer service or maintenance of the collections, they have low income, and do not have any education in library science or related disciplines.

Librarians are the second largest group of employees. A typical librarian is female, has a permanent position, and holds a university degree in library science. As a group, librarians are not specialised in any specific type of tasks, even though administrative tasks were often included in their jobs.

Library secretaries form 13% of the staff. Typically, library secretaries have a temporal position and a library science related degree. Library secretaries work in customer service, and do cataloguing, acquisition, or maintenance related tasks.

The library has 13 library clerks. A typical library clerk is female, somewhat older than the other employees, has a permanent position and a library science related university degree. They do mostly cataloguing related tasks, but also maintenance and customer services.

Of the minor professional groups the librarians who are specialised in information service, are the most important. This library employs only two information specialists. They are highly skilled in the use of different types of information systems, they train the customers, and they are better paid than the other employees.

From the perspective of librarianship some alarming, rather global changes have taken place in the library industry. Firstly, the increasing use of IT in publishing is a challenge for the libraries. For example, electronic publications have already radically changed the traditional domain of the library, causing uncertainty among employees as they have to modify their work practices. Secondly, the development of IT has made it possible for the customers to take over traditional tasks of librarians. The tendency to increase self services is seen as a threat for the proficiency of librarians. The

Table 1: Employees, collections and CBIS

| | | | |
|---------------------------|-----|--|-----------|
| Staff | 118 | Collections, total | 2,100,000 |
| Professional groups | | • annual accumulation | 50,000 |
| • information specialists | 2% | Central CBIS | |
| • librarians | 26% | • employees using the system | 84% |
| • assistant librarians | 35% | • working hours used on the central system | 55% |
| • library secretaries | 13% | • working hours used on other systems | 16% |
| • librarian clerks | 11% | Collections (1997) | |
| • others | 13% | • in CBIS database | 32% |
| Education | | • manually updated | 68% |
| • university degree | 51% | | |
| • lower education | 49% | | |
| Gender | | | |
| • male | 32% | | |
| • female | 68% | | |

employees are frightened of the changes because their professional status is weakening. The pessimistic view of the future of the profession is embodied in low-educated assistant librarians. Their number has grown radically which reflects the weakening position of librarians. Furthermore, the number of the top professionals in librarianship, i.e. the information specialists, is next to nothing.

The use of IT in the case organisation was the primary interest of the study. A central CBIS supports the core activities. Altogether 84% of the employees use the system, and the average use of the system was 55% of working hours (see Table 1). Furthermore, the organisation applies around ten other important computer applications. The employees who use the central system in their work also use these applications around 16% of working hours. In other words, 84% of the employees spend 71% of their working hours using some CBIS, which suggests that the organisation is highly dependent on information technology.

The importance of the CBISs is more obvious if we look at the pool of information which is stored, updated, sorted and searched by the employees and the customers. The total amount of volumes in the library is huge, around 2,100,000 copies. In 1997, there were about 673,000 volumes in the CBIS, and the rest of the collections filed in manual card catalogues. However, not only is the pool of information about the existing collections huge, but also the information concerning orders and acquisition of new items is significant. The collections increase by about 50,000 copies per year. Furthermore, the information related to the customer service process, i.e., ordering, borrowing and returning publications, is an important part of information flow from the perspective of information technology.

SETTING THE STAGE

The library system has been developed by an international software house. It is used in every scientific library in Finland with tens of thousands of users in the country. Further, different releases of the system are applied at least in several European countries and in the USA.

The introduction of the IS has changed the nature of the activities in scientific libraries in Finland. The system has facilitated totally new forms of cooperation and communication between the libraries. It has integrated the departments within each library. In addition, the system has allowed more effective utilisation of collections by the customers.

Although the system has radically improved the quality of library activities, the users have encountered a number of problems. However, no complete understanding exists about the quantity or quality of the problems related to the system. Furthermore, the organisational structure needs apparently to be redesigned, which would set new requirements for the system.

CASE DESCRIPTION

The organisation invited a group of IS researchers to study the deployment of the CBIS in the library's work processes. The research group spent nine months in the organisation in order to gather information about the problems perceived and experienced by the users. Data were gathered in several ways: by using the system, by examining the documents produced by the organisation, by observing, by performing two questionnaires, and by interviewing. One of the questionnaires was filled in by the employees (all employees, $n=118$) of the library. Customers' viewpoints were studied by the other questionnaire ($n=200$). Further, 15 employees representing different phases in the major work processes were interviewed.

Parallel to the research, an organisational development project was started. The goal of the development project was to enhance the effectiveness and efficiency of work processes. The development project modelled the work processes in order to document the existing work practices, to compare the differences between the organisational units and to analyse the problems in the existing work processes. The results of this project will be used as the starting point in a future project, which will concentrate on the reorganisation of work processes.

The activities of the library were analysed both as a whole and as separate work processes. Two main objectives were found when the activity was observed. On the one hand, the goal of the library is to accumulate and store the collections, which was manifested as comprehensive and well-

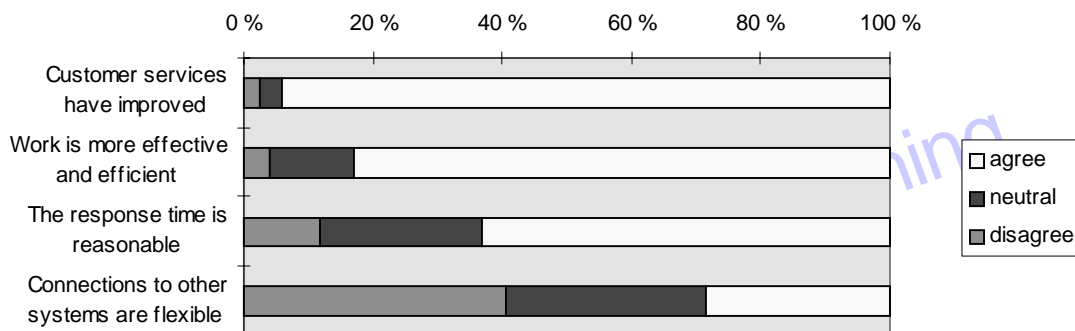


Figure 1: Some opinions of the employees about the influence and characteristics of the system (n=99).

documented collections. On the other hand, the goal is to utilise the collections which takes the form of fast and flexible circulation of copies to the customers. These goals of the library are in a way contradictory. To oversimplify, the goal is achieved when either none of the copies is checked out or all the copies are checked out.

These two goals were manifested in the main work processes of the library: the acquisition and service processes. The researchers modelled the processes by using generalised process diagrams. The diagrams included information about the sub-goals of work phases, and the ways to achieve the goals in different organisational units. The tools (e.g., information technology) which were available to support the performance of work tasks were analysed, and the problems in their use were gathered for analysis.

PROBLEMS FACING THE ORGANISATION

The CBIS had an important role in the library's activities. The benefits of the system were visible in the every day work of the employees. Most users thought that the system had improved the customer service. Further, the users considered that the system had improved the effectiveness and efficiency of work. The response time of the system was reasonable for most of the users, but the connections to other systems were not flexible enough in some tasks. (See Figure 1.)

The employees were able to tell quite accurately about the problems in the use of the system. However, evaluation of the causes and effects of the problems seemed to be more difficult. Because the knowledge about the problems was fragmented, the users had difficulties in seeing the overall pattern of problems. They had to tolerate these problems in their daily routines and find alternative ways to perform their tasks in order to avoid the problems.

The most obvious problems were of a technical nature or indicated weaknesses in the user interface. However, problems also derived from the way of applying the system, lack of user skills, and even from the organisation of work processes. Because nobody had a clear view of the possible causes and effects of the problems and the overall pattern of them, the organisation tried to compensate for the problems by improving the employees' skills in the use of the system.

Next, the daily problems facing the users as well as the causes of the problems are discussed in detail. The problems can be classified into five main groups: technical problems, problems in the user interface, problems in the usage of the system, problems related to skills and knowledge, and problems related to division of labour and work processes. Some instances of the problems and their causes belong to several main groups.

Technical problems

The problems classified as technical problems were derived from both in hardware and software. Hardware problems were related to efficiency and telecommunications. Efficiency of the hardware became apparent in continuous starting and closing different software applications during the work. Also, breakdowns in telecommunications caused serious harm to the work. Because many employees worked up to 90% of their working hours with the system, the breakdowns in telecom-

munications constituted a serious problem.

Obvious errors in the software caused serious problems in the work. Most of the problems were accumulated to the service process. Software errors covered, for example, unexplained response of software while pushing a certain button or while working with a certain group of customers, the malfunction of a control parameter or other illogical behaviour of the software. A part of the software did not work at all. From the users' point of view, errors in the software were especially difficult because they appeared always unexpectedly and were related to certain work situations. Some errors were found only by chance. Thus, nobody in the organisation knew the harm the error had already caused or its final effects. Because the organisation could not correct the errors in the software package, the users demanded a great deal of creativeness in order to cope with software problems. It was only possible to report the errors. Consequently, the only way to handle the problems was to tolerate them or to get around as well as possible.

“...and then there are these bugs that some programs don't function as they should. Just like this one. If a book has not been returned and you can see that two reminders have been sent. In that situation you could send a bill. But you can't. You have to contact the customer first because you can't be sure that the reminders really have been printed out by the system... it's quite unfair that you get a bill, if you haven't got even a reminder.”

There were a number of serious shortcomings in the software which actually cannot be called errors. For example, some data fields and pieces of software which would have been of value for the activity were totally missing. The integration between different parts of the software was insufficient. Also, some parts of the software simply did not fit into the work practices of the organisation, because the software was originally developed to support a different organisational culture.

In all, the organisation could not influence the features of the CBIS which caused the technical problems. This was very frustrating for the employees, because even if they were aware of the problems, it was practically impossible for them to solve the problems. One employee described the process of correcting the software errors as follows:

“Yes, those [development suggestions] have usually gone through these teams and then they are treated on the European level and then only after that they have been sent to the USA as suggestions. Generally they have been ranked so that the developers can decide the order of implementing them and...and... it is not a very quick process... to get further that way. One could be about these different releases of the library system that only some of the bugs have been managed to get rid of. And it has happened that when one bug has been removed it has created others somewhere else. Always, when you start working with an updated version you have to be very sharp, because you never know what has changed.”

The problems related to the technical aspects of the CBIS actually were manifested in two ways: the system did not behave as expected or some information “disappeared.” In addition, the technical shortcomings caused unnecessary work, and some tasks were put off or totally given up. In some situations, the necessary information was hard to find which hindered the customer service.

User Interface

The weaknesses in the user interface caused various problems. Generally, the user interface was found very uninformative. This was not a surprise, because the interface was character-based and the system was used by line commands. The commands usually consisted of only one or two characters. Further, the commands referred to English words and thus were not so easy to remember for Finnish workers, which decreased the usability of the system.

To compensate for the weaknesses of the user interface, a number of user manuals had been written in the organisation. However, the manuals were of poor quality. Only 7% of the employees reported that they use the manuals to cope with problem situations. The weaknesses of the user interface, the inconvenient way of using the system, and the poor quality of the user manuals together resulted in that it was difficult to learn independently to use the system.

“Well, this really is a very complicated system, although I’ve got used to it and don’t have any good point of comparison. I have always “floundered” with this record format. Earlier, I worked in another library and there was also the same system. It was a long time ago. But it is a fact that you have to browse through many screens. Of course I’m not the right person to say something is complicated, but this system really is constructed quite...”

As mentioned earlier, the actual operative use of the system, for example, remembering a command was difficult. Furthermore, certain tasks were quite troublesome to perform. For example, editing an existing data field was so difficult that the users preferred deleting the old data and rewriting the whole thing. In some cases, the users experienced the manual system even better than the computerised.

“...[correcting mistakes] could be simpler. I’ll give you an example here. If I want to add something, for example, to line 6, first I take the line up and then I move the cursor with the space key [to the right position]. And if I want to add ‘m’ here I have to write ‘i’ [insert] under the next letter and then ‘m’. Now it’s there and then I have to save this record.”

The shortcomings and weaknesses of the user interface had various consequences. Some data in the database were insufficient or faulty, and sometimes very difficult to search for. Also, finding the right command was difficult and sometimes the work practices turned complicated. Difficulties in interpreting the meaning and functionality of data fields reduced the quality of the interface. Furthermore, the employees had to bear in mind many details related to the system. The user interface caused extra work and delayed some tasks. Because the user interface to be used by the customers was also very primitive, the shortcomings caused extra work to the stressed staff. In this way, the low quality of the interface weakened also the standard of customer service.

Usafe of the CBIS

Difficulties in defining the value of certain software parameters caused unexpected behaviour of the CBIS. In some service-related tasks, the users suddenly observed loss of information which hindered the coordination of the activity. For example, information of claims was lost when a customer returned a loan, irrespective of whether the returned item was the cause for the claim or not. The consequence was that the librarians had no possibilities to control that the customer paid the notification fee. Therefore, the problem caused some loss of money.

Timeliness of the information in databases was not adequate. Firstly, some tasks were performed manually, because it was found better and more practical. Thus, all the information in the library database was not up-to-date. Secondly, there was no program for removing large amounts of data. Further, it was difficult to provide information for the customers because of missing data fields. To conclude, many things, such as manual activities, human mistakes, and misinterpretations of the data caused false notions of the true situation. Also, it was not clear who was responsible for the contents of information, which did not help in avoiding problems in the correctness of the information.

All necessary data were not entered into the database because there was shortage of resources in the library. Consequently the quality of the customer service was not the best possible, because customers could not rely on the correctness of the data. Further, manual performance of certain activities in some units multiplied the effect. Problems in defining certain data items weakened the customer service by delaying the circulation rate of the material. The possibilities of the customers to utilise the CBIS effectively were impaired by superficiality of customer manuals and by lack of customer training. Sometimes, customers were not able to use the CBIS at all, because the system had without any reason cancelled the rights to use the library. Also, the contents of the database often failed to satisfy the needs of the customers.

Finding a piece of information sometimes required browsing through several screens. Some tasks required so much browsing that work practices were unnecessarily complex. Editing was so

laborious that simple modifying operations had to be performed by deleting and rewriting. In some units, the work was organised so that the material had to be transferred back and forth between different units.

Many work tasks were to be performed manually because the CBIS was found difficult to use. Further, 'working around' was performed in computerised tasks, resulting in unnecessary operations. The reasons for working around were related both to the functionality of and deficiencies in the software. In some cases, the functions of the CBIS had to be applied to fit the work tasks. Sometimes, tasks had to be delayed in order to be able to complete them. Awkward editing caused unnecessary deleting and rewriting. Also, the value of certain data item had to be changed for a moment, so that the task could be completed. Performance problems in hardware forced the workers to close and re-start applications, if they wanted to use several programs. One employee described working around as follows:

"I've invented this kind of a trick, when I want to print the whole reference. In the system there is the 'print' command which prints a couple of lines, but I'd like to print all of them, the whole [index] card. I've put here the 'print-to-file' command, and now all that I take with 'print screen' will be printed to a file. And in the library system I use ... then I will use Windows and ... when I get the reference to the card screen I will take the 'print screen', and it goes to the file. Then you have to edit it. All the stuff at the screen goes there. That is why it is difficult. "

A lot of problems were found in the usage of the library system because information was hard to find. First, the commands were complicated which made searching for information difficult. Second, searches were difficult to perform, because the search command could often be applied only to impractical data fields. Sometimes it happened that for an unknown reason the restriction of the search space had changed without the user noticing it. Therefore, only part of the searched information was found and the user never realised the mistake. Manuals would often have been needed when using more complicated commands. The manuals, however, only provided information about rather simple operations. Furthermore, customers who used the CBIS did not often know the variety of data the system included.

The characteristics of the library system caused that some tasks were delayed or not performed at all. In consequence, the work process was performed slower or the customer service was impaired. In some cases people simply avoided using the CBIS, because they had had problems in using it.

Problems in the usage of the CBIS caused unnecessary work tasks. For example, when ordering for material, customers typed inadequate or faulty commands, and the system did not work as expected. However, the customer learned about the error only when coming to collect the requested material. Because of the complexity of the CBIS, work processes were often divided to very small parts, which increased the number of coordination tasks, i.e. starting, stopping, and transferring.

To conclude, the usability and flexibility of the CBIS were not at a very high level. The fact is indicated by deficiencies in the database, problems in finding material, and the need to remember a lot of details. Many tasks included working around, and the same tasks had to be performed several times. Also, delayed tasks and impaired customer service were, at least in some cases, consequences of the properties of the CBIS. In the worst cases, the problems were so difficult that the CBIS was not used at all.

Skills and knowledge

Poor technical quality of the CBIS set additional requirements on users' skills. Some of the problems in the usage of the CBIS can be explained by shortages in skills and knowledge. This put strain on the more skillful employees and caused dissatisfaction for the customers who could not use the system by themselves. Further, the number of temporary employees was high in the library, which increased problems related to skills and knowledge. In some cases the employees did not have a shared view on the usage, e.g., in which form data should be entered into the CBIS. The lack of shared view resulted in extra tasks and made the internal atmosphere worse.

The users had to learn quite complicated commands of the CBIS by heart. On the other hand,

the users also had to remember a number of fields, their meanings, and the order in which to fill them in. All these issues were an excessive requirement on the memory of the users. Furthermore, the issues were often not related to the contents of work, but only to the use of the CBIS.

Both customers and employees had considerable difficulties in finding the right commands for different purposes. These difficulties caused the need for training of both groups. For example, a librarian who led customer training sessions evaluated that the customers had considerable difficulties in finding all relevant references from the database. She thought that the major reason for this was that the customers could not use the right commands for the right problem:

“Yep, it’s the ‘cutting’. All of the customers don’t get it. That she didn’t know that the [search] term should be cut. They just do those quick and dirty searches. And they find something and accept it, but... How would it be... I think that it is at least every third reference they don’t find. It depends on the topic. In some cases, you don’t find anything, no matter how many searches you do... but it requires teaching and participating. Always when you see somebody trying to do searches, you have to stand next to her, ... and I always keep asking them if they have tried to search by cutting the term.”

So, problems in skills and knowledge were realised in many different ways. Having a good command of the CBIS use requires a lot of rote learning. Information and functions were hard to find. Tasks which the customers basically could have performed themselves burdened the staff. In practice, customers did not find all possible references without assistance, or could not use the commands at all. These issues caused extra need for training. On the other hand, customer service was impaired because of shortage of resources. As its worst, problems in skills and knowledge led to job dissatisfaction and in some cases it was decided not to use the CBIS at all.

Work processes and division of labour

Overlapping tasks derived from several sources. Inadequate integration of the CBISs used in the same work process resulted in typing of the same data several times. Shortcomings in the functionality of the system forced the users to write many lists and statistics manually. Also, the structure of the records required that the same data had to be typed several times in different fields. Old manual work practices were still used in many units, either along with the computerised system or alone. This was, at least partly, due to negative attitudes towards information technology. Fragmented work processes caused repeated copying and deleting of data. Also, dissatisfaction with colleagues’ work, e.g. in cataloguing, was found to be one reason of repeating tasks.

In some cases, the work practices led to problems in the usage of the CBIS, for example, varying cataloguing practices both inside the organisation and in other cooperating libraries. These problems were rather interesting, because their sources may have hidden in other phases of the work process than the one in which the effect was perceived. Also, obvious failures in work tasks naturally led to, e.g., erroneous data in the CBIS.

Several CBISs were linked to the library system. Considerable problems in the usage of the system were discovered because of the poor integration of the parallel CBISs. Repetition of tasks was observed in many different forms:

“Yes, there is a problem ...if you think the material which comes from the acquisitions you can not utilise it well ... the record which comes from there ... because the form of the record is so different and you should fix it. And then in ‘LINDA’ [national scientific library database] there can already be a complete record, so it is useless to do here [library system], because first we create a record to ‘LINDA’ and then we copy it here”

One serious problem originating from organisation of work was related to communication between employees. When the work processes were studied it was found that highly specialised division of labour resulted in barriers in information flows, and fragmentation of skills and

knowledge to certain employees. At the same time, other employees who were responsible for other phases of the work process, would have benefited of the skill or piece of knowledge in question. Broader tasks would clearly have helped in reducing these problems in the usage of the CBIS.

DISCUSSION

It is often thought that IS designers suggest only technical solutions to organisational problems. Our study, however, indicates that the users also tend to suggest technical improvements, whether the causes of problems are technical or not. The large number of problems that were found in the case organisation indicates the importance of accurate analysis of use related problems. Means for enhancing the utilisation of CBIS have to be discovered in order to perform the work effectively and to achieve the set goals. Improvements in design require that both the designers and the users take an open-minded view on the various causes of problems.

The classification of use related problems does not offer any solution for the organisation. One way to analyse the problems and their effects on activities is to place them in work process diagrams. Figure 2 illustrates six problems with their relationships that were found in the case library's processes. Problems a, b, c, d, e and f were perceived by four employees. In fact, the problems were related to each other, although the employees did not completely realise it. The real cause of the problem chain hides in the ordering phase of the acquisition process (Problem a) and is reflected in other parts of the process and even in the service process. In this case, poor integration between the acquisition system and the library system was the ultimate cause. The solution would be either better integration of the systems or introduction of an acquisition module to the library system. However, all the problems were not technical which may require also organisational changes.

Even if the problems could not be explained in relation to each other, the process oriented analysis allows identification of the most problematic work phases. Further, there are usually several computer applications in a real work situation which have to be evaluated together. In the library case there were three main applications in the acquisition and service processes. The analysis revealed two most problematic work phases: cataloguing in the acquisition process and searching in the service process.

The analysis becomes even more complex than described above, because the organisational aspects have to be considered besides the technical issues. In the library, the need for organisational redesign was indicated by two obvious signals: the shortage of resources in customer service and the employees' dissatisfaction on work conditions. The questionnaire revealed a clear imbalance in the allocation of the resources between the work processes (Figure 3). Each employee evaluated the proportion of working hours by a list of work tasks which included about 100 different tasks. The tasks related to acquisition took almost half of the working hours in the organisation while the tasks related to customer service took only one third of working hours. This can be explained by the existence of important collections which needed a lot of acquisition related tasks and which had a value of their own, even if they were not used by customers. Another interpretation would suggest the need for organisational redesign. The relatively high number of working hours spent to administrative tasks reflects the high number of organisational units with their own administration,

Figure 2: The relationships of the problems

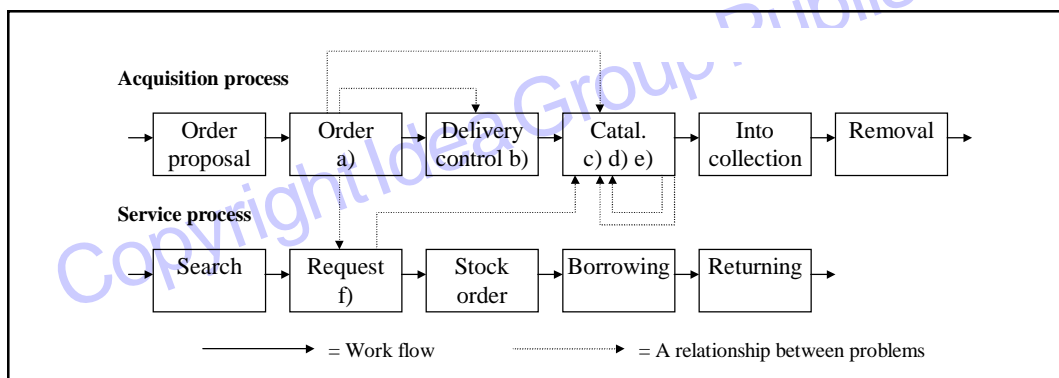
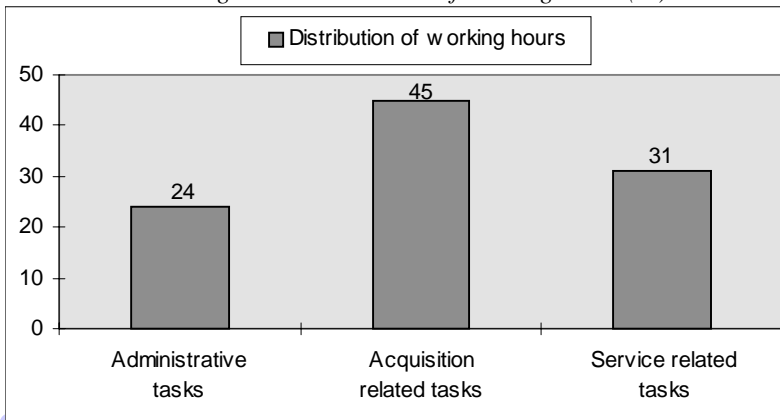


Figure 3: Distribution of working hours (%)



as well as the bureaucratic organisational culture.

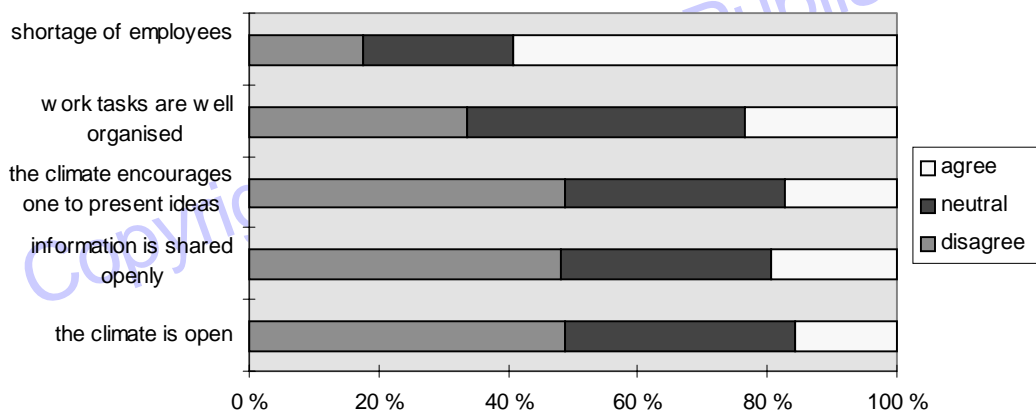
There was a clear need for change indicated by the employees (Figure 4). More than half of the employees agreed that the number of employees in the organisation was insufficient in proportion to the work to be done. In other words, the employees were under stress and burdened with too much work. Furthermore, only 20% of the employees agreed that the work tasks were well organised. There was something wrong in the organisational climate, too. Less than 20% of the employees agreed that the organisational climate was open, encouraged the employees to present new ideas, and that information was shared openly in the organisation.

The multifaceted nature of the observed problems indicates that CBIS should not be analysed as a separate entity, but as an inseparable part of the work. It is hard to imagine that the problems found in this study would be unique or that the number of problems would be somehow unusual. On the contrary, we suggest that problems in the use of information technology are underestimated both in research and practice. Therefore, a deeper and more holistic understanding of problems should be pursued.

There seem to be five development areas of which the organisation would benefit the most. These development ideas are based on the case study and some later analysis of possible organisational changes. The ideas are not necessarily in line with the views of the organisation, but reflect the results of the researchers' analysis. The ideas are presented here as the areas which probably have the highest potential to benefit the organisation. However, there is still an analytical gap between the problems reported in the previous sections and the ideas for changes presented here.

First, the user interface should be replaced by a graphical one. This investment would be of

Figure 4: The employees' opinions about the number of employees, organisation of work tasks, and the organisational climate (n=118).



benefit for both the employees and the customers. The graphical interface would simplify the work of employees who reported difficulties in, e.g., editing the data fields, memorising the right commands, and browsing through several screens. On the one hand, customers and temporary employees would learn the graphical interface more quickly which would reduce the need of user training and manuals, as well as the number of interruptions caused by the novice users asking for help in problematic situations. On the other hand, the lower skill requirements would offer new solutions for the organisation of work tasks. Some tasks were performed exclusively by certain employees because the system was difficult to use. Graphical user interface could diversify the work of employees because specific tasks would not be so difficult to perform.

Secondly, better integration of various CBISs would offer a possibility to transfer and utilise existing data, for example in cataloguing tasks, more effectively. This would require enhanced integration of the acquisition system and the library system in such a way that the quantity and quality of the data transferred between the systems would be easily utilised and edited. The effect of the same problem is seen in a wider scale when working with the national scientific library database. Better integration would simplify the work practices and diminish the number of certain operations.

Thirdly, both national and international co-operation provides significant opportunities in reducing the cataloguing work carried out by a single library. One possibility would be shared catalogues of scientific libraries in Finland. In this way the cataloguing data would be entered only once into the CBIS. Of course, for effectivity reasons the data should be replicated over several physical locations. International cooperation which already is under examination could provide most of the cataloguing data in electronic form directly from the publishing companies.

Fourthly, the reorganisation of work and tasks offers several development possibilities. Work processes could be performed more effectively and efficiently, if some subsequent tasks were done by one person instead of splitting the tasks between several employees. Furthermore, organising the work processes in a more sensible way would diminish unnecessary transferring of material and reduce the danger of losing information in additional coordinating tasks. Also, totally new forms of organising and conceptualising the activities, like new types of services, could contain potential for change.

Lastly, many of the manual catalogues could be computerised. For example, lists of terms which are used in describing the nature of a publication and in the search of them could be updated centrally. Further, integration of these lists into the library system would probably reduce the work load and the amount of mistakes made in cataloguing tasks.

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