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The Planned and Materialized Implementation of an Information System

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EXECUTIVE SUMMARY

The object of this case study is a marketing and sales information system in two local offices of a regional telephone company. A unified, advanced client/server system was needed due to the merging of three companies into a bigger regional company, keener competition, and the growing complexity of the services provided. The system is tailor-made to meet the needs of the industry and it was developed by a software vendor in close cooperation with the nation-wide alliance of regional telephone companies.

This study illustrates the difficulties in simultaneously aligning an organization and implementing a new information system. Views on the skills and competence needed in using the system vary, and lead to the negligence of education and training. The consequent lack of skills and knowledge of some users, especially of those not using the system regularly, create profound problems in the whole work process and in productivity as the first, obvious work practices become the dominant mode of operation bypassing the desired integrated workflow. The findings are discussed and reflected to concepts of institutionalization, positive reinforcement, and productivity paradox. This case emphasizes the importance of the organizational implementation and adaptation process which ought to begin after the implementation of the technical system.

BACKGROUND

It was only in the beginning of the 1990s when the telecommunications sector was deregulated in Finland. Long distance lines (i.e., crossing the local telecommunication areas), which were previously operated by a state-owned company, opened to competition. Deregulation took place simultaneously with the emergence of radio-based telecommunications, most notably with the introduction of the wireless analog NMT and later digital GSM and DCS networks. Radio-based telecommunication is also open to competition. The mobile phone has grasped a significant share of the phone traffic (there are more than 2.3 million mobile phone subscribers in a country of five million inhabitants and 2.8 million subscriber lines). As a consequence, the rates of hard-wired long distance calls have fallen by 80 percent and the rates of local calls by 50 percent since deregulation. Deregulation has affected the regional teleoperators the least, but as the former licensing of

Table 1. Breakdown of the teleoperators' market in Finland (Telecommunications Statistics, 1998).

Regional phone calls	3.3 billion FIM
Long distance calls	4.1 billion FIM
International calls	1.3 billion FIM
Data communications	1.8 billion FIM
Equipment	4.7 billion FIM

telecommunication areas is deregulated, too, local operators have started to merge.

Currently there are two main telecommunications operators in Finland: Sonera plc (formerly known as the state-owned Telecom Finland) and the Finnet consortium, which is owned by 46 regional telephone companies. There is a third player, owned by Swedish Telia, but as its market share is less than 2 percent, long-distance and radio-based telecommunication markets have practically a duopoly. Our case company belongs to the Finnet consortium, the market share of which is about 50 percent of the total telecommunications turnover, 16 billion FIM (about 3 billion USD), and the market is expected to grow to 22 billion FIM by the year 2000.

The nation-wide Finnet consortium was established by the regional telephone operators in order to provide seamless long-distance calls for their subscribers and to keep up with the pace of fast rapidly-developing technology. The consortium developed a digital SDH-based backbone network, primarily on optical cabling, for long-distance and mobile-voice calls and data communication.

The regional telephone company, called here Areal Phone Ltd. (AP), implemented a new information system (IS) about one year before this case study. The implementation was not, actually, a free choice, rather the company was driven to changes. The reason for the new IS was simple: AP

Table 2. Areal Phone Ltd. in figures (1997).

Turnover	145 million FIM (28 million $US)
Investments	69 million FIM (13 million $US)
Gross margin	43 %
Revenue	11 million FIM (2 million $US)
Balance sheet	320 million FIM (62 million $US)
Telephone subscribers (wired)	75 293
Cable television subscribers	25 827
Employees	240
Inhabitants in the territory	152 500
Area of the territory	3236 square kilometers (2000 mile^2)
Municipalities in the territory	23

is the result of a merger of three mutual, local telephone companies. The three companies each had their own tailor-made operative information systems, so there was a need to unify the operations and ISs.

The reasons for the merger stem from the previously mentioned changes in the telephone operators' business environment. On the one hand, deregulation has driven small local companies to seek economies of scale by merging. On the other hand, it is considered difficult for small companies

to keep up with the rapid development of digital telephone technology, where different data services are becoming more and more important (for example, the percentage of Internet users in Finland is one of the highest in the world).

At present AP serves about 74 000 wire-based telephone subscribers and 26,000 cable television (CATV) subscribers (see Table 2). The company functions in 23 municipalities, where there are 152,000 inhabitants. The private customer base consists mainly of urban households but a significant number of customers live in the countryside. This means that maintaining the infrastructure is a demanding and expensive responsibility of the telephone company. The digitalization of the telephone network that started from switches has continued at the subscriber end and the number of ISDN installations has been growing constantly. For example, in 1997 the turnover of AP data services grew over 30 percent. Data services are especially important in enterprises, which is the other important customer sector of AP. The possibilities of AP offering data and other add-on services are excellent because their network is totally digitized.

The main business of AP is still to maintain the telephone network and operating calls. The future trend is to increase the complexity of value-added services both for the private customers (e.g., CATV–network renewal for data communications and xDSL connections) and enterprises (e.g., running outsourced switchboards and high-speed data communications). However, as the hype for an information society continues, telephone operators are seen as vital players; hence, the interest for mergers continues: in 1997, AP acquired the telephone company of a town situated nearby. In 1997, AP also introduced their own radio-based DCS/GSM 1800 city phone network.

SETTING THE STAGE

The new information system at AP was seen as a means to cope with the competition and to improve marketing, sales, installation, and maintenance of the increasingly complex value-added services. As we browsed through the documentation, it became clear, however, that the project had concentrated only on defining data structures and little attention was paid to actual business concerns and work process (re)organization.

The selection process of the new IS for AP had taken about one year. The turn-key information system chosen had not been used earlier in any of the three separate companies. The coalition worked in close co-operation with a Finnish representative of a large international software vendor. The new

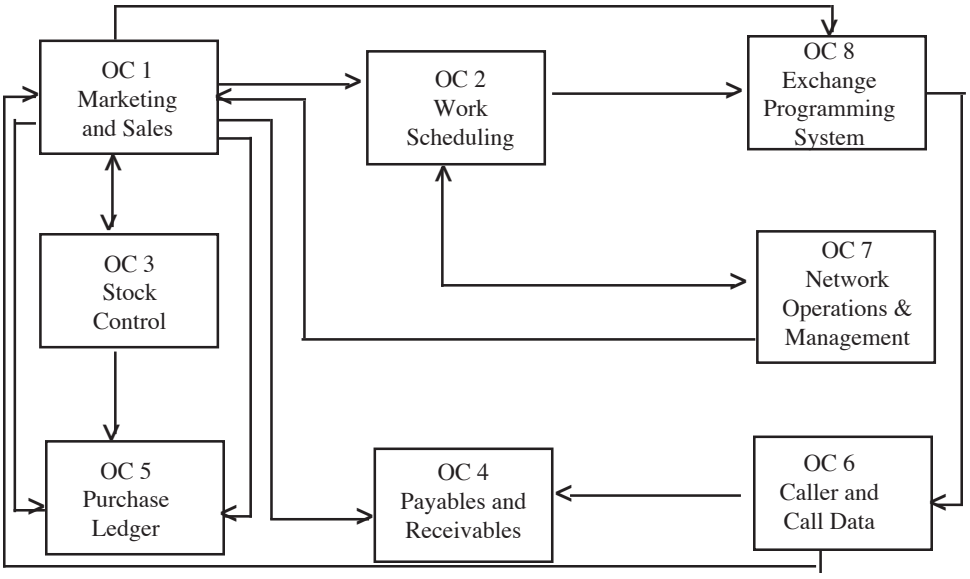


Figure 1. The subsystems of the OC system (Operations Control) and their interconnections. Subsystem #1 ('Marketing and Sales') was the main object of the deployment evaluation project.

IS for operations control was to cover practically all the functions of the company (see Figure 1).

The broad domain was not news to any of the companies, because their former ISs covered also the majority of operations. As the new IS was different from any of the three former ISs, the data conversion from the old ISs was anticipated to become one of the most demanding tasks of the implementation process.

The new IS was implemented on an Oracle database using Oracle Forms and Report Writer development tools. The most computing intensive routines were programmed in C++. The system runs on a UNIX-server and the workstations (PCs) are connected to the server via an Ethernet-connection. The OC system is used with a terminal program, so the architecture actually corresponds to a mainframe system. Office programs, however, are used directly from the server.

The initial problems with the capacity of the server were due to the greater-than-expected number of concurrent connections. The number of connections grew high as the IS did not support incomplete tasks (i.e., if a task was interrupted all the previous input was lost and the task had to be restarted from the very beginning). Hence the users opened several concurrent terminal sessions in order to manage their work fluently in a customer service situation. At the time of the study, this capacity bottleneck had been removed and the response times of the system reached an acceptable level.

However, there arose additional, 'fuzzy' problems that led the CIO of AP to contact our research unit at the university to evaluate the situation at the marketing and sales subsystem. The perception of the problem by management was vague; it was based on casual user complaints about the poor usability of the system. According to management, the problems concerned mainly the private customer sector and were caused primarily by deficient features of the IS: the IS did not support business processes anymore because it had been designed for selling hard-wired connections instead of add-on services. Therefore, management decided to set up a project for streamlining the interface in order to improve the functionality of the IS by "reducing the number of screens by half." Our evaluation was planned to complement the requirements analysis of the forthcoming renewal project. In addition, management wanted to compare the IS usage and usability problems to earlier evaluations made by our research unit.

The subsystem studied (see Figure 1) was labeled "Marketing and sales," but actually "Customer and product" would better describe the system. This is because the marketing part of the subsystem was actually abandoned—mostly for its lack of usability and functionality—after a short trial period. The subsystem is linked to all other subsystems (see Figure 1) because it is used for maintaining customer records (e.g., names and addresses, and long-term contracts).

The goal of the evaluation was to describe end-users' work tasks, work processes, and the use situation of the IS, so that more informed decisions about further development of the organization and the IS could be made. The study was carried out at all three regional offices of AP, but we use two offices of comparable size and departments to illustrate our case.

CASE DESCRIPTION

In both offices sales function of AP is organized according to their clientele, into Private and Enterprise departments. There were 15 end-users in the Private subscribers department and 11 in the Enterprise department. Management named these two groups as the target groups of the evaluation. It soon turned out, however, that about an equal number of end-users are using the same subsystems outside the marketing and sales department, and their IS usage is directly related to the work processes of the personnel in marketing and sales.

The average age of the users is about 37 years in both departments. In the Private department, nearly all users are women, but in the Enterprise department the proportion of women is only about 20 percent. The end-users are competent long-term employees and are accustomed to the organizational culture: mean employment time is 9 years in the Private department and 14 years in the Enterprise department.

The users are also experienced computer users (on average, 8-10 years of usage), even though most users have experience only in the systems used in the current work place. In the Private department, the IS is the main tool of its end-users – on average, 87 percent of the total computer

usage, which is equivalent to about 74 percent of the working hours spent using the new information system. In the Enterprise department, the average usage time is 48 percent (about 25 percent of the working hours) and the variance in usage time is considerably higher. The situation in which the IS is used is also different: in the Private department, most of the usage (40 percent of the working hours) took place in customer service situations, whereas computer usage in the Enterprise department is more back-office –like; in only four percent of the working hours was the computer used while dealing with customers.

Before the IS implementation, the program vendor first trained and educated a few principal users who in turn trained their peers. The average training time was eight days in the Private department and five days in the Enterprise department —both figures can be considered impressive in light of our earlier research (Laboris, 1997)—despite the fact that in the Enterprise department the training is unevenly distributed and over half of the users had received less than four days of training. The reported reason for missing the training courses was urgent duties but, on the basis of interviews, a lack of motivation seemed to be the major reason.

Technological Concerns

The new IS has a text-based interface managed with the keyboard. This solution was decided on in the cooperative planning association long before the implementation of the system. The decision was justified by the requirement that "the appearance of the interface must be the same in all kinds of workstations like PCs, X-terminals, and ASCII-terminals." Even though consistency and uniformity are important aspects in interface design, the grounds for this decision are not relevant to AP because all the workstations are PCs. Contrary to its initial idea, the decision eventually limited the possible range of interface options (e.g. it eliminated the possibility to implement a graphical user interface) and the development tools.

As a result, the system is somewhat difficult to interact with – or, actually, there is little interaction. The system consists of 90 separate screens, and the coupling of the individual screens to the process of completing a specific task is weak. For the end-users this means that they have to memorize the screens and in which order they are used for each specific work task. This makes the system hard to learn and much practice and repetition is required in order to master the system fluently. This is confirmed by the fact that users' estimates of the time required to learn to use the system to the extent that one can work efficiently vary from two months to two years (the average was nine months). The estimates of the average learning time differ in the two departments: the average estimate of the learning time is four months in the Private and 13 months in the Enterprise department. As most of the learning takes place during system usage, it is obvious that the perceived learning time is correlated with the amount of system usage ($r = 0.59$, $p = 0.01$, $n = 18$). At the time of the study (one year after its implementation), users rated their current ability at 7.7 (on a scale ranging from 4 to 10) in the Private department and at 6.8 in the Enterprise department.

Users are unanimous that the system has been, and is, difficult to learn and to use. There are too many screens and there is little help built into the system to find the right screens in the right order. Obviously, the IS supports occasional users poorly, but with a sufficient amount of practice, the user eventually can learn it by heart. One clerk who has been using the system for 5-6 hours a day for one year expressed this by saying:

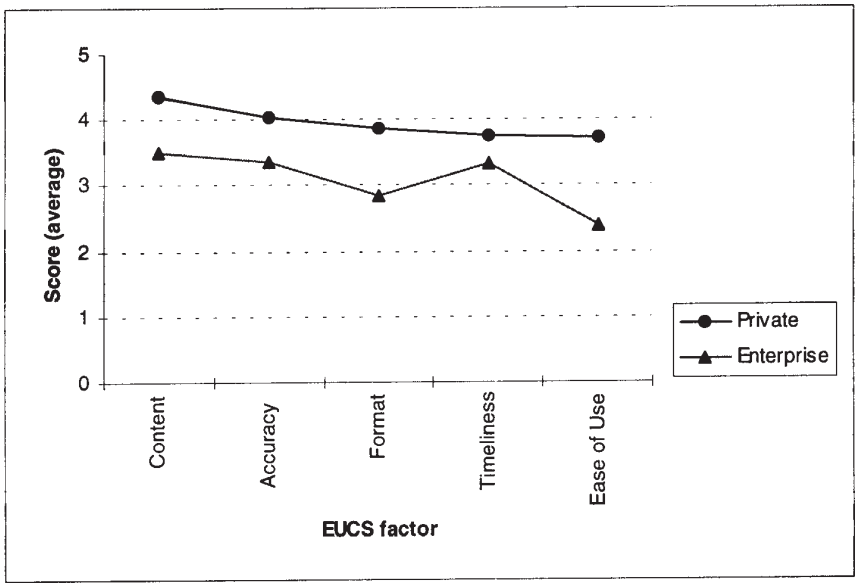
> *"That task is so routine nowadays, we have done them so much, that one does not need to think much anymore."*

But the system usage is obligatory for less often or irregularly performed tasks, too. In these cases, it has become a common practice to write the necessary information on a piece of paper and key the data in the IS later (with help from co-workers or support personnel).

The overall evaluation of the system by an EUCS-measure demonstrates that all features of the system are rated lower in the Enterprise department than in the Private department (Figure 2).

The user opinions give grounds for two possible conclusions: the system really is not well suited to the work in the Enterprise department, and/or the computer self-efficacy of the users is low, i.e.

Figure 2: End User Computer Satisfaction (EUCS) scores of the two groups. The differences in the means between the groups are statistically significant (t-test, $p < 0.05$) except for the factor 'Timeliness'.



the users feel that they cannot manage their computer supported work tasks properly (c.f. Compeau & Higgins, 1995).

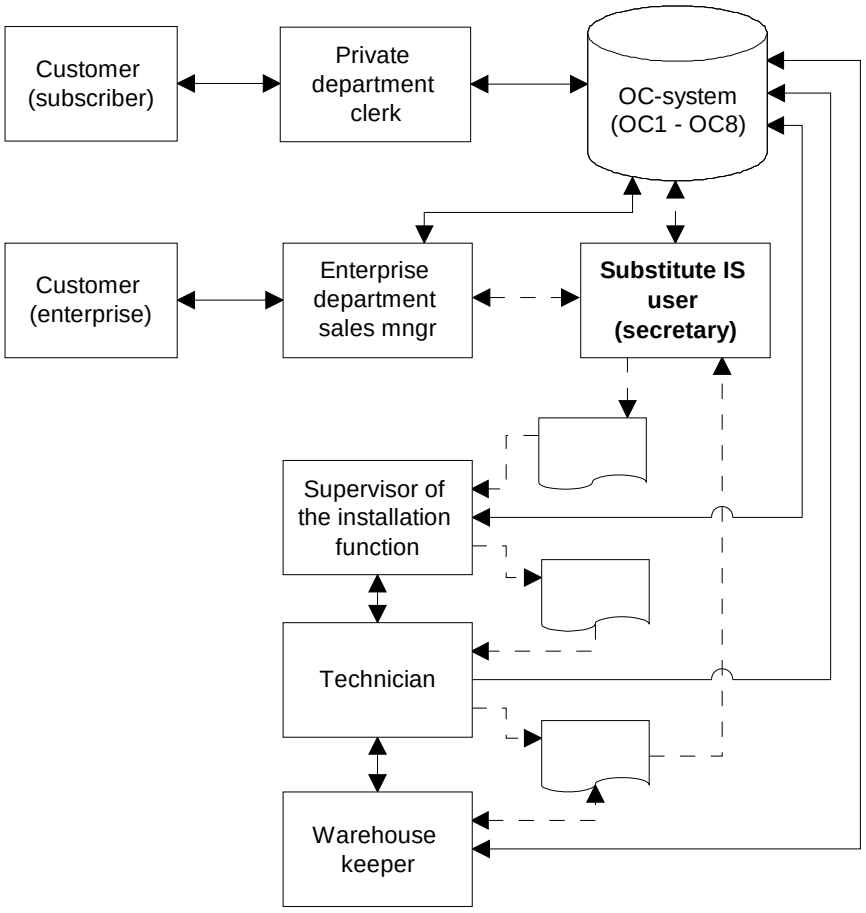
Organizational Concerns

The consequence of the poor alignment of the system functions and the actual work flow is that less-frequent users did not learn to utilize the system properly. Because some user groups (e.g. supervisors of the installation function, technicians and some of the sales managers in the Enterprise department) received little education in the system usage and on the ideal planned work flows, they developed apparently successful, but manual routines, to work around the system's limitations.

Management launched a re-design project to streamline the process in the Private department, but actually the problems were more severe in the Enterprise department. In the private sector, the service procedure was rather simple: customers were either face-to-face or on the telephone with the clerk who used the IS to carry out the service (see Figure 2). However, the system did not fully meet the requirements of marketing, selling, installing, and maintaining more complex services such as corporate ISDN-subscriptions. The willingness and skills to learn and use the system were also lower in the Enterprise department.

In the Private department, the implementation was carried out according to the plan: at the time of the study, most end-users have reached such a skill level that the speed of the work process was acceptable in both offices. The work is interrupted by breakdowns only occasionally (about half of the users have problems weekly, and 57 percent of the problems are due to the lack of skills and knowledge, mostly a problem for newly enrolled clerks). In other words, there are few severe problems in the use of the IS. Also the work processes closely follow the planned workflow. Although the system is clumsy for some individual tasks, and some operations are not institutionalized yet, the users have learned to manage their work with the IS and to resolve the few problems with assistance from their fellow workers. In other words, private customer service either in direct contact face-to-face or by phone proceeds rather fluently. Direct customer contact also increases the clerks' motivation for developing their skills in system usage because, by being able to use the IS fluently, they could avoid embarrassing social situations which might arise if they had to say to a customer: "Well, actually, I cannot perform my work tasks."

Figure 3. The use of the IS in the sales processes (from order to invoicing): end-user roles, IS usage, and interactions in the work processes. The solid lines represent the planned interactions and work flows. The dashed lines represent the situation which was institutionalized in the other office.



In the Enterprise department, there has emerged an unplanned supplemental work role (substitute IS user in Figure 3) because the sales managers were unwilling to learn and use the IS. Instead of inputting the order information into the IS, they deliver orders as hand written notes to 'the substitute IS user' who then inputs the orders into the IS. The sales managers' notes rarely include product numbers, only the name of the product or service. It is not unusual that while inputting data, extra contacts between the sales manager and 'the substitute IS user' are needed because the product name the sales manager uses is not found in the IS.

In the other office, technicians and their supervisors also ceased to use the IS after a few weeks of initial use. Actually, they ceased to use the IS as they were told to stop using it. This is because they had received neither enough training nor enough practice to master the IS as occasional users. For example, when the technicians were to record in the IS the working hours spent and materials consumed for a certain order, they often could not find the right order nor the right customer number. Instead, they keyed in the data in the first found occurrence of this specific customer— or created a new customer number. This led to a situation where some orders were not invoiced, the incorrect department of an enterprise was invoiced, and the database of the IS was eroding because of the duplicates. Except for extra work, this also caused customer complaints and in the present

competitive environment, flawless customer service, quick response, and a good reputation are critical.

In order to correct the situation, the IT usage of these user groups was replaced with pencil and paper: after inputting the work order, the substitute IS user printed out the order, and data of the later phases of the work process were documented on it. The notes made on the paper document were then inputted into the IS by the substitute IS user as the final step of the process after the installation was completed. This meant new procedures and a lot of extra work in finding missing data, since the data on the paper-based documents were only occasionally complete. As a consequence, the invoicing process was delayed dramatically, in some cases up to several months, despite the constant overtime work of the substitute IS user.

A closer look at the episodes and encounters of the process that led to the ban of usage in the Enterprise department revealed that the key problem was the end-users' inability to cope with the IS. The incapability of technicians and supervisors at the other office resulted in chaos, temporarily solved by the use of paper instead of the IS. However, this arrangement became permanent. For the sales managers, it was also a question of their power in the organization: a substitute user was assigned to the 'less valuable' task of learning to use the IS and keying in the data.

Current Challenges

Even though the situation might have been avoided by managing the organizational implementation process 'better', there are two interrelated facts, which have contributed to the evolvement of the problems.

First, the IS is not user-friendly with its character-based windowed user interface, and it does not have any support for learning or remembering the flow of operations. Its functionality for some tasks is questionable as it was originally developed for a different business environment. The learning time is long (but not extraordinary) and as a consequence, some user groups are not willing to adopt the system. And we are afraid that there will be more problems of this kind. This is because the way the IS was built seems to have become an industry standard: a shared relational database is normalized to atomistic tables, which are updated by using screens and procedures (half) automatically created from the columns of the table with an application generator. This easily leads to a great number of separate screens. But, as the starting point for development is a semantic data model, the design is seldom compatible with the work procedures of the organization. It is also difficult to learn to navigate in a bunch of separate, seemingly unrelated screens.

The second problem is the inertia caused by the IS in a rapidly changing environment. For example, the IS has been designed so that there can only be one subscriber telephone number per customer ID. This means problems with the rest of the possible numbers of an ISDN line. Or, when a customer enterprise wants to regroup invoices according to its new organizational structure, there are no mechanisms for handling the update. It is inevitable that information systems freeze the current mode of operation and all changes in operations almost always call for reprogramming of ISs. And in the case of the IS, the advantage of sharing the costs of development in the first place has become an obstacle for further development. The software is owned by the consortium, the members of which have to be convinced and agree upon the need for changing the software.

To us the case clearly illustrates the common dilemma in IS implementation: an information system that is somewhat awkward to use, slightly incompatible in work processes, and difficult to change (but otherwise technically functional) can be implemented in one organization whereas in another, almost similar organization, the IS is abandoned.

DISCUSSION

The design, production, and implementation phases of a computer-based information system are commonly considered the key activities in its life cycle – in money, time and other resources. Skillful software development is about the technical maneuvers in conducting the phases. However, the value of the IS, how technologically progressive it might be, can not be realized until it is effectively implemented and deployed. As pointed out by Kling and Allen (1996), effective use of

information technology does not depend on technology alone: organizational issues often play an important role. In order to emphasize the importance of non-technical factors, they use the term 'organizational implementation': "Organizational implementation means making a computer system accessible to those who could or should use it, and integrating its use into the routine work practices" (ibid. p. 269). In the world of outsourced development, this is more important than ever.

Organizational implementation necessitates, for example, that users are willing to adopt the IS and that they have the necessary skills and knowledge (both domain and technology/tools) needed in the deployment of the CBIS. In research, the need for education and training in computer-related skills is commonly recognized and its importance emphasized (Nelson et al., 1995; Clement, 1994). In practice, however, the training issues are often neglected and it has even been argued that one of the reasons for less successful CBIS implementations is the lack of user training (Mitev, 1996).

One reason for the relative ignorance of training and education issues is that the deficiency of competence usually becomes apparent only in the beginning of the usage phase of a new CBIS. If the usage of the CBIS is obligatory, users learn — sooner or later — to deploy the system while doing their daily work. When users have learned to manage their work to the extent that there are no apparent problems, the problems disappear. And, as there are no problems, there is no need to evaluate the efficiency and effectiveness of the actual implementation and work practices! Or, only the technical functionality, such as response times, is checked.

The time required to learn to use a new CBIS depends on many factors, for example, the structure and appearance of the CBIS, the amount of use (i.e. the practice obtained), and the individual learning capacity. Learning times of operative ISs, such as the OC-system, are rather long with huge variation; in most cases the learning period is several months. The learning process can be characterized as a trial-and-error diffusion process where a single user or a group of users solve the problems encountered when integrating their work practices into the features of the CBIS. It is not a uniform process, rather there are multiple simultaneous processes (Heikkilä, 1995). In this kind of learning environment people tend to accept the first functional solution and stick to it as long as it works. Its effectiveness is never questioned, nor are alternative solutions actively sought: the functional solution will do. A typical feature in this learning period is that users search for help mainly from their peers (in 80-90% of the problems) whereas manuals, help-desks and other types of support arrangements play only a secondary role (Heikkilä, 1995; Laboris, 1997). It is worth noting that managers are seldom in advising roles because they rarely can give support in CBIS-related problems. As a consequence, managers often only have a vague idea of the real CBIS deployment situation. Therefore, the effectiveness of the applied procedures depends mainly on the initially invented workable solution which becomes the best practice in that environment.

Implementation of a new CBIS generally also changes the division of labor and incentive structure which cause changes in the work tasks and motivation of individuals. After implementation users must learn this new division of labor and potentially some new work tasks as well as the functions of the new CBIS. The division of labor is planned and institutionalized rather carefully, therefore, some kind of 'role book' is thus already available when a CBIS is designed. The process of dealing out the roles to the actors is also part of the management of the implementation. However, management, control, and evaluation after implementation are often shallow and based more on beliefs, attitudes, and opinions than technological or economical data (Kumar, 1990; Kling & Iacono, 1984). Iivari (1986) has concluded the following about the intra-organizational implementation of multi-user ISs: there are actually two coexisting sets of activities in implementing an IS, or innovation in general; the technically-oriented rational-constructive tasks and a political process of resolving conflicts of interests and changing the organization.

In practice, many of the problems, which are caused by the changes in the division of labor and encountered when deploying a CBIS, are solved with the same kind of ad hoc principle as other work-related problems. As management's concerns are in restructuring the industry, the most important thing is to get the work done by the doers, no matter how it is done. And, in the same way as an individual repeats an action after a positive reward, an organization gives legitimate status rather quickly to an arrangement which seems to be functional (see positive reinforcement trap; Argyris, 1985). Finally, the division of labor becomes institutionalized and legitimated (Berger & Luckman,

1966). At this stage, the way of acting feels to be the right one and the actor becomes confident: "This is how things are done." In his book on organizational culture, Schein (1992) has described the process as follows: "When a solution to a problem works repeatedly, it comes to be taken for granted. What was once a hypothesis, supported only by a hunch or a value, comes gradually to be treated as a reality" (ibid., p. 21).

The insufficient training and the consequent emerging ad hoc work practices that get institutionalized with the IS can easily lead to inefficient and unchallenged operations, as our case study clearly demonstrates. There is growing evidence of the high hidden costs of using computers in the workplace: about 2/3 of the total costs seem to come from the invisible opportunity costs in the usage phase of the computer technology (Heikkilä, 1995; Gartner Group, 1995; van Hillegersberg & Korthals Altes, 1998). In other words, the out-of-pocket costs from the IS department budget represent only one third of the total costs. Two thirds of the costs arise from the users' working hours spent in tackling computer-related problems, advising other users, learning new computer skills, and taking part in various CBIS planning, development, and coordinating taskforces. And the number of the hours of education, training and peer-hands-on- learning on applying ISs in work settings has not kept up with the increase in IS-based activities.

How much of this hassle can be removed by training is still unclear, but the fact is that it is one of the key actions to diminish the time wasted. And what has been found so far, is that the traditional teaching courses are deficient in meeting the needs of users applying ISs in their work practices. More innovative ways of learning are needed, such as peer tutoring, support activities, and workshops for the users of ISs (Reijonen, 1998).

The problems highlighted in this case are not typical in just one kind of business sector or type of information system, but a more general trend which we have noticed in several organizations. Hence, the emphasis is on the level of the general findings and the case is used to illustrate how problems can be manifested in a particular situation.

ENDNOTES

[1] At a first glance the mutual telephone companies were geographical (natural) monopolies. But as the mutual companies were owned by the subscribers, who also elected representatives to the board of directors, the monopoly power was never actually exploited to its full extent. Nevertheless, this led to a price discrimination between leased lines and 'owned' lines, which is currently banned by the European Union regulation.

[2] The subscribers of the conventional mobile phones (NMT and GSM) are served via a separate, nation-wide company, Radiolinja, owned by the Finnet consortium.

[3] As Finnet operates GSM networks via Radiolinja, the regional telephone companies are most interested in getting their share of the radio-based telecommunications by providing geographically limited mobile services for private and business customers at favorable prices.

[4] Preliminary discussions about the development of the system had actually started several years earlier at Finnet. One of the companies that merged with AP took part in the requirements analysis. The first installations took place only a couple of years before this study, and nobody at AP was experienced with the system.

[5] UNIX environment and client/server architecture were selected because of its openness (it is possible to select between different software vendors) and versatility (technically easy to extend).

[6] The data were gathered with a survey questionnaire (26 end-users), by interviewing end-users, managers and IS-personnel (16 interviews), from documentation (e.g. documents of the CBIS development project, end-user manuals), by observing the use situation, and by using the training version of the CBIS.

[7] EUCS is End User Computing Satisfaction, see Doll & Torkzadeh, 1988.

[8] For example, it takes almost half an hour to register and schedule installation for a new telephone subscriber.

[9] For instance, some Private department clerks preferred to call the warehouse keeper for the price of a product instead of checking it themselves from the database.

[10] Both the product numbers and product names were changed when the new IS was implemented.

The new numbering/naming system has its benefits because it is becoming a standard in the Finnet-group.

[11] The design of the IS did not make the situation easier because there were no practical means for managing enterprise level customer data, so, for example, the departments of a large enterprise occurred as separate customers with unique customer numbers in the database.

[12] The use of paper-based documents also meant that the IS no longer was a real time system, so answering customer inquiries of the state of an order always required contacting supervisors or technicians.

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