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Human Computer Systems

SESSIONS
Human Computer Systems I
Human Computer Systems II
e-Learning and Internet Training

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ABSTRACT

An evaluation of distributed computer supported co-operative work in a project workshop for students utilising internet-based videoconference technology is presented. The interaction has been evaluated in respect to relevant theoretical communication factors and according to feedback from the students. Conclusions are given as guidelines for instructors.

1 Introduction

Computer-supported co-operative work (CSCW) in education is concerned with how both large and small groups of people can co-operate using computer technology. The aim of a project workshop was to create distributed project groups that enable students from Switzerland and Germany to co-operate as naturally as possible in order to complete assignments related to different aspects of human-computer interaction by means of internet possibilities including internet video. Further, the students should be given the possibility to learn, use and explore the actual state-of-the-art in web-based communication. The choice of Internet-based CSCW tools was motivated by the intention to increase participation through the employment of easily accessible technology. Because of the high technology diffusion in Germany and Switzerland, the participants could run their activities for the project workshop both at the university and at home. The distance between the two institutions ensured that the students had to use the infrastructure to communicate and to co-operate.

In a CSCW environment many questions about how to support real communication and co-operation are still open. One of the most present questions of the Ed-Media’2000 conference was how to enhance co-operation in a distributed context. In order to approach an answer it is important to understand the basic elements of communication and co-operation. When working at distance with technical tools to enhance communication, the tools take on an important function in supporting communication, task management and co-operation.

Person-orientation is considered to be the core-category in understanding communication mediated by teleconferencing. Short et al. (1976) from the distinguish between person oriented and non-person oriented communication categories. These categories are based on Bales analysis of communication, which took place in simulated meetings (Bales 1955). From these experiments Bales elaborated four main categories: positive reactions and negative reactions (person-oriented), problem-solving attempts and questions (non-person oriented). Later Bales offered a more differentiated, three dimensional, view on the person-oriented factor: (1) Dominance vs. Submissiveness, (2) Friendliness vs. Unfriendliness, (3) Acceptance vs. Non-acceptance of Authority (Bales 1999).

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Also the non-person-oriented category has been analysed. Thorngren distinguishes between three kinds of communication in business (Thorngren, 1972). Pro-
grammed communication activities are routine, repetitive and standardised, e.g. giving or receiving orders, or making sales or purchases. The involved people usually are well acquainted with one another. In contrast, orientation communication activities are novel, unstructured and complex, e.g. developing ideas for new products. Between these two extremes are planning activities. They result in the development and realisation of alternatives suggested by the orientation activities. Other theorists use similar categories: Ansoff (1965) distinguishes between strategic, administrative and operating activities, or Simon’s (1960) concepts of intelligence, design and choice.

Successful co-operation pre-poses that the involved people can establish satisfying communication on the different levels mentioned above. Besides communication between people, CSCW also involve sharing of information and of task-space, co-ordination, organisation and decision-making (Olson et al. 1993, Macaulay, 1995). In a co-operation context an important distinction can be drawn between the person space and the task space. The shared task space (Buxton 1992), or action space (Harrison et al. 1996) can be distinguished from the space where people are physically or virtually present, i.e. a place (Harrison et al. 1996), or a person space (Buxton 1992). When people share the same person space and the same task space communication and the exchange of information are facilitated naturally. The flow and quality of several modes of communication (e.g. speech, gestures, expressions, text and graphics) arrange itself almost automatically. Co-operation pre-poses that people share the task space. Distributed CSCW implies that the task space is being shared, but only a part of the information concerning the person space. Reducing the information from the person space has impact on the content of the communication. Hence, a rich CSCW context should offer communication tools that also support person-orientated information.

2 Methods

The project workshop (URL in References) started in as a co-operation between the University of Karlsruhe (TUK), Germany, Institute of Applied Informatics and Formal Methods (AIFB) and the Swiss Federal Institute of Technology (ETHZ), Institute of Hygiene and Applied Physiology (IHA). Students form project groups for co-operation during one semester. Each project group consists of between 2 and 5 students and includes students from both universities. The students’ motivation for participation is either to follow a self-chosen course to gain study credit (AIFB), or as a means to perform an obligatory assignment (IHA).

The workshop enhanced the acquisition of experience with the technology in four ways:
1. The students used web-based technology to communicate;
2. Web-based technology is employed to present the final results.
3. The assignments are related to problems using the technology;
4. The assignments could be designed as Web pages.

At the beginning of the term the project workshop starts with an introductory course in the use of the technology (at each site). Then, the students “meet” in a videoconference and discuss the assignments in detail. The group formation is performed online in the first videoconference. The teams exchange names and addresses, and leave the videoconference with the task to contact the other members of their group and to stay regularly in contact to work on the assignment with the available tools. The students at each site are supervised independently, the general schedule is to meet the administrator once per week during the semester.

To communicate, to share applications and to present results, Microsoft Netmeeting© (point to point) with its videoconferencing capabilities, white board, chat board, screen capture, file transfer function and application sharing is used. For co-ordination of our work and for administration of documents, BSCW© (Basic Support for Co-operative Work) is used. The BSCW software is cross platform compatible, and supports synchronous (planning and organisation of virtual meetings) and asynchronous (e.g. shared workspace for document transfer) for interactive co-operation. The students have access to BSCW from the project-server via a web-Browser. Presentations and project reviews were presented with Microsoft Powerpoint or as for Web-presentations. In addition the project homepage, e-mail and telephone extended the information and communication possibilities.

2.1 Results

We evaluated the project workshop according to tool use and satisfaction by the termination. The intention was not to perform a quantitative statistical analysis, but rather to get an impression of the most successful communication channels. Data was collected by means of a questionnaire addressing the frequency and related satisfaction of tool-use. The return rate of the questionnaires was 85% (n=7) from Zurich and 75% from Karlsruhe (n=9).

Table 2: Overview over tool use and satisfaction

<table>
<thead>
<tr>
<th>Mean</th>
<th>Text</th>
<th>E-mail</th>
<th>E-mail + data</th>
<th>Telephone</th>
<th>BSCW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq. use</td>
<td>8.3</td>
<td>27.7</td>
<td>15.9</td>
<td>3.9</td>
<td>17.0</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>2-6</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Table 2: Overview over videoconference tools

<table>
<thead>
<tr>
<th>Mean</th>
<th>Video-conf.</th>
<th>Program-sharing</th>
<th>White-Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq. use</td>
<td>10.1</td>
<td>5.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>4.6</td>
<td>3.7</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Table 2 shows the mean number of times a tool was used over the semester. Satisfaction is the mean of ratings on a scale from 1 to 7, where 1 was excellent, 4 neutral and 7 too bad. Prior experience in distributed CSCW: mean = 5.2 on a seven-point scale where 1 was much and 7 was none. 25% of the students performed the videoconferences at home. General satisfaction: 76.9% of the students would recommend a study colleague to participate in the project workshop, 23.1% did not know. The students were also asked to express their experience with the workshop. The feedback could be sorted in three categories: positive and negative and reactions related to co-operation. On the positive side the experience with the new technology is prevalent. The reactions show that videoconferencing was given high importance:

• “This is the chance to work with new media and communication possibilities as well as applications. The world talks about videoconferencing, the project workshop is the best way to learn about the technology in a playful way, about what is possible already, and how it functions.”
• “It is a great experience to work with videoconferencing although it didn’t always work.”

The negative feedback was mostly related to technological factors:

• “The quality of the videoconferences was often bad.”
• “Good experience but hard to communicate. Technology is still a steep threshold.”

Much of the feedback was related to the new co-operation context:

• “There are lot of possibilities in videoconferencing and Internet, but I think it will take some time before communication in co-operative teams is as effective as a face-to-face meeting. It needs a lot of learning on both sides.”
• “The co-operation across such a long distance as well as locally repeatedly, presented new challenges. It was very interesting because it was different from traditional student assignments. The co-operation between the universities should be continued and even extended.”

The most used tools were e-mails, BSCW, e-mails with attachment and videoconferencing, in this order. The use of telephone was low in comparison to e-mails. Some students reported that telephone calls were used to spontaneously address the need for a group session. E-mails accomplished asynchronous communication needs. Distribution of information with e-mail is more time independent than telephone calls. The frequent use of e-mails with attachment shows that the BSCW tool did not reach full acceptance among the students. Some students also spontaneously reported during the semester that they preferred e-mails for the transmission of smaller files. However, the co-operation often implicated the generation of large files and applications, which only could be shared and distributed effectively with the BSCW tool.

In spite of the unstable video-quality, the students still preferred to run videoconferences at an average rate of almost once per week during the semester. In light of our observations and their comments the reason is most likely to be first, that they were inclined to want to experience this technology and second, that it did offer the only way of demonstrating their on-going developments: the feature program sharing enabled online and synchronous co-operation sessions. Further, the accessibility of the videoconference equipment must account for the relatively low usage. Due to the fact that the videoconference-room was used for many activities in the institutes, the students could not access it spontaneously. This certainly resulted in less use of videoconferences as a means to communicate for some, while other compensated for this by installing the necessary equipment at home. videoconferencing from at home impairs the video/audio quality more than at the university because of slower transfer via modem. The reported complaints may also reflect this.

Person-orientation seemed not to be the major reason for the use of the videoconferencing tool. The videoconferences did not offer enough information about all the modes of communication to satisfactorily support person orientation. In line with recent research we found that the video image was less important for the perceived communication quality than the voice. Good video-quality, without satisfying voice-quality can not enhance communication. Some students even reported that they closed the video-window in order to focus on the shared application. The voice quality during videoconferencing reached telephone quality, consequently the verbal information mode was feasible.

In general, our CSCW setting made co-operation possible. All of the groups produced accepted assignments, some of the assignments were outstanding with a quality and volume not to be expected from single person effort. The reported dissatisfaction concerning co-operation may reflect poor person-oriented interaction. Obviously, the students noticed that distributed co-operation did influence their collaboration style. Most clearly this was expressed as loss of personal contact.

3 Discussion

We recognise a general positive effect of the creation of distributed co-operation teams. The combination of two universities/countries results in an extended information transfer and larger information space. The students take advantage of the extended pool of knowledge resources and experience.

We found the assignments to have a key function in stimulating the distributed co-operation. Earlier experience taught us that the assignment is an important key to real co-operation. When we first started, the assignments comprised theoretical work and literature reviews. These tasks did not really require the students to work in a close co-operation. The result was rather that they adopted a kind of parallel work style. Co-operation was only initiated by the end of the semester in order to
co-ordinate the presentation. We predicted that more direct interaction throughout the semester could be achieved by giving assignments with more components of design, also integrating work with a graphical representation and the development of interactive demonstrations related to the topics. To reinforce this development we required the students to present their work as Web pages, which also were accepted as a replacement of a printed report. As results of these actions, we have noticed a remarkable improvement in use of the tools and active co-operation during the entire semester.

The intention to keep up with new technological development was a major motivation for this workshop, both for the students as well as for the organisers. Our distributed cooperation concept invoked a pioneer spirit, which positively influenced the groups and also implied more tolerance towards the technological deficits. The project workshop enables the students to practice and experience new communication and co-operation methods. This serves as preparation for the increasingly computerised environment they may be expected to meet when leaving the university to work.

Some problems were, however, obvious. First, high motivation can not completely make up for the immature videoconference technology. The video framerate for Internet based videoconferences does not guarantee fluent movement, and the audio quality when the load on the net is high, makes long conferences too exhausting. Other practical consequences were related to the fact that two different institutions co-operated. The semester schedules between the two universities were not always identical. Consequently, the project workshop could not always start at the beginning of the semester for both sites, and also not end according to the semester brake for both sites. Last but not least, the student’s motivation for participation differed between the two universities because of different credit systems. This resulted in an unequal pool of students at the two sites. Some students expressed that a more equal distribution of students from each site would have been better.

Recommendations

- Utilize assignments that support co-operation.
- Ensure that the assignment is interesting for the team.
- Let the team members modify the assignment to fit their qualifications and interests.
- Reinforce the technology employment in the assignments.
- Make the technology accessible.
- Employ user friendly software.
- Offer multiple communication and co-operation channels.
- Practice correct videoconference behavior and presentation techniques.

4 References


Longitudinal Study in a Financial Institution

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ABSTRACT

The impact of changes in information technology on work content, autonomy and work load was analyzed in two call center units of a nationwide telephone bank in Finland. Based on questionnaire data during one-and-half-year follow-up period in 1998-1999, evaluations of the same change were compared between units with different change histories (incremental change with old tasks in unit A, 24 employees vs. radical change with new more skilled tasks in unit B, 49 employees). As a theoretical frame of reference, a multilevel process model of change was adopted. In the beginning, the impact of new technology was evaluated as greater among the employees in the radical change unit. The difference between the evaluations of change decreased, e.g. regarding the level of interest of work, difficulty of tasks, job appreciation, and mental load. Partial support was found for the defreezing-moving-refreezing phase model of change.

1 Introduction

The financial service sector has undergone continuous changes in information and communication technology (ICT). Electronic transactions and increased self-service for the customers, e.g. via internet have increased simultaneously with changing work organizations and division of tasks. Associated with national and international mergers, outsourcing, and other flexible customer service and personnel strategies, the labour force reduced dramatically in bank organizations in Finland.

The impact of changes in information technology on work content, autonomy and workload was analyzed in a nationwide telephone bank in Finland. As a theoretical frame of reference, a multilevel process model of change was adopted (Huuhtanen 1997); it combines technological, organizational and psychological change processes. It was hypothesized that the evaluations of change vary according to the phase of change.

A systemic viewpoint was adopted: simultaneous changes in information and communication technologies, work organization, and job content were analyzed.

2 Call center (telephone bank) under study

Technologically, the telephone banking system used (CTI) is among the most highly developed ones. It identifies the customer, recognises whether loan, investment or payment services are required, and automatically routes the call directly to suitable bank experts. The telephone bank has a staff of about over 300 employees in three towns. The work organization of Call Centers is based on teams, each offering services to specific customer groups. Employees have different skill categories based on three major competence areas: loans, investments, and payment services. The bank under study was the first in the Nordic countries to offer personal banking services on Sundays, too.

The study group consisted of customer service employees in two call centers (figure 1). The first center (unit A) was started in 1992, the other (unit B) in 1998.

In unit A, incremental changes have been implemented since 1992. The new CTI system was installed in 1998 (figure 1). In unit B, a radical change from traditional transactional banking tasks to demanding customer service tasks with the CTI system was implemented. The employees were also located in another office building. The basic principles of work organization, customer service model, job contents and computer applications were the same in both units.

Research data in V-VI/98 and in X/99

Figure 1: Chance processes in two units of a telephone bank

3 Sample and methods

The size of the follow-up group was 24 employees in unit A and 49 employees in unit B. The mean age of the subjects was 43 years (sd 7 years) in 1998. Data were collected by questionnaires and interviews in 1998 and 1999. The response rate was 83% in 1998 and 86% in 1999. In unit A, 27% of the employees had been in their present task in 1998 for less than one year, 27% for 3-5 years, and 46% for more than five years.

Survey data were collected on the impact of the new data systems (during the previous six months) in 1998 and 1999 in the following areas: job content, job demands, autonomy, interaction, mastery of tasks, feeling of being productive, and job appreciation. Changes in work characteristics were inquired by giving the alterna-
tives: (1) decreased a great deal, (2) decreased somewhat, (3) remained the same, (4) increased somewhat, or (5) increased a great deal. Furthermore, questions were asked about the usability of applications, experienced stress, strain symptoms, and ergonomic issues of the physical work environment and computer work station.

In this paper, the following comparisons between the two units are discussed: i) the difference in the basic level of evaluations in 1998; ii) changes during the one-and-a-half-year period; iii) differences in the follow-up measurement in 1999.

4 Results

In 1998, those working in unit B evaluated the changes due to new information technology on work as greater than their colleagues in unit A. This could be seen e.g. in the evaluations of the increase in things to be remembered, level of interesting work, opportunities to use one’s abilities, difficulty of tasks, and job appreciation. In addition, the feeling of mastering the work was lower among the employees in unit B. Both groups felt that the implementation of the new system had increased work pace, and monitoring of their work by supervisors.

In 1999, the differences in the evaluations diminished between the two units. The change in unit B toward the level of unit A was most marked in things to be remembered (the employees in unit B evaluated its increase by 70% in 1998, and only 20% in 1999, figure 2), difficulty of tasks (increased 88% in 1998, 43% in 1999), and mental load (increased 92% in 1998, 48% in 1999).

The increase in the level of interest of work and in the feeling of being productive had fallen during the one-and-a-half year follow-up in both units. However, an increase in the level of interest was still seen in 1999 in both units (figure 3).

The employees in unit B estimated the increase in job appreciation in 1998 as higher than those in unit A. The evaluations no longer differed in the second measurement. This reduction in the difference between the two units could be seen also regarding the evaluation of mental load. In 1998, 92% of the employees in unit B felt that their mental load had increased, 48% in 1999, and correspondingly, 60% and 33% in unit B.

From the beginning, the following items were evaluated quite similarly in both groups: opportunities to use one’s abilities (increase more often than decrease); monitoring of work by supervisors (the increase was less in both units), and work pace the (increase had slightly diminished in 1999).

In unit B, the employees felt more often that their possibility to control work pace was reduced due to the new computer system. On the other hand, they experienced a considerable increase in the feeling of mastering their work in 1999. This, together with the reduction of things to be remembered, reflected the learning of new tasks and tools in this group.

5 Discussion

The study focused mainly on the positive impact of ICT on the content of work. However, time pressure, monitoring of output by supervisors, and mental load had increased, and contacts with co-workers had decreased. The study revealed significant differences between the two units, each with a different change history in telephonic banking tasks (incremental vs. radical change). This difference had clearly decreased during the one-and-a-half year follow-up period. The preliminary results of the two surveys can be interpreted with the theoretical model of change. Adaptation to new work demands and mastery of computer applications lowered the subjective evaluation of change. Furthermore, the decrease in the level of interest of work in unit B demonstrates that the motivational potential of more skilled tasks tends to diminish with time. The findings give a basis for more detailed discussions about the multicausality of changes and the relevance of the Lewinian three-stage model of change under conditions of continuous changes in modern work life.

6 References

Usability Engineering at the Workplace

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ABSTRACT

This contribution reports on the practice and practical needs of institutions, companies and consultants when dealing with usability-engineering principles. A survey has been performed in the course of implementing the European-Union directive on human-computer interaction. It reflects the attitude and the different ways to increase occupational health and safety of VDU-workers at their work place.

1 Introduction

With the advent of the European Directive 90/270/EEC on Human-Computer Interaction (European Union, 1990) minimal standards have been provided with respect to the usage of interactive software systems. These minimal requirements have to be met by European employers, not only to prohibit work-related stress and overload of VDU-workers, but also to promote the effective use of information technology at the work place. It is well known that software that has not been adapted to tasks and user needs might lead to work conditions that endanger the health rather than being of effective use for workers, e.g., Preece (1993). In this paper the needs of evaluators and their practical handling of usability-engineering issues in occupational settings are reported. The survey has been the starting point for the development of EU-CON (Stary et al., 1997), a practical procedure for the integrated measurement and redesign of VDU-work.

2 The Survey

Over 30 structured interviews with members of Austrian government institutions responsible for occupational health and safety, consultancy agencies, companies, the Austrian chamber of commerce, and trade union have been performed. The practical handling of usability-engineering issues has been addressed through the following items:

1. How crucial is the implementation of usability-engineering principles in the context of occupational-health and -safety issues?
2. How can the evaluation and redesign of VDU-work be performed accurately?
3. Who is responsible for evaluation and what kind of external organizations or experts have to be involved for accurate evaluation and/or redesign?
4. How can the results from evaluation be used for improvements of VDU work?

3 Results

3.1 Usability Engineering in the Context of Occupational Health and Safety

In general, usability principles and corresponding regulations are considered to be important. However, their implementation is considered to be troublesome due to the lack of best practices.

Although the number of workplaces with interactive software is increasing steadily, usability principles have not been implemented so far in most of the cases. In general, usability engineering principles are considered to be redundant and fuzzy. Additional information is required in order to implement them. Few companies have developed concepts on how to select or develop a proper instrument. Finally, usability-engineering issues are rarely discussed within organizations, since software is still considered to be just another tool for task accomplishment. In most of the cases there is a dispute on how to adapt software systems to individual needs and particular tasks.

Consultancy agencies have already identified the importance of implementing the usability-engineering principles. However, they have also identified a lack of understanding, as well as misconceptions when dealing with corresponding regulations. They also expect from the government additional regulations, in order to set priorities. Government regulations for handling software in an enterprise context are of high importance due to several reasons:

The evaluation and redesign of software systems at VDU-workplaces may lead to improvements in quality management as well as to a reduction of failures.

Companies that actually implement usability-engineering principles are able to improve their internal quality management as well occupational health conditions. However, when it comes to mental overload and stress there is a lack of instruments for practitioners. Consultants provide some instruments to indicate user-specific hindrances for the successful use of software. However, they fail in providing concrete measurements.

It is widely believed that standard software systems have to be treated isolated and cannot be adapted towards the needs of employees and organizations.

Company responsible, as well as consultants and government responsible consider standard software to be more or less inflexible. This type of software is considered not to be adaptable easily to individual user needs and processes of an enterprise. The responsible would...
Chris STARY

Usability Engineering at the Workplace

like to have some quality checks of this type of software. They should be performed externally, according to principles that can be met objectively. However, major software developers are not very interested in aspects of usability engineering, since human-oriented measurements cannot be performed in a straightforward and representative way. In addition, as soon as software can be evaluated objectively there is still the open question in how far the software should be flexible and adaptable to individual needs and work processes of an enterprise.

Usability-engineering principles are interpreted in the context of the company’s software systems. This interpretation is required, since the objectives of the principles are not always made transparent. Even additional government regulations are not sufficient for a complete implementation of the directives concerning occupational health and safety. Redundancy should be removed when it comes to operational definitions. In addition, both the granularity as well as the level of abstraction differ from principle to principle. This leads to implementation problems for high-level specifications of usability principles as well as of those principles addressing different dimensions of VDU-work, such as task conformance which addresses the technical and the user perspective.

3.2 How to Evaluate Software

Enterprises that are evaluating work places according to particular categories of work places often neglect user-oriented principles. In case a company is interested in the evaluation and redesign of VDU-work, traditionally, it selects a particular type of work place and then applies usability-engineering principles to a standard work procedure. In doing so, the responsibilities expect minimal amount of time to be spent for each workplace. The VDU-workers who are actually involved in task accomplishment are not participating in the evaluation process in most of the cases. If only standard work procedures are addressed the individual perception of VDU-tasks and their accomplishment cannot be captured in the course of evaluation. The trade unions have recognized this dilemma and have proposed the definition of principles which can be measured objectively. The chamber of commerce prefers the evaluation and redesign of VDU-work with minimal involvement of employees.

In order to evaluate and redesign software, companies tend to develop corporate strategies and instruments. The reason for corporate developments is the lack of instruments that are easy-to-use and easy-to-adapt for a particular company. Although there exist some approaches for measuring occupational health and safety at the work place with regard to usability-engineering principles there is almost no procedure on how to handle the results, and consequently improve VDU-work conditions. The latter, however, is the most crucial part, otherwise a gap remains between the results from measurement and redesign activities.

Help is required for the design of corporate procedures for evaluation and redesign. This help should have long-term impact and be accurate.

Besides responsible government institutions consultants are challenged to that respect. On one hand, the reasons for hindrances at the workplace should become evident in the course of measuring, on the other hand direct user support to remove hindrances should also be available. Overall, instruments should meet the following requirements:

- support quick measurement (maximum 1 hour)
- automatically analyze the results of measurement
- apply usability-engineering principles accurately
- allow easy recognition of hindrances in the course of interaction
- provide direct feedback about the required changes to remove hindrances.

3.3 Role Assignments

Evaluation and redesign activities should be initiated by management rather than employees. The initiative for improving VDU-work should come from management. Functional roles with respect to evaluation are considered to be physicians, occupational-health and -safety staff members and usability specialists. Middle management or top management should assign evaluation tasks to those health- and safety-staff members who are responsible for the implementation of the usability-engineering guidelines and principles. Unfortunately, in most of the companies principles and techniques from usability engineering have never been applied in a structured way. Members from the health- and safety-departments are not educated and skilled in applying principles from usability engineering. However, first results are available from the development of corporate instruments: The more fundamental knowledge from usability engineering has been embodied into techniques the more likely have become improvements at VDU-workplaces. External experts are usually required to validate results from evaluations or to perform additional evaluations. They are also called to resolve methodological problems. However, for all of the evaluators skills and experiences in usability engineering are required, in order to design and implement improvements of the work conditions.

The cooperation with government institutions is highly appreciated, in order to meet formal requirements.

The companies ask for cooperation with government institutions or experts when implementing usability-engineering principles. They complain about the lack of support in order to meet formal requirements, such as the EU-directive. Some consultants have already proposed an outsourcing scheme for government institutions that are responsible for implementation of laws. As such, staff members from the government institutions would
become consultants and thus, would become available for support tasks exclusively.

The participation of employees in the course of evaluation is stressed differently.

The role of employees working with software in the course of evaluation is handled differently. On one hand, participation is considered to be a means for more democracy within an enterprise that finally leads to higher productivity. On the other hand, participation is considered not to be required for evaluation and redesign, since the users are considered being not capable to handle complex procedures for evaluation. The trade unions consider participation as a useful means, although they envision a particular set of principles that could be measured without involving employees. Consultants consider the participation of employees to be required in the beginning of the evaluation procedure, in order to find out hindrances for higher productivity. In a second step, they advise experts to remove the identified hindrances in VDU-work.

3.4 Handling the Results of Evaluation

Results from evaluations have not necessarily to explain the reasons for difficulties, as long as they provide practical tips and procedures to be followed for the removal of hindrances in VDU-work. Companies are particularly interested in results of evaluation procedures that can be implemented directly.

Besides meeting the usability requirements potential improvements should be implemented immediately. If possible, external consultants should, according to the results, optimize the application of software. Improvements are considered to be possible with respect to the organization of work as well to the use of technology.

A major requirement to handle results effectively is the possibility to actually introduce new concepts at the level of the organization. In order to succeed in the implementation of improvements the reasons for hindrances should also become evident. However, from the conception of usability engineering coming up with a list of activities in order to remove possible hindrances is considered less effective than to know why certain improvements have to be performed. Hence, the reasons for hindrances should also become transparent in the course of evaluation.

The training of software users is considered to be a means to reduce hindrances and problems in the course of interaction.

In most of the cases of indicated troubles with VDU-work employees are trained more intensively on how use the concerned software systems, rather than exploring technical possibilities to overcome the experienced difficulties. Overall, it could be less expensive to adapt existing software to user needs instead of trying to adapt people to software functions through training. Only those cases should be handled through skill management and training that cannot be solved through technology itself. In particular, the use of standard software allows a wide range of adaptation to individual skills and needs to meet this objective.

4 Conclusion

The survey has provided several insights into the practical use of usability-engineering principles and existing techniques for evaluation. Besides the difficulties to understand some principles fully, a variety of approaches exist for implementation. Major differences have been found with respect to user participation. Some companies tend to measure without user involvement at all, whereas others integrate individual perception of VDU-tasks into evaluation programs. Overall, a demand for usability-engineering techniques has become evident for bridging the gap between measurement and redesign of VDU-work, in order to achieve accurate improvement at work places.

5 Acknowledgement

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6 References


Promoting Universal Access in Health Telematics

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ABSTRACT

This article presents an overview of the work being carried out by the European Commission funded Thematic Network (Working Group) “Information Society for All” - IS4ALL (IST-1999-14101). Specifically, the methodological frame of reference which drives the project’s objective to introduce universal access principles into the design of Health Telematics applications and services is described. Health Telematics has been chosen due to some distinctive characteristics, such as the variety of end-users involved and the new opportunities offered as a result of emerging technologies that re-shape the way in which healthcare practices are structured and organized.

1 Introduction

The Information Society has the potential to improve the quality of life of citizens, the efficiency of our social and economic organisation, and to reinforce cohesion. However, as with all major technological changes, it can also have disadvantages, introducing new barriers, human isolation and alienation (the so-called “digital divide”), if the diverse requirements of all potential users are not taken seriously and systematically into consideration and if an appropriate “connection” to computer applications and services is not guaranteed. It is in this context that the notion of universal access becomes critically important for ensuring social acceptability of the emerging Information Society. Universal access implies the accessibility and usability of Information Society Technologies (IST) by any authorised user, anywhere, anytime.

In the recent past, Research and Technological Development (RTD) work has demonstrated the feasibility of universal access in the field of Human-Computer Interaction (HCI) (Stephanidis & Emiliani, 1999), yielding results which have met wide appreciation by the international research community, thus establishing the foundations for a series of international initiatives explicitly focused on universal access, including the ERCIM Working Group “User Interfaces for All”1, the International Scientific Forum “Towards and Information Society for All”2, and the International Conference “Universal access in Human - Computer Interaction”3.

Amongst the above, the International Scientific Forum (ISF) “Towards an Information Society for All” was instrumental to the conception and subsequent launch of the EC-funded Thematic Network (Working Group) “Information Society for All” - IS4ALL (IST-1999-14101)4. ISF was launched in 1997, as an international ad hoc group of experts sharing common vision and objectives, namely the advancement of the principles of Universal Access in the emerging Information Society. The Forum held three workshops5 to foster interdisciplinary discussion, a common vocabulary to facilitate exchange and dissemination of knowledge, and to promote international co-operation. The Forum has produced two White Papers (Stephanidis et al., 1998; Stephanidis et al., 1999) reporting on an evolving international RTD agenda focusing on the development of an Information Society acceptable to all citizens.

Based on the success of its initial activities, the Forum had proposed to the European Commission the establishment of an interdisciplinary Thematic Network the IS4ALL Working Group, aiming to advance the principles and practice of Universal Access in IST focusing on the area of Health Telematics, a critical Information Society application domain, and on emerging technologies shaping the nature and contents of this domain.

2 IS4ALL base line and objectives

The primary focus of IS4ALL is on the impact of advanced desktop and mobile interaction technologies on emerging Health Telematics products and services. The domain of Health Telematics has been selected on the grounds of being a critical service sector, catering for the population at large, and at the same time involving a variety of diverse target user groups (e.g., doctors, nurses, administrators, patients). These characteristics render it a complex domain - due to the inherent diversity - and an ideal “testbed” for exemplifying the principles of Universal Access, and assessing both the challenges and the opportunities in the context of the emerging Information Society.

The specific scientific and technological objectives to be attained by IS4ALL can be summarised as follows:

2. http://ui4all.ics.forth.gr/isf_is4all/
4. http://is4all.ics.forth.gr

5. The 1st workshop took place in San Francisco, USA, August 29, 1997, and was sponsored by IBM. The 2nd took place in Crete, Greece, June 15-16, 1998. The 3rd took place in Munich, Germany, August 22-23, 1999. The latter two events were partially funded by the European Commission.
To consolidate existing knowledge on Universal Access in the context of IST, which is currently dispersed across different international sites and actors, into a comprehensive code of design practice (e.g., enumeration of methods, process guidelines, etc).

To translate the consolidated wisdom to concrete recommendations for emerging technologies (e.g., emerging desktop and mobile platforms) in Health Telematics.

To demonstrate the validity and applicability of the recommendations in the context of concrete scenarios drawn from an experimental regional Health Telematics network.

To promote the Universal Access principles and practice in Health Telematics through a mix of outreach activities, which include seminars, and participation in major international conferences, concertation meetings, and project clustering events.

3 Technical approach and expected outcomes

To attain the above stated objectives, IS4ALL has defined a technical approach, which is based on a scenario-based perspective on systems development (Carroll, 1995; Carroll, 2001), and in particular on requirements engineering through scenarios. Scenarios in the context of IS4ALL are perceived as narrative descriptions of computer-mediated human activities in a Health Telematics environment. The social setting of a Health Telematics environment may be bound to a clinic within the hospital, a ward within a clinic or even to an end-user’s business or residential environment. The scope of such scenarios is intended to be narrow and focused on a very specific issue.

As an example, a possible scenario would be focused on the patient’s access to the electronic healthcare record from home, or while on the move, using a portable device which runs Windows CE. Such a scenario may correspond to technical developments planned in the course of a particular project (either industrial or EC-funded), or indeed, it may identify post-project activities relevant for exploitation and take-up. In any case, scenarios are intended to play a dual role, namely as a source for subsequent design activities and/or as a reference point for validating specific universal access methods and techniques. An additional benefit of these scenarios is that they will help IS4ALL establish liaisons with other EC-funded projects, so as to ensure that the project’s outcomes are of practical value to designated target communities (i.e., designers / developers of Health Telematics applications and services).

IS4ALL’s technical workplan proceeds in three phases, namely scenario analysis, consolidation and outreach.

3.1 Scenario analysis

Scenario analysis entails a process of extracting and developing scenarios for two primary purposes: firstly, to obtain a detailed insight into the universal access requirements relevant to Health Telematics, and secondly, to demonstrate the validity and applicability of the envisioned code of practice. These scenarios are being formulated around an agreed common theme, namely electronic patient records. Scenario formulation is an iterative process. Initially, narrative descriptions of tasks, as carried out by actual users, are developed, and subsequently peer reviewed by health professionals or end-user communities. This peer review acts as validity check to ensure that the scenarios are realistic and valid. In the course of this iterative phase, any system mock-ups, prototypes or other artefacts which reveal aspects of the scenario’s real execution context are taken into account. Once an initial formulation is compiled and agreed upon, scenarios are articulated in a way as to unfold various perspectives relevant to universal access. Two primary scenario articulation mechanisms are supported, namely scenario screening and growth scenarios.

Figure 1: Scenario articulation mechanisms

Both mechanisms serve the purpose of extrapolating (some of) the universal access design considerations relevant to a particular scenario (see Figure 1).

Scenario screening assumes the availability of artefacts for review and discussion, and entails a structured process whereby assumptions in the scenario’s artefacts, related to the intended users, the platform used to implement the artefact and the context of use, are identified and documented. In a subsequent phase, these assumptions are relaxed to facilitate envisioning and generation of new artefacts.

Growth scenarios are slightly different in the sense that they do not pre-suppose the availability of an artefact. Instead, growth scenarios are formulated on the basis of critical design issues or questions, such as “what if … the task was to be used by another user?”, “what if … the task was to be carried out through an alternative device?” etc. Then, growth scenarios are developed to provide a context for one or more of these issues / questions.
3.2 Consolidation

Consolidation in IS4ALL entails two main activities. The first is the selection of specific techniques to address designated growth scenarios. The second activity is the compilation of a body of knowledge comprising the validated techniques and a process model to provide a reference guide for designers wishing to introduce universal access principles into a user-centred design process. Techniques and methods are clustered into macro- and micro-methods depending on their scope and type of design input. Macro-methods describe processes and stages involved in a design activity. On the other hand, micro-methods depict how specific targets within a design process or stage are met. Irrespective of their type and scope, methods are to be validated in the context of a designated scenario. Thus, for example, the use of W3C-WAI\(^1\) guidelines, which constitute a micro-method for designing and evaluating Web sites, should be validated using one or more reference scenarios from the domain of Health Telematics.

The compound collection of validated macro- and micro-methods, along with the validation case studies, will compile the IS4ALL Universal Access code of practice in Health Telematics. The primary target audience of such a tool are designers and developers of Health Telematics products and services, who are concerned with the incorporation of universal access principles into the product/service development cycle. To this effect, the code of practice will offer targeted and validated support as to how to structure the development process, as well as what techniques can be used and how to attain specific design and development targets.

3.3 Outreach

IS4ALL plans to reach a wide community within Health Telematics, but also other sectors of the IST industry. To this effect, the project is undertaking several activities. Firstly, IS4ALL organises seminars, targeted to mainstream IT&T industry, held in different European countries. These seminars contribute to reach a wide community of potential participants and make them aware of the principles and practice of Universal Access in Health Telematics. Secondly, IS4ALL targets relevant international standards organisations to facilitate updates in draft international standards, or the introduction of new work items that accommodate the project’s results. Of primary importance is standardisation at an international (i.e., ISO) level, and in particular the new Work Item on Accessibility under ISO9241/SC4/WG5. Finally, IS4ALL participates in a variety of conferences and international workshops, offering presentations and review of relevant results.

4 Concluding remarks

IS4ALL runs from the 1st of October 2001 until 30th of September 2003. In the first twelve months the project has concentrated upon a comprehensive data collection effort, the development of a sound methodological frame of reference and the compilation of scenarios from Health Telematics communities (e.g., IST-funded projects, experiences from national regional Health Telematics networks and national projects). Following this, a small set of design methods and techniques are used to demonstrate the validity of the project’s methodological approach. This is confirmed by two seminars organised by the project.

In the second and third year of operation, IS4ALL aims to:

- Further develop the designated scenarios with the aim to reach up to nine detailed scenarios.
- Validate a wider range of macro-methods using the designated scenarios.
- Compile the universal access code of practice.
- Concentrate on dissemination and outreach activities, aiming to reach as wide target communities as possible.

5 Acknowledgements

The IS4ALL Consortium comprises one co-ordinating partner, the Institute of Computer Science, Foundation for Research and Technology – Hellas (ICS-FORTH), and the following member organisations: Microsoft Healthcare Users Group Europe (MS-HUGE), European Health Telematics Association (EHTEL), Consiglio Nazionale delle Ricerche - Istituto di Ricerca sulle Onde Elettromagnetiche (CNR-IRE), Forschungszentrum Informationstechnik GmbH (GMD), Institut National de Recherche en Informatique et Automatique - Laboratoire lorrain de recherche en informatique et ses applications (INRIA) and Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V. - Institut fur Arbeitswirtschaft und Organisation (PhG-IAO). Several other co-operating organisations participate as subcontractors.

6 References


Standards and Guidelines for Web-based User Interfaces

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ABSTRACT
This paper presents an overview of current standardisation activities related to Web-based user interfaces and discusses issues involved in the design and evaluation of Internet applications. New and forthcoming ISO standards addressing multimedia and Web user interfaces are introduced. A particularly important area for designing Web interfaces is universal accessibility for the broadest possible range of users including persons with disabilities. A brief outline of standards addressing this aspect is given.

1 Introduction
In spite of the rapidly increasing pervasiveness of the Internet and Web-based applications in particular, there is very little ergonomic guidance for designing World Wide Web sites and applications that is generally agreed upon by experts at a national or international level. While various sets of guidelines have been developed by individual authors or companies, there is still a lack of solid, generally accepted material that could be used in the design or evaluation of Web-based user interfaces. A major vehicle through which the consensus of experts in a field is usually documented are international standards published, for instance, by ISO.

In the field of human-computer interaction, the ISO 9241 series has played a pivotal role in providing a framework and concrete guidance for hardware and software aspects of computerized workplaces. Especially the software-related parts of this standards series (ISO 9241 parts 10-17) are applicable also in domain of Web user interfaces because their validity is essentially not depending on a particular technology. Restrictions must be seen, however, in their focus on computer-based work tasks (of an individual user) and the lack of addressing new technical capabilities such as the broad range of media and modalities available in current user interfaces.

The Web, on the other hand, cannot just be seen as a new technical environment, but as an enabler and driver for new business models, tasks and contexts of use. In view of the rapid changes in these areas, we can identify a number of new requirements that HCI research as well as standardisation needs to address (see Figure 1). One of the most salient aspects is the enormous widening of the socio-demographic range of users of Internet technologies, leading to new applications, for instance, in the private sector. In the professional domain, changing business and organizational contexts call for technologies that can support global networking, cooperative work processes, and the virtualization of organizations. This development shifts the focus of attention from single-user issues to completely networked cooperative environments, a comprehensive support of distributed processes across different organizations, and the exchange of knowledge and experiences as well as the systematic management of the intellectual assets of an organization. In this context, tasks are becoming more knowledge-intensive and creative in nature.

Finally, embedding computational power into miniaturized personal devices, smart products in daily life or in vehicles and buildings, leads to paradigms like ubiquitous computing where technology use is no longer restricted to specific workplaces. In addition to issues related to interacting with such devices, new functional, integration, aesthetic and ergonomic aspects are becoming important.

In the field of standardisation, these developments need to be reflected by broadening the scope of users, tasks and contexts to be addressed. In many cases, this will mean that no “hard” requirements can be formulated (which is rarely the case in existing HCI standards). Instead, principles, guidelines and process descriptions will become even more relevant.

In the following, we will discuss several current standardisation activities related to these issues and point at some of the open issues that may constitute the subject of future activities. Specifically, we will present the new ISO 14915 standards series with parts 1-3, the activities on accessibility and universal design, and a new ISO work item on software ergonomics for Web-based user interfaces.

2 ISO 14915 – Software ergonomics for multimedia user interfaces
ISO 14915 addresses the design and evaluation of user interfaces.

Figure 1: New challenges for HCI research and standardisation

In the following, we will discuss several current standardisation activities related to these issues and point at some of the open issues that may constitute the subject of future activities. Specifically, we will present the new ISO 14915 standards series with parts 1-3, the activities on accessibility and universal design, and a new ISO work item on software ergonomics for Web-based user interfaces.

2 ISO 14915 – Software ergonomics for multimedia user interfaces
ISO 14915 addresses the design and evaluation of user interfaces making use of different, static and dynamic

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media. It employs a top-down approach, moving from general design principles to more specific guidelines (cf. Ziegler 1999). Part 1 (currently in FDIS voting) introduces a framework and describes four design principles particularly relevant for multimedia interfaces, which may be seen as additions to the dialogue principles established in ISO 9241-10. These additional principles are: suitability for the communication goal, suitability for exploration, suitability for engagement and suitability for perception and understanding. With these principles, the communicative and non-work/task related aspects of multimedia systems are reflected.

Part 2, Multimedia control and navigation, provides guidance on navigating in hypermedia structures and on controlling the different media. An important concept used in this standard is the mapping between content structure and navigation structure. The standard describes different types of navigation structures (linear, tree, network), recommendations when to select a particular structure and navigation functions appropriate for the structure selected. In addition, controls for dynamic media are specified and guidelines concerning their design are provided.

Part 3, Media selection and combination, focuses on the selection, combination and integration of different media. While the standard does not deal with the design “within” a single medium (e.g. how to produce a video for a particular instructional purpose), it provides guidance on selecting a medium for a specific type of information and on integrating different media to convey different aspects and perspectives of the content. The standard is based on a user-oriented taxonomy of media and on rules for mapping different types of content to those media types. In addition to providing general guidelines for selecting media and media combinations, particular attention is paid to the transition points between different media, which can guide the user’s attention when following a presentation thread through different media components.

Currently, parts 1 and 3 have been accepted as Draft International Standards (DIS) and are in the voting process for Final Draft International Standards, while part 2 is in the voting process for DIS.

3 Standards for Universal Accessibility

The concept of universal accessibility aims at removing barriers for using and utilizing information and communication technologies that may stem from a wide range of factors such as personal, social or cultural characteristics. The design of systems and, specifically, of user interfaces should address those impediments and make information technology accessible to the widest possible range of users in the intended target groups (cf. Stephanidis 2001).

The concept of universal accessibility is not restricted to providing interfaces for disabled persons but encompasses a wide range of potential constraints such as:

- Usability of the system as determined by the effectiveness, efficiency and satisfaction by which users can achieve their goals (ISO 9241-11). Low usability can significantly deteriorate accessibility, for instance, due to insufficient task match, high cognitive complexity, or inefficient dialogs.
- Personal characteristics such as education, individual differences or cognitive or physical disabilities. Such factors may generate the need for alternative interaction modes, adaptation of content or functionality of the system, or special assistive techniques.
- Cultural and social factors such as language or level of income. If culturally determined preferences or conventions are violated in a system design (e.g. with respect to colors or dialog styles) acceptance of the system may be significantly lowered. Similarly, as current studies of Internet use show, the social background is an important determinant of technology access and use.

While standardization is not sufficient to remove all these constraints, it can contribute to lowering some of the barriers. ISO/IEC has issued a policy statement and guidelines (ISO/IEC 71.2) which requires that all standards makers address requirements of disabled and elderly people. ISO TC159/SC4/WG5 has recently produced the Technical Specification ISO/TS 16071 Ergonomics of human-system interaction - Guidance on accessibility for human-computer interfaces, which is intended to be transformed into a Standard in the near future. The report provides a description of characteristics of users with special requirements and problems commonly encountered by impaired persons. It presents guidelines for system design in two aspects: for developing software without assistive technologies, and for providing software interfaces with assistive technologies.

Concerning accessibility for the Web, the W3C’s Web Accessibility Initiative (W3C 2001) constitutes the most significant effort in making the Web universally accessible. The development of guidelines is split in three lines: guidelines for site development (Web Content Accessibility Guidelines), authoring tools (Authoring Tools Accessibility Guidelines), and browsers (User Agent Accessibility Guidelines).

4 Software ergonomics for World Wide Web user interfaces

The design and evaluation of Web sites and applications encompasses aspects that go significantly beyond the conventional ergonomics and HCI criteria. For instance, due to the fact that everyone is able to provide information and services through the Web, credibility and trust become important factors, that are much less critical in in-house applications. Whereas in conventional applications users and developers share (at least in principle) the same understanding of the purpose and functions of a system, the goals of information providers and consumers on the Web may be conflicting. A user, for in-
stance, may have the clear goal of quickly finding the price of a certain type of car described on a Web site, while the provider may be more interested in conveying the quality and innovativeness of his/her product. The criterion ‘suitability for the task’ must be seen in conjunction with the ‘suitability for the communication goal (of the provider)’. Finding the right trade-off between potentially conflicting goals becomes an important design issue.

For these and other reasons, the design and evaluation of Web sites should take different levels of criteria into account. Such a multi-level design and evaluation framework has been proposed, for example, in Bullinger et al. (2002). The WebSCORE reference model shown in Figure 2 provides a holistic framework from which more specific design and evaluation approaches can be derived.

A New Work Item Proposal was recently developed within ISO with the aim of developing a standard ‘Software ergonomics for World Wide Web User Interfaces’. Input to this proposal came from the reference model mentioned above and other sources, especially a large set of company-specific Web design guidelines. The standard is intended to complement existing software ergonomics standards with Web-specific material. An initial outline comprises the following areas that are currently being filled with specific guidelines:

- Concept, purpose and strategy of a Web site/application
- Content architecture
- Site design and navigation
- Page design
- Interaction elements
- Site credibility
- Personalization
- Web-based cooperation
- Internationalization
- Cross-platform and technical issues

While the structure and guidance of the forthcoming standard is still subject to change, there is already a substantial body of guidance concerning the areas listed above. In conjunction with ISO 9241 and the multimedia standard 14915 we can expect this new standard to provide comprehensive guidance for designers, developers and evaluators of Web sites.

The Web will continue to offer an enormous variety of information resources, services, design styles, media combinations and others. The goal of standardisation cannot be to abolish this richness and variety that has contributed significantly to the dynamic development of the Web. It can contribute, however, to making it more useful, usable and universally accessible.

5 References


ISO DIS 14915-1 (2001), Software ergonomics for multimedia user interfaces: Introduction and framework

ISO CD 14915-2 (2001), Software ergonomics for multimedia user interfaces: Media control and navigation

ISO DIS 14915-3 (2001), Software ergonomics for multimedia user interfaces: Media selection and integration

ISO 9241-10 (1996), Ergonomic requirements for office work with visual display terminals: Dialogue principles


Figure 2: WebSCORE reference model for Web site design and evaluation
Organizational Interventions: Concepts and Methods

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1 Introduction

Organizational changes and interventions are common in private companies and in public organizations. Their nature has however, changed during the past ten years. Earlier, the change processes followed more or less the typical Levinian model of unfreezing, moving and re-freezing characterizing a planned change. Now the changes are increasingly so-called episodic changes, which are parallel, simultaneous and structural. This means that the change process itself, as well as the role the management and of the consultant has changed. When looking back at the information technology changes in 1980s, e.g. in banks and insurance companies, rather comprehensive data systems were developed and implemented (Lindström et al. 1997). Nowadays the changes are often related to mergers or to some other structural changes which are sudden and do not necessarily follow Levin’s model. A recent type of change is the implementation of new data systems, which enables at the same time an enlargement of tasks, flexible customer services, and networking within and outside the work unit or company.

2 Cases of current type of change processes

Examples of recent changes in which also information technology was involved are:

Case 1. A merger of three hospital organizations characterized by many types of parallel and structural changes, including also the change of the data system for handling patient information and personnel administration (Lindström et al. 2001)

Case 2. Implementing a new integrated IT system simultaneously with a client-centered learning organization in a public service organization (Gard et al. 2002)

2.1 Nature of intervention

In both cases, structural and functional changes were implemented simultaneously, involving also changes in the data system as a central part of the change. The goals in both cases of organizational change were

- economic savings
- improved quality of services

Also very optimistic goals regarding personnel well-being and competence were set in both cases. In the first merger case these goals were more theoretical and idealistic, although very little was actually done to realize these goals. In the second case the change process and its success depended on how well the main goals of the planned change had been reached, i.e.

- integrated IT system
- client-centered learning organization
- teamwork-based work organization

The implementation processes were totally different in these two cases. In the merger case, the transition period was very short, with minimal detailed planning in advance, and without real participation and training. The main focus was on the organizational level and on the new structure of the organization. In the other case, the focus was on developing generalists who could function well with their group and give IT support regarding problems of the customer, i.e. this case was a learning organization. Special emphasis was placed on the training and competence development.

2.2 The role of the management and personnel

In the merger case, the top management was responsible for the implementation, and the problems that arose after the transition were solved case by case. Only a general system of information communication and feedback was built. Some information meetings were organized, and the internal newsletter included information on plans and decisions. No special training was planned for the employees. The failures that occurred during and after the transition were seen by the personnel as being caused by the top management. The implementation was criticized heavily by the personnel.

In the second case, the active involvement and participation of all employees was the main idea, although the planning of the process and the idea of the new organization came from the top. A lot of training courses and on-the-job training were organized.

It can be concluded that in the first case the approach was more at the macro level and concentrated on financial savings, while in the second case emphasis was also on financial savings, but a central goal was also to achieve a cultural change by implementing a new paradigm of having competent people networking with the help of IT.

In both cases the process started from the top, but in the second case the process was well planned and supported by training. In the first case only minimal support was provided to take care of arising problems. These processes could be called minimally and maximally planned structural changes.

The role of IT was different in the two cases. In the merger case the dominant partner decided which data
system would be used, and the others had to follow and adopt it. In the learning organization case, a totally new integrated data system was built to enable the idea of customer orientation and enlarged competence.

2.3 Evaluation of change process
How to evaluate these two processes? Evaluation itself is a difficult task, as shown already in the classical Hawthorne study. One possibility is to describe the critical phases and elements based on documentation during the process. The evaluation is then carried out based on those data (Griffiths, 1999). The evaluation model, taking into account the change processes, is presented. Figure 1 shows the phases of a planned change with the targets to be documented in order to enable the process evaluation afterwards (Lindström, 2001).

3 Conclusions
The societal and organizational context in which the data system and IT changes are implemented has changed during the past ten years. Therefore the general temporal and local context of the total change should be taken more into account. The process itself cannot be fully preplanned because of the turbulence inside and outside the organization. Therefore a qualitative evaluation which builds on the data documentation during the process is necessary. One possibility would be an evaluation model based on the narratives of the participants analyzed by grounded theory.

4 References
Griffiths, A. (1999), Organizational interventions. Facing the limits of the natural science paradigm, Scan J Work Environ Health 25, Special issue 6, 589-596.
"Customer Contact Centres: Perspectives in Work Organisation"

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ABSTRACT

Many people are currently employed in call centres and much more are expected to work in them in the near future. As shown by an overview of work in call centres carried out during a European project (Euro-Telework), operators coordinate and take care of the relationship with customers. They fully represent the company. Their work in practice is based on a processing of distributed knowledge that is dynamic and continuously evolving. Nevertheless, they have to face with a sort of “tayloristic” organisation that hampers knowledge sharing and reduces the quality of work. Additionally, there is scarce attention to training, retention and career development of agents. The paper reports a case study where a team-based perspective has been set out for building and empowering new professional roles in order to make the contact centres evolve from Customer care to Customer Relationship Management structures.

1 Introduction

Call centres represent a new emerging work setting where services are delivered through information and communication technology. The statistics show a huge occupational and economic phenomenon alike all over the world: an increase at 30–35% per annum in terms of calls volumes and 20–25% in terms of agents employed. Additionally, authoritative research estimates that the overall market for call centre technology and services will grow to about $30bn by 2004, from around $7.1bn at the end of 1999 (Bradshaw, Wood e Delaney, 1999). The numbers are impressive if one considers the world: an increase at 30–35% per annum in terms of calls volumes and 20–25% in terms of agents employed. Additionally, authoritative research estimates that the overall market for call centre technology and services will grow to about $30bn by 2004, from around $7.1bn at the end of 1999 (Bradshaw, Wood e Delaney, 1999). The numbers are impressive if one considers that call centres started recently, in the 1960s. They have evolved in functions, technology and competencies, as recently shown in the Euro-Telework project (Bagnara, 2000). Up to now call centres have been conceived as spending structures where the main objective was to reduce the costs for delivering services. The search for efficiency and productivity has prevailed within a Tayloristic work model. This has led to some organisational contradictions between the aims to be pursued and the way people are treated. Although companies have been aware of the central role of people, they have seldom paid the necessary attention to the training, retention and career development of agents (or Reps as they are typically called). The current trend of development and innovation in customer services shows a shift toward a new paradigm for many known as Customer relationship Management (CRM) (Bagnara et al., 2002). Conversational time is always a key variable, but the priority is now customer loyalty and profit seeking. In this scenario call centres become places for strategically building and caring long lasting and trust-based relations with customers. Studies and surveys show huge investments in CRM. Many projects that in most cases coincide with technological platforms. Nevertheless, statistics reveal that more than 60% of users are not satisfied by these technology-based projects (source: IDC 2001). The problem is that you cannot automate a customer relationship even with the most sophisticated technology. CRM must be a strategic approach consisting of new methods and tools for managing the organisational change. People are the central focus and organisational models, processes and technology are tools at their disposal for achieving an integrated and valuable management of customer relationships.

At this aim it’s fundamental to think about work organisation in order to be prepared for tackling the new challenge. Basing on current projects in telecom contact centres, the authors will show a perspective for thinking about the work organisation of customer contact centres.

2 Call centres’ evolution

There have been four phases in the evolution of call centres since the first one was opened (Bagnara, 2000). The original call centre in the 1960s was a claims office with a toll-free phone line that answered standard requests. Agents had limited knowledge and basic communication skills. Later, in the 1970s and 1980s, claim factories were served by Automatic Call Distribution (ACD) systems that handled a large number of mostly repetitive requests. Operators had limited, specialist knowledge and a few restricted communication skills; stress was high and the agent had to cope with a quantitative cognitive workload (Kellerup, 1999). During the 1990s, the call centre became a communication node dedicated to customised interactions, in which the process of communication was dynamic and long lasting,
and whose objective was customer care and retention. Operators were supported by the integration of computer and telecommunication technologies (CTI), and had good communication skills. The “factory model” continued to be the prevalent organisational model of work. The selling node will be next: it combines previous ACD, CTI and new Interactive Voice Responder (IVR) technologies with web-based communication. It takes the form of learning, marketing, negotiating and selling node. The “integrated contact centre” incorporates access to agents via call-back, voice-over Internet protocol (VoIP) and text chat. It is predicted that by 2004, this new generation of contact centres will be central to organisations (Intranet), across supply chains (Extranet), and with the on-line population (Internet). In this new setting, it becomes essential to have skilled and motivated people for establishing trust and long-lasting relationships with customers.

3 Work analysis in contact centres: emerging contradictions

Reps form the strategic factor in managing the customer relationship. Their activity is critical to the success of a contact centre. They always face with unpredictable problem solving and collective decision-making, difficult to be constrained within stable procedures. Nevertheless, all surveys in EU member states reveal symptoms of organisational disease including high turnover, workload and stress. (Bagnara, 2000). At a careful examination some contradictions become clear:

a) Although contact centres are turning into the elective place for communicating with customers, work organisation and technology integration are not designed for enhancing communication and organisational learning. Mostly, agents work alone in their relationship with customers, with a very limited view of the system they work in. Technologies are usually poorly integrated (see e.g. Ackerman and Halverson 2000) and are mostly designed to support an individual user. Moreover, teams can have a fragile and heterogenous structure, often with an instable and not clearly codified division of labour. This can prevent traditional modalities of knowledge sharing within a community of practice (Lave, 1988), but also reduce quality of work. At an ethnomethodological observation of their activity (Brown and Duguid, 1991; Barley, 1996), it appears that Reps develop creative practices to carry out critical activities and bridge technological and organizational gaps. A large amount of knowledge resides in these informal practices, but is poorly preserved and irregularly distributed, especially by those who have acquired more experience inside the organization (Bagnara et al., 2000).

b) Although agents (especially those of the front line) are in charge of critical processes of knowledge gathering, diffusion and creation, and their level of education is usually high, they are managed according to the paradigm of the traditional “blue collar” industrial worker. In fact, agents possess valuable knowledge about customers, products, services, processes, organisation and technologies. They are young (on average 23-25 years old), in possession of a diploma or university degree, and in most cases at the first work experience. However, for most of them, there is no clear path to the future: career development in call centres has not been made very attractive, and often it is completely unplanned. Large-scale horizontal mobility (from one call centre to another new one) conceals the fact that there is little mobility within the company from the call centre to other departments.

c) While there is attention on cost and efficiency standards, average turnover and cost of training are rising. In most cases, agents are managed as disposable resources, and retention plans are rare. There are no vocational training programs. Call centre jobs are based on generic education, and the perceived image is that of a job that anyone can do. Needless to say, social and professional identities are very weak. This situation is also underlined by the figures for part-time and temporary recruitment. Therefore, there is a need for integration and development of technology, organisation, performance, jobs and quality of work.

4 A team-based perspective for CRM organisations

The above description reveals an “organisational ground” not well arranged to tackle the new CRM challenge. An alternative conceptual framework can recognise contact centres as modern knowledge-based service organisations focused on creating value. This assigns a fundamental role to the distribution of knowledge structures in the work environment through different resources (division of labour, roles and responsibilities, systems, rules and procedures, community of practices and so forth) (Bagnara et al., 2000). Core knowledge is not restricted to supposedly universal agents, but is made available in a sort of “knowledge cell” where the operator (or knowledge worker) is integrated within a team and shares cognitive artefacts1 and supporting technologies with colleagues, and even with the customer. The objective of the “CRM cell” is threefold:

- to provide customers with information, and assist and support them at 360 degrees (from welcome to request resolution);
- to acquire and transfer knowledge to the customer and to the company;
- to be a place for vicarial learning that occurs as a gradual participation to a community of practice (Lave and Wenger, 1991; Brown and Duguid, 1991).

At this aim the professional role of Reps has to be empowered. In this vision they gain more responsibility and delegation from the company in caring the relationship with the customer. This can happen coordinating

1. A cognitive artefact (Donald Norman, 1991) stands for tools that represent maintain and manipulate information, tools that complete our cognitive ability increasing the powers.
personal competences with the knowledge resources at disposal in the environment, that in case can lead to activate other groups or organisational units.

Three can be the main drivers for implementing a new CRM model of work.

- A professional system where the identity of Reps is recognized and developed continuously. The process of professional maturity can be achieved through a “zone of proximal development” (Vygotskij, 1978) towards target level of maturity (Rep, Master Rep, Team Leader), created within a team-based environment. In this view the team has a fundamental role as to be the elective place for learning. There is a progressive recognition of CRM Reps as professional jobs.

- A micro-organisational model of work where, as stated above, prevails a team-based orientation (Butera and Donati, 1997). A CRM team has a team-leader that coordinates and manages people and turns, taking into account the different level of competences of Reps. He shares the space with team members, and has a key role in people evaluation on the job. Teams can consist of 15-18 members at maximum.

- The team leader is not more “out of Reps sight” but is a direct manager of his team. Intermediate and not formally recognized roles disappear. But their precious knowledge is maintained allocating them in tasks of leadership or “knowledge scaffolding” for newcomers.

- There is a distribution of tasks in the team, constantly coordinated by the team leader: in this way each Rep can have different roles for different period of time. The team leader can allocate Master Rep in temporary tasks like coaching to newcomers, ACD monitoring, special projects and so forth.

- In this way the team should become a reference point of the organisational and professional identity of people.

- A professional development program aimed at building and “seeding” Rep competences. The program can last 36 months basing on two main elements: core occupancy within the front line group (dedicated to the customer management) and secondary occupancy (at periodic rotation) within specialist groups at increasing levels of complexity. Newcomers can become Reps of a CRM team when they reach a good level of the different experiences.

Additionally, some processes should support the change management:

- A new people evaluation system based on the certification of CRM professional roles periodically monitored;

- A new rewarding system consisting of more structured and defined retribution and carrier steps, mainly based on the technical and organizational competences acquired during their work life;

- A new training program for the key leader roles but also a continuous training for Reps;

- A communication program for diffusion and sharing of the new organisational model of work;

- A Team KPI system that supports the job of the team and of the team leader, and that includes not only the traditional productivity data on calls (average conversational time, service levels, number of calls per agent...), but also performance indicators that allow Reps to understand how they are doing on the strategic objectives of the new contact centres (cross selling indicators, customer satisfaction indexes, and so on).

5 Conclusions

The team-based organisation of work tries to overcome the contradictions of the dominant Tayloristic model of work in call and contact centres. Something of very important can change within the organisation: the building of a new professional role, where the Rep is not more an invisible worker but a “customer manager” at 360°, and the development of a knowledge system for achieving effectiveness and quality of service. People start to be recognized as the hub that allows the contact centre to become a learning organisation.

6 References


Bagnara, S., Donati E. and Schael T. (2002), Call & Contact Center, Il Sole 24 Ore, Milano.


Product Descriptions for E-Tailing Using the Copeland/Bucklin and Kano Models

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ABSTRACT
This research proposes applying product categorizations identified through research in Marketing and the Kano Model of Quality used in product design to create guidelines for product presentation for e-tailing. We will conduct an online survey of Americans to establish consumer requirements and will present the findings at the conference.

1 Introduction
While traditional stores have physical access to shoppers, electronic retailers (e-tailers) are restricted to presenting product information on a two-dimensional screen. Unlike a storefront that vendors may design and construct, the characteristics of the user’s computer screen, such as size and color palette are beyond the control of the e-tailer. However, as in a traditional environment, the layout and atmospherics associated with the presentation of the store material acts as a mechanism to aid in shopping decisions. This paper applies longstanding marketing and product design principles to investigate the question “What do we display about products so users are satisfied with the information and presentation?”. It is expected that the display includes text and a picture of the product. By using principles from Marketing and product design, we are considering the Web site as a Marketing tool and also as a company product. Creating a quality Web site may involve a systematic and detailed methodology as used in the Quality Function Deployment (QFD), championed in the manufacturing sector. As a step in creating this Web site methodology, we will survey online shoppers to determine what to display about what type of products. The results of the survey will provide a set of guidelines for use in displaying product information on U.S. e-tailing sites.

2 Background - Marketing
It is clear that a Web site performs many functions, including the marketing of products and services. The purpose of this paper is to present a framework for displaying product information in a business-to-consumer (B2C) relationship, where the end-user is also the consumer. While a combination of the consumer, the task they are performing, the products they are buying, the vendor, and the Web environment determine whether purchases are made, this research focuses only on the products available online and what to display about the products. Marketing research has proposed product categorization schemes and this research incorporates two of the dominant schemes for retail stores. The first is the classification proposed by Copeland (1923) and refined by Bucklin (1962). This framework separates products into shopping or non-shopping goods. The non-shopping goods are further divided into convenience or specialty goods. These goods require little planning since the consumer knows their characteristics before they commence the purchase. Shopping goods, on the other hand, require more in-depth information, since the consumer begins the shopping experience by first gathering information in order to make an informed purchase. The experience consumers expect once they own a product is another area considered important to buying behavior. Several behaviorally-oriented product categorizations focus on how involved the consumer is in the product and in how much pleasure is derived from the product (Vaughn 1980, 1986, Rossiter, Percy and Donovan 1991, Wells 1988, Weinberger, Campbell, and Brody 1994, Weinberger and Spotts 1995). Krugman (1966) first suggested that viewing advertising on television, even though it is a passive activity, effects consumer behavior by altering the effort spent on making shopping purchases. Others have identified many types of involvement, such as enduring and situational involvement (Houston & Rothschild 1978), rational and emotional involvement (Hirschman & Holbrook 1982), and ego involvement (Foxall 1993). Another classification of user involvement presents a continuum of whether a product is considered a thinking or feeling product (Vaughn 1986). The Foote, Cone & Belding (FCB) grid (Vaughn 1980) combines the level of consumer involvement (feeling) with the functional value (thinking) of the product. This grid consists of four quadrants, with rows labeled as high to low involvement and columns labeled as thinking to feeling. The validity of the grid was supported by Ratchford (1987) and Zaichowsky (1980). Table 1 presents the integration of the Copeland/Bucklin and the Vaughn models used in this research.
### Table 1: Integration of Copeland/Bucklin frameworks used for this survey.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Sub-sub category</th>
<th>Definition</th>
<th>FCB quadrant</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-shopping - have apriori knowledge of products</td>
<td>Convenience</td>
<td>Emergency</td>
<td>Needed immediately</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Impulse</td>
<td>Aren’t aware of the need until see the product</td>
<td>low</td>
<td>high</td>
<td>Items next to checkout counter</td>
<td></td>
</tr>
<tr>
<td>Staple</td>
<td>Frequently purchased</td>
<td>low</td>
<td>low</td>
<td>Bread, magazines</td>
<td></td>
</tr>
<tr>
<td>Speciality</td>
<td>-</td>
<td>Strong brand preference and loyalty, little comparison</td>
<td>high</td>
<td>high</td>
<td>Luxury goods such as Rolex watches or fine crystal</td>
</tr>
<tr>
<td>Shopping - Less frequent purchase with much planning and shopping effort</td>
<td>-</td>
<td>-</td>
<td>high</td>
<td>low</td>
<td>Major appliances, stereos, furniture</td>
</tr>
</tbody>
</table>

### 3 Background - Product Design

Marketing research has identified categories used for product presentation in advertising and marketing. We look to the Kano Model of Product Quality (Kano et al. 1984) to aid in distinguishing user requirements for these product categories. According to the model, there are three types of customer requirements to consider - expected, normal and exciting. Expected requirements are so basic that only their absence is noted, such as elasticity in a rubber band. These are considered dissatisfiers, since without them, the product will not meet consumer expectations. Normal requirements are those that represent characteristics that consumers are aware of and value. Product differentiation may occur around these requirements, such as price and performance, which generate additional perceived benefit. Exciting requirements are those that customers are not aware of and if they are not present, it is not noticed. If requirements such as these are included in a product, however, they generate enthusiasm and inspire customer loyalty.

### 4 Research Method

We propose to survey online shoppers to identify the influence of these product categorizations on their purchase decisions. While initial speculation of Internet shopping were wildly optimistic, it is now clear that product presentation and value are vital to sustaining an online presence. The survey method first asks basic demographic information found to impact user preferences for e-tailing sites and online shopping habits (Lightner 2003). It then follows the established QFD methodology of querying users about product requirements in the positive and negative case, with five responses possible for each question: 1-I like it, 2-It is expected to be that way, 3-I don’t feel anything, 4-There is no other choice, 5-I don’t like it (King 1989). The responses to both positive and negative cases determine whether the characteristic is normal, expected or exciting to the consumer. The cell (for normal) or cell combinations (for expected and exciting) that have the largest percentage of responses will identify the type of characteristic for each product category. The questions themselves are derived from the descriptions of the product categories used in publications based on Copeland (1923), Bucklin (1962) and Vaughn (1980), such as Kotler and Armstrong (1997).

### 5 Surveys

Four surveys were created to administer to online shoppers, identified through classroom and other discussions. Students will be offered bonus points to participate in the survey and to have their friends and acquaintances participate. Table 2 contains the URLs for the surveys used in this research. Since it is unlikely that emergency goods will be purchased online, except if a strong home delivery warranty is offered, this category was not considered for this research. Each of the 4 surveys, impulse, staple, specialty and shopping, consists of the same set of 27 questions, plus 5 demographic questions. Respondents are instructed to answer according to the appropriate product category.

### Table 2: URLs for surveys used in this research.

<table>
<thead>
<tr>
<th>Product Category</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulse</td>
<td><a href="http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/ImpulseSurvey.htm">http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/ImpulseSurvey.htm</a></td>
</tr>
<tr>
<td>Staple</td>
<td><a href="http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/CommoditySurvey.htm">http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/CommoditySurvey.htm</a></td>
</tr>
<tr>
<td>Specialty</td>
<td><a href="http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/SpecialtySurvey.htm">http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/SpecialtySurvey.htm</a></td>
</tr>
<tr>
<td>Shopping</td>
<td><a href="http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/ShoppingSurvey.htm">http://dmsweb.badm.sc.edu/lightner/prodsurvey/prodsurvey/ShoppingSurvey.htm</a></td>
</tr>
</tbody>
</table>
6 Conclusions
Product categorization has influenced advertising media strategy since before the commercialization of the Internet. By determining how product information is viewed online, this research will guide online retailers in product presentation. We will incorporate these results into a broader methodology for Web site design at a later date.

7 References
Weinberger, M.G., Campbell, L. and Brody, B. (1994), Effective Radio Advertising
Humans on the Net

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ABSTRACT

The paper is primarily concerned with human organization and psychosocial work environment related to Information and Communication Technology (ICT). The author will synthesise the results of her book “Humans on the Net” with her own research as a background and elaborates on the following issues and their interaction with ICT: work organizations, human communication, stress, allocation issues, knowledge transfer, and global villages.

1 Introduction

Information and communication technology (ICT) is more and more influencing us all, both in our professional and private lives and in our role as citizens. Focusing on the professional role, this is true with regard to the nature of our work, the design of our organizations, in communication between people and also in leadership and managerial roles. Quality of life, power, competence development, stress are other crucial areas related to the ongoing convergence of technologies. The book “Humans on the Net” (Bradley 2001) deals with those issues from different research disciplines, such as Informatics, Organisational Behavior and Communication, Industrial Engineering, Psychology and Education. Many of the contributors are distinguished scholars within the Ergonomics- and HCI-societies. The paper addresses some key issues about work and life in the ICT society primarily based on the chapter entitled “The Information and Communication Society: How people will live and work in the new millennium”.

2 Continuous changes are occurring in the design of organisation, work and management in the Net Era

There is a main change pattern in the organisational structure related to the use of ICT (earlier computerisation), which in our research has been analysed during three main periods in the history of ICT during the last three decades. What is happening with work content and work organisation in the latest, the fourth era of computerisation - the Net Era? We have achieved more flexible work processes regarding both the professional role itself and leadership. Further, the professional role, the learning role and the role of citizen are becoming more and more integrated. Repetitive jobs and physically strenuous jobs disappear and a total upgrading of qualifications has occurred. In parallel, the organisation is flattened out. Networks have become more and more common as the main type of organisational structure. Psychosocial and organisational aspects of networking are in focus. In an international perspective more work tasks are becoming similar because software programs are sold world-wide and the work tasks are carried out in a more and more similar way.

2.1 Network Organisations

Knitting a lace could represent the process of organising in networks and could be a process model with respect to social systems, organizations, and official authorities in the future. The network era has arrived and seems to be here to stay, and the network interactions are more and more wireless. It is possible to crochet (create and connect) all the time: each new loop (person/computer/unit) is connected to another loop through the same yarn (teletechnology). The distribution of power is now possible in a quite a deep sense, competence is transferred to the periphery, out to the line. The hierarchical structures of companies mirrored industrialisation and the industrial technology during the mainframe period of the computerisation era. Some characteristics of the network organisation are direct communication between the various levels of the organisation; barriers between idea and execution are disappearing; reallocation of power in the organisation; continuous change of structure and roles; openness to the surrounding world; multidimensional virtual culture.

2.2 Workforce in the flexible company

There is a core workforce at the centre with permanent full time employees who enjoy a wide range of employment rights and benefits: but the core workforce is decreasing. The other growing part is often called the peripheral work force. They consist of part time staff, self employed consultants, sub-contracted and out sourced workers, and temporary and agency employees. Some of these “knowledge workers” are key resources, others are exchangeable e.g. call centre personal. Through the network organisational structure they might have very strong positions in the company through their expertise or social contact, but this is invisible. Power is invisible in these new forms of organisations: power has no dress, is not reflected to the same extent as earlier in properties and gadgets tied to leadership. One common trait is, however, that the peripheral workers are so called free agents: they take care of their own security, competence development, and personal marketing. The individual represents a “unit” on a competitive world market. They are very loosely, if at all, tied into the welfare system. They are strong when health and good times are present, but are in a high risk situation when
health and family relations are taking away their energy and motivation. In summary, too much of responsibility is put on the individual.

3 Psychosocial communication becomes a key issue - networking

Important changes related to communication between humans both regarding structure, quality and quantity are occurring: Our perception of time and space is changing; Communication overload appear; Electronic subcultures are developed at the same time as a global culture is developed; Equality between sexes is challenged; Identity and trust is challenged; Subdivision in work and leisure loses relevance; Human needs for having few narrow contacts increase in parallel to a process where the remote contacts increase.

4 Stress - With ICT our pace is increasing

Stress represents an established research field, but should focus action strategies, preventive and prophylactic. Certain ICT stress is related to the fact that we have an increased dependency on computers and networks and increased expectancy that these technologies are functioning well. Stress phenomena are more and more connected to information overload and contact overload, requirements on availability emphasised through mobile technology, lack of organisational filters e.g. hard to separate "noise" from essentials, changing level of expectations, and changed perception of time and space in general. There are reasons to talk about stress syndromes related to integrated effects of "Internet stress", "stress emphasised through mobile devices" and the "technostress" at the societal level, mostly in big cities. This is not a necessary development, we could as humans learn to handle and master technology.

5 Allocation issues - Knowledge Transfer - Global villages

5.1 The allocation issue and ICT

Twenty-five years ago, at a time when ICT was entitled EDP (electronic data processing), I used to close my speeches by arguing that computerisation is really an issue of allocation. It has very much to do with allocating the so-called "good life". That is, allocation of: work and leisure time; citizens' services (paid/unpaid); production and reproduction; allocation between cities and rural areas; allocation of profit between sectors within a country; between industrialised countries; between industrialised countries and industrially developing countries. During the latest years NGO movement (e.g. Attack) as well as established national and international organisations are concerned with the increased gap between those who have and those who have not access to ICT especially internet including the infrastructure and educational resources - the so called digital divide.

5.2 Transfer/growth of knowledge and influence is an ongoing and deep process

What we call "knowledge transfer" is an important phenomenon in the present and future knowledge society. The transfer of knowledge could be exemplified with regard to: urban-rural, Sweden-Europe, centre-periphery, north - south, and globally. The technology is now used to transfer knowledge, which was earlier concentrated to experts, out to people, and they become strengthened both in their professional role and their roles as citizens. Learning in itself is changing to be an active and interactive process. ICT involves a transfer of power connected with knowledge. A decomposition of the traditional hierarchical structure is occurring. There is an embryo for renewal. Long distance work, distance tuition, and long distance services already provide new prerequisites for the role of regions. The issue of knowledge has attracted much attention over the years - from the intensive and emotional AI debate - expert systems - knowledge based systems - to the softer period of business reengineering, learning organizations, creative organizations. Information Management is now Knowledge Management - maybe due to the more sophisticated technology mix. We will probably reach Creativity Management, Fantasy Management, Trust Management in the future. The creation, transfer, and management of knowledge in the society as a whole as a basis for reallocation of power, influence and deepening of democracy is the crucial issue.

6 Home of the Future

Our research has shown that more and more activities take place within the home (physical) such as money transactions, shopping, booking, entertaining etc, and are supported by the use of ICT. Along with increased market activities in homes comes an increase in contacts and communication. Our home becomes our main communication hub. The big challenge in the near future is the home in a broad sense, as many human roles are converging to one life role and the home is more and more understood in terms of virtual space as well as physical.

7 Reference

Macroergonomics in WWDU: What About Computer and Information System Security?

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ABSTRACT

This paper describes the macroergonomics conceptual framework that we have developed to examine the organizational and human factors issues involved in computer and information system security.

1 Introduction

In the wake of the tragic events that occurred on September 11, 2001, much attention has been devoted to various dimensions of security: security of airports, security of special events such as the Olympic games, etc… The security of computer and information systems has also received increasing attention. In this paper, we examine how macroergonomics can provide the basis for a conceptual framework to understand the ‘latent’ organizational causes of (potential or real) security breaches of computer and information systems.

According to the National Research Council Computer Science and Telecommunications Board (2002) it is important to distinguish between accidental causes and deliberate causes. Accidental causes are natural or human but non-deliberate (e.g., human error). Deliberate causes result from conscious human choice (e.g., terrorism). In the cybersecurity literature, these are referred as ‘attacks’. We propose to examine how models of human error and macroergonomics can be used to understand accidental causes. But we also argue that knowledge generated from the understanding of accidental causes can help in building better defense mechanisms against attacks.

2 Human error and security of computer and information system

Models of human error can be used to identify and characterize vulnerabilities of computer and information systems. It has been argued that “Human error is usually not a useful explanation for security problems. Usually either operational or management practice is at fault” (Computer Science and Telecommunications Board-National Research Council 2002). However, this assertion does not consider the rich human error literature, in particular with regard to ‘latent’ organizational failures (Reason 1990). The human error literature has explored the cognitive mechanisms involved in human errors, but has also emphasized the role of organizational and management factors in contributing to the creation of error-prone conditions.

3 Conceptual framework

Human error can be defined as ‘an inappropriate or undesirable human decision or behavior that reduces, or has the potential for reducing, effectiveness, safety, or system performance’ (Sanders and McCormick 1993). Although there may be a tendency to view errors as those of people, it is important to consider the entire system when talking about human error. The focus should not only be on the operator. When investigating a problem or when analyzing a potential problem, it is important to examine the different elements of the system that can lead to human errors, such as faulty equipment, poor management practices or incomplete procedures.

According to Smith and Carayon (Smith and Carayon-Sainfort 1989; Carayon and Smith 2000), a work system can be conceptualized as having five elements: the individual, task, tools and technologies, environment and the organization. The interplay and interactions between these different elements can produce various effects on the individual that then produce a ‘stress load’. The ‘stress load’ on the person challenge biological resources (energy expenditure, biomechanical strain, physical status), psychological resources (perception, cognition, decision-making, emotion) and behavioral resources (motivation, coping behaviors). The stress load, if sustained over time and depending on the individual resources, can produce adverse effects, such as lack of performance and errors. In examining the potential human errors it is important to consider all elements of the work system as well as their interactions.

Therefore, our conceptual framework includes the following levels (see Figure 1): (1) security breaches or vulnerabilities of computer and information systems; (2) error: level of error (skill, rule, knowledge), information/cognitive processing stage, and task; and (3) work system. Our conceptual framework states that security breaches can be caused by human errors, which, in turn, can be influenced by a range of work system variables.

3.1 Work system components

In the context of computer and information system (CIS) security, the important work system elements can be described as follows.

1. Individual: This element includes the type of network user. This includes network administrators, management, end users, etc.... These users have different needs on the network and varying levels of accessibility. Further, the responsibilities for security may differ among these groups. Other important issues include...
divergent individual motivations and attitudes toward security.

2. **Organizational factors**: This element includes security policy and procedures, management style, and organizational culture and climate with regard to security, and teamwork. Issues related to the implementation and regular use of security policy and procedures need to be addressed. People working in teams are faced with different security issues (Adams and Sasse 1999).

3. **Technology**: This includes the types and characteristics of technology and tools used for maintenance, regular usage, security management, etc. This also includes CIS security tools. Additionally, the resources available with regard to technology are included. This includes training to learn the technology, CIS specialist availability for help, and information available on the CIS security tools.

4. **Tasks**: This category includes the description of tasks performed by the person(s) directly or indirectly involved in the security breaches, such as maintenance, and usage of security tools. Workload levels and job control (access to additional resources, status/priority in receiving help from CIS) are additional task factors.

5. **Environment**: These factors include physical elements that contribute to CIS security breaches. Workstation and ergonomic issues are contributing factors. Noise levels, lighting, workspace layout contribute to interruptions that can contribute to human error.

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**Figure 1: Macroergonomic Conceptual Framework of Security of Computer and Information System**

### 3.2 Cognitive characterization

The cognitive characterization refers to the characteristics of the human error involved in the security breach.

1. **Task type**: The task the person was doing when the security breach occurred.
   - maintenance of the network
   - checking the system
   - communication (between technology and user, between users)
   - performing a routine normal task
   - prevention: anticipating problems with network

2. **Information - cognitive processing stage**: This level of cognitive characterization is done using Rasmussen’s step ladder model (Rasmussen, Peijtersen et al. 1994).

3. **Level of error**:
   - **Skill-Based** (apply to well-known and routine activity): interruptions (delays in sequence), perceptual confusions (incorrect object selected in action sequence), plan failures (attention lapse, confusion), etc...
   - **Rule-Based** (apply to known, but not routine activity): context (apply rule to wrong situation), inadequately formed rule, rigidity (perform at suboptimal rules, even when better rules exist), etc...

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**Note**: CIS = Computer and Information System
Knowledge-Based (apply to unfamiliar situations and tasks for which there was no training): bounded rationality, confirmation bias, tunnel vision, etc…

Using the proposed macroergonomic conceptual framework, we have developed a methodology aimed at identifying the organizational and human factors involved in security breaches of computer and information systems. We are currently testing the methodology on a selected set of vulnerabilities identified in a technical security audit performed by Professor Vernon and her team in the Computer Sciences department of the University of Wisconsin-Madison.

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5 References


Macroergonomics in WWDU: What About Computer and Information System Security?