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User certification of workplace software: assessing both artefact and usage

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This article summarises activities and results from the quality assessment project ‘Quality Assurance of IT Support at Work’ (ITQ) which has been performed by Swedish researchers in close cooperation with trade unions 1999–2005. The ITQ project is part of a network, UsersAward, which works for the goal to develop and implement a strategy for good software products on the work floor. A main result of the ITQ project is the first version of a software certification programme, User Certified 2002, which is described in some detail. The underlying theoretical arguments for its design and the performed pilot projects which have informed its implementation are also presented. The outcome of performed certifications is discussed in terms of stakeholder response; in terms of whether to certify artefact, processes, or both; and in terms of the relationship between software certification, standardisation, and public procurement agreements. One conclusion from the project is that a viable software certification programme has to cover the software’s built-in features, its deployment process, and its actual situated usage. A second conclusion is that the buying organisation has to implement integrative processes in which its organisational development and its implementation of IT systems are coordinated. Conclusions are also drawn with respect to the set of organisational patterns underlying the UsersAward initiative – certifications, user panels, user surveys, user conferences and a yearly IT Prize contest. Finally, implications and plans for the future, especially international research and union cooperation activities, and further development of the certification process are described.

Keywords: certification of software; user involvement; participatory design; quality in use; quality assurance; quality criteria

1. Introduction

The ITQ research project ‘Quality Assurance of IT Support at Work’ (ITQ) was a major research activity in a network of user-oriented activities, the UsersAward network, launched in Sweden in 1999. The network was initiated by the LO (Swedish Trade Union Confederation) in cooperation with the TCO (Swedish Confederation for Professional Employees) and the ITQ project was started in response to their request for research support in the area of user-driven quality assurance.

In this article, we present the background of the ITQ project in terms of the needs expressed by the trade unions that initiated the UsersAward network and the challenge this represented to the Swedish tradition of worklife studies and research on IT design and development. The theoretical background of the project is briefly accounted for. Six pilot studies that investigated key quality issues of current workplace software are described. This provides the basis for the presentation of the quality criteria and the procedure of the User Certified 2002 certification programme, which is the main result of the project. In the concluding section, the experiences and the lessons learned from the UsersAward research are presented and discussed.

2. Project background

2.1. New challenges for the Participatory Design tradition

The research group that answered the trade union request to form a quality assurance project had participants from the Centre for User Oriented IT Design at KTH in Stockholm (coordinator), Human Computer Interaction at Uppsala University, and Industrial Economy at Gävle University. Thus, the group was interdisciplinary, representing computer science as well as worklife studies. Some of the members of the group have taken active parts in early Cooperative Design projects and the group as a whole is heavily influenced by the Participatory Design approach which, from the beginning, had a generic trade union presence.

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The absolute pioneer and inspirer was Kristen Nygaard, studying computer support for and with Norwegian metal workers from 1972. Also, the Utopia project, started in 1981, was initiated by the trade union movement (the NGU, Nordic labour unions for graphic workers) as an ambitious follow-up of Kristen Nygaard’s work, not only involving the users in evaluation but also in designing the new computerised tools.

One strong goal of the Utopia project was to ‘give the end-users a voice’ in design and development of computer support in workplaces, thus enhancing the quality of the resulting system. The ‘secondary result’, the methodology, with ingredients such as low-tech prototyping and early design sessions with users, has had great impact on IT design in general (Bødker et al. 1987, 2000, Sundblad 2001, Sundblad et al. 2002). A third outcome, which was highlighted as possibly the main result for the trade union participants, was that the union members’ active engagement in the research gave them an understanding and a know-how that turned out to be an important resource in the ensuing negotiations about work organisation and systems deployment. It is specifically in relation to this ‘third result’ that the ITQ project can be seen as a continuation of the Utopia project. The challenge now is to help develop a quality assurance framework that would support an active and ongoing trade union engagement with the software tools of their members.

In the 20 years that have passed since the Utopia project, a lot has changed, in a fantastic evolution of computer technology and networks for access by ‘everyone’. However, the promise of an all-inclusive ‘for everyone’ seems to be less pronounced when it comes to use of IT support at the workplace. And the pervasive development has raised new issues for participatory design. Perhaps the most noticeable issue is that the broadened use of IT, within and beyond the traditional borders of ‘the workplace’, has given many software packages large and very heterogeneous user groups (Taxén 2003). How should end-users be selected, studied, and engaged first hand in order to assess and take part in the (radical) re-design of such software? And for which of the diffused working contexts should the software be assessed and re-designed? An interlinked question arises from the fact that the degree of modularisation, specifically in what is declared to be ‘standardised solutions’, forces extended deployment and adaptation processes in order to get the software integrated into local work contexts. How can we assess and help re-design software that derives an increasing part of its characteristics from local circumstances?

To come to grips with these new challenges to IT-in-use research, with the goal to develop a user-oriented quality assurance framework, we have had to look beyond our common Participatory Design research themes and try to embrace new perspectives from studies geared towards user-centred standardisation work, from worklife studies, and from customer satisfaction evaluation studies (Gulliksen et al. 2000). Before we present the theoretical framework in which our questions and answers were articulated, we have to give a more detailed image of what the trade union request amounted to. Specifically, we will describe what kind of software certification the unions wanted the project to investigate, what had prompted them to express this interest, in terms of membership experiences from daily workplace usage, and what other measures than certification they advocated for the UsersAward programme.

2.2. Trade unions demand a broader scope for workplace IT research

To what extent did the research efforts to promote a user-oriented perspective on IT design have an impact on how computers were used in the Swedish offices, workshops and health clinics of the late 1990s? According to staff within the trade union movement, the examples of IT deployments that lived up to the trade union vision of ‘a rewarding work organisation’ were quite few. The consensus among workers, professional employees and management was that some IT tools that were critical for the flow of production had serious problems, regarding both usability and efficiency. Stories were told, from small firms as well as big ones, that sizeable sums were invested in ERP (enterprise resource planning) software that got implemented in the departments for marketing and finance, but that had to be shelved when it came to implementation for human resources, production and maintenance (Lind et al. 2000, Lind 2002, Koch and Buhl 2001).

In the mid-1990s, a group of investigators at LO, the Swedish Trade Union Confederation, concluded that the last 15 years of trade union efforts geared at co-determination and local influence at the workplace had been marked by a defensive and re-active stance that, in their opinion, could not be continued. Their report bears witness to a widespread anxiety about the quality of IT tools at the workplace, but it also describes a wide spectrum of countermeasures they thought were needed in order to give end-users instruments for influencing how IT tools were deployed at their workplaces (Utbult and Wiberg 1998). These countermeasures were inspired by a few LO initiatives aimed at influencing the workplace use of IT, such as the appointment of an IT ombudsman, the collective procurement of an ‘LO computer’ available for LO members and special development projects concerning computer conferencing and networking for local union members. One of the most central of the countermeasures proposed in the new report was the idea to develop a certification method for workplace software that
would help procurers and end-users understand the strengths and weaknesses of different software packages. The reason this was such a central measure was that a union-driven quality certification programme had already been proved to work successfully for information technology hardware.

### 2.3. Bringing hardware quality certification to software

At the beginning of the 1990s, TCO, the Swedish Confederation of Professional Employees, had shown that union members could have an influence on the quality of IT equipment, even the kind of equipment provided by big corporations in the international marketplace. The TCO’92 certification of visual display units (VDU), launched in 1992, was based on extensive surveys of membership satisfaction with display units, combined with technical research on the issues of energy consumption, emissions and ergonomics. The TCO’92 label was accepted as a de facto standard after some indecisiveness from a few of the major hardware suppliers. It is a unique example of an environmental innovation with its substantial impact in the marketplace. Today, approximately 250 million display units bear the TCO label, making it one of the most influential Swedish innovations in information technology (Boivie 1990, 2002).

LO’s new strategy, developed in close contact with TCO, was to underpin the more demanding certification procedure aimed at workplace software with a broad range of supportive measures. Firstly, with the support of a more comprehensive research effort required by complex software issues and, secondly, with the mobilisation of a user movement that could help promote the idea that IT tools were not just about automation and rationalisation but, even more importantly, about communication between people and competence development at work. After a survey of the ongoing IT and worklife research in Sweden, the LO investigators invited a group of researchers to formulate a proposal for a research project. This was the starting point of the ITQ project, Quality Assurance of IT Support at Work, through which the supportive user activities were to be organised.

### 3. The ‘IT Map’ and the vision of the UsersAward network

#### 3.1. The IT map: a gloomy picture of how systems are actually used

One of the first actions taken by the trade unionists leading the UsersAward programme was to initiate a broad survey on the union membership satisfaction with the IT tools at their workplace. The survey was performed in 2000 together with five industrial unions organising the forest and wood; paper; food; metals; chemistry and mechanical industries. The survey is summarised in Lind (2002), a booklet jointly produced by LO with the five industrial unions and distributed to their members as a study material. By confirming the widespread discontent signalled by earlier studies, it provided an ‘IT Map’ of the grave problems the UsersAward network would have to deal with. With background chapters on the 56 software packages from the seven different categories covered (enterprise resource planning, automation, process control, maintenance, simulation, Internet and email, office administration) the IT Map presented the opinions of 1124 users, of which 50% were workers in direct production.

- Out of all users, just over 50% regarded the workplace software to be useful in their own work situation. For personnel in direct production, maintenance and distribution, this figure decreases to 40%.
- Less than half of all users found that the workplace software gave them a satisfactory overview of the workflow.
- 9% of the women and 16% of the men felt that they could influence how the systems were deployed.
- 30% agreed that the systems had helped develop the work organisation.
- Only 10% stated that they had obtained appropriate training.
- Out of the personnel working in direct production, just over 10% found that the systems supported learning and experimentation.

An earlier study, from May 1999, had asked the membership and the local union leadership to prioritise a set of concrete tasks that the UsersAward programme should engage in. Sixty-five per cent of the respondents argued that ‘certification of software providers’ was the most urgent task, followed by ‘checklists for deployment’ (62%), ‘education and training on IT and work organisation’ (58%), ‘user tests of systems’ (56%) and ‘user conferences’ (42%) (Lind 2000).

#### 3.2. The vision of the UsersAward network

Based on the gloomy picture the IT Map presents, and guided by the membership opinions on what to do about it, the following vision for subsequent actions emerged for the UsersAward network. The network should:

- develop criteria and a procedure for user-driven workplace software certification,
The project leadership at LO, Peter Forss, Torbjörn Lind and Ove Ivarsen, were all strongly inspired by the successful TCO example. And the early survey on policy measures showed that this appreciation was grounded in the union membership. Thus, the main challenge for the LO group and the researchers was to develop a consistent method for measuring user satisfaction with a broad spectrum of workplace software, a method that would meet the basic requirements of end-users and procurers at buying organisations as well as the requirements of software suppliers with a strong interest in customer retention.

The TCO certification of visual display units received much of its strength from the fact that end-users of those tools had been actively involved in setting the standard for what should be regarded as an adequate quality level. With guidance from technical research, and through a set of membership surveys on what the employees experienced as being the most severe problems, a set of criteria regarding ergonomics, emissions, and energy was formulated which, after initial protests from some influential hardware suppliers, was accepted by the marketplace as a de facto standard (Boivie 1997).

In the case of the UsersAward certification, the problem was much more complex, since the certificate aimed at setting a standard for the constantly moving target of computer software. The project group at LO and the researchers agreed that this added complexity had to be approached with the same grounding in user-centred methods as the TCO had chosen. What was needed, in order to untangle the complexity, was a broader interdisciplinary approach and a broader user involvement. For the PD approach, the broadened participation of trade union members, which TCO had pioneered and LO now wanted to follow, represented an interesting possible solution to the problem of studying software with a high degree of diffused users and user contexts. Could the supportive measures help to ground the certification and pilot study research in a sufficiently critical membership debate on what quality criteria were essential for what kind of workplace software and what kind of use? This prospect, that the trade union as user organisation could be instrumental for broadening user participation in assessment and redesign, represented a first attempt to widen the PD research approach.

With the trade unions supplying a supportive interpretive framework, the actual certification procedure could be geared at attending to all the particularities of users, contexts and software characteristics that the PD approach advises. Thus, to be trustworthy in the eyes of end-users, procurers and software suppliers, each certification of a software package had to be based on investigations of end-user satisfaction with that package in its actual situated use. In this way, the certification method could be called ‘user-driven’ in two senses of the word. Firstly, in the sense that it was initiated by two of Sweden’s biggest user organisations and supported with their membership debate arenas. Secondly, in the sense that the qualification each software package received was based on the opinion of end-users who, after having operated the software for at least a year, had given it their sign of approval. The active involvement of real users with ‘sharp’ experience of the system meant that the certification had to be an ‘after product release’ process.
The broad union engagement meant that the research in the ITQ project was carried out in a close and ongoing dialogue with the trade union leaders and membership. The new research setting also implied that the obligation to verify usability in the workplace had to be taken one step further than in traditional usability investigations. It was not enough for the certification process to be able to empirically demonstrate that a certain IT tool was useful at the workplace. The certification process itself had to meet the criteria of usefulness for a broad audience. The reports from each certification had to be concise, informative and expressive enough to be read and studied in depth by end-users and procurers alike. This in turn meant that the set of criteria and the questionnaires had to be short, meaningful and pointed so that people from all occupations of the typical workplace could recognise and engage in answering them. Therefore, the research effort had to be conducted in close contact with experienced users in order to get a direct feedback on relevance and language. In sum, the complexity of the workplace IT design, development, deployment, and maintenance issues involved required a high degree of transparency of the certification method.

If the measure to involve users in the articulation of quality criteria with the help of strong user organisations was a first attempt to widen our PD approach, then the methodological issues of certification prompted another kind of openness, namely towards standardisation studies. To a large part, formulating the quality criteria for the certification involved a compilation of known quality factors, as documented in the relevant standards and discussed in recent research. This amounted to a screening and re-use of ISO standards, specifically those concerning software ergonomics (ISO 9241: 10–17) (International Organization for Standardization 1998) and human-centred design (ISO 13407) (International Organization for Standardization 1999). Although these committee-driven, formal standards are not a main theme in PD research – which rather strives for user-driven, informal, hands-on, innovative breakthroughs in design – it was a strong hypothesis of the research group that the two strands of studies had to be combined. The concerns of standardisation work for ergonomics, health, environmental and productivity issues would increase, rather than decrease, the knowledge base for the development of a quality framework.

To summarise our theoretical position vis-à-vis the Participatory Design tradition, it should embrace an active participation of user organisations in building a quality framework and it should also embrace the rich knowledge base of standards oriented IT research. We find that this widening of the PD scope to a broad, organised user participation is in line with the long-term union grounded worklife research done in the 1970s and 1980s, e.g. at the Centre for Working Life in Sweden and at Aarhus University in Denmark. Tomas Berns in Sweden and Karl-Heinz Rödiger in Germany have been inspirational for our interest in the contributions from standardisation studies. Christian Koch in Denmark, Timo Jokela in Finland, Peter Brödner and Jochen Prümper in Germany, with whom the group has had repeated seminar discussion, have also studied the central issue of what kind of software quality to investigate at the workplace: artefact or activity (Sundblad et al. 2006).

4.2. What quality: artefact, artefact usage or both?

4.2.1. Interplay between IT support and work organisation

An important premise for the ITQ project was to underline the intimate relationship between technology, in our case computer systems, and work organisation. Computer systems are developed by actors guided by specific interests, and the features of the system will affect the users and the organisation using it. The way the systems are used is, however, not deterministic. The built-in features can be understood, used and configured in several ways by different actors, and these interpretations may also change over time. This means that both the technology and the organisation using it are continuously involved in a process of shaping and re-shaping (McLoughlin 1999, Koch and Buhl 2001). This socio-technical duality has specific implications for our project. The certification process of computer systems has to include not only the declared features of the computer system itself, but also how the system is actually deployed and used.

Previous research has shown that a specific configuration of a computer system may support or hinder certain forms of work organisation. As a reaction to existing types of computer support which were aimed at centralisation of control, there were several European initiatives around the early 1990s to develop anthropocentric systems and human centred CIM (Computer Integrated Manufacturing) to support decentralisation and empowered work teams (Warner et al. 1990, Corbett et al. 1991). This need to formulate specific demands on systems based on certain organisational ideas is still valid. During the past decade, the major players on the market for ERP software have introduced still larger and more integrated software solutions, with modularisation and parametric adaptation as important arguments for an extended flexibility. As a result, today most companies buy standard packages of software, while in-house solutions have become rarer. For ERP systems, the standardisation trend has so far implied the risk of a ‘one-size-fits-all’
philosophy, i.e. a risk that companies will have to reorganise in accordance with the configuration of the ERP package rather than follow the specific business logic that has made the company competitive (Davenport 1998, 2000, Markus and Benjamin 1997). Another shortcoming is that standardised ERP systems are mainly characterised by centralisation rather than local support for decentralised work. Most ERP systems still lack specific support for teamwork (Carstensen et al. 2001). However, the final configuration and use of the systems is not pre-determined, and many choices remain to be made by the organisation.

Successful user-oriented deployment of computer systems does not solely rest on the technical configuration of the computer system itself. An IT system is not a ‘magic bullet’ (Markus and Benjamin 1997) that automatically controls and transforms organisational behaviour and realises expected benefits. The methodology used when implementing the system will strongly influence how the system will be used. Previous studies show that computer systems initially aimed at supporting decentralised planning or programming in work teams may instead be used by planners and engineers in a way that strengthens the vertical division of labour (Bengtsson et al. 1998). The problem is that the actors developing and implementing ERP systems often do not include aspects of decentralised control and teamwork (Koch and Buhl 2001). There is a risk that this potential will never be realised since the single firm lacks sufficient resources for local adaptation. The result will instead be substitution of existing structures or centralisation. And furthermore, after implementation, the system will be shaped by the structure and the individuals of the organisation using the system. Case studies of ERP systems show that the systems may be perceived differently, or assigned different roles, by different actors in the organisation (Askenäs 2000). Depending on the configuration of the system and the organisational structure, different users may perceive the system as either flexible or controlling.

Our conclusions from this are twofold. Firstly, the certification of a computer system supporting local work development needs to embrace its technical configuration, its deployment and maintenance methods as well as its actual usage. Secondly, since the actual, situated use of a system at work is not an unproblematic phenomenon to interpret, it is important that users from several independent workplaces evaluate the system.

4.2.2. The interplay between IT support and work tasks

One important approach for the evaluation of work situations is built on theories mainly developed in Germany on human activity and the design of work tasks. These ‘action regulation theories’ describe the basic characteristics of human activity and derive from them a number of principles and criteria for designing work tasks (Hacker 1998). To analyse work tasks on the basis of these principles, a number of methods and instruments have been developed.

Regulation hindrances leading to negative mental load is measured with the RHIA-instrument (Leitner et al. 1983). Two different types of hindrances related to the work task are defined: ‘regulation barriers’, which stop or hinder the performing of a task and ‘capacity overtaxing’. The most well known of the methods based on action regulation theory is the VERA-instrument (Volpert et al. 1983). It is used to determine the ‘scope of action’ or the regulation requirements for a specific task, the degree to which a worker can make autonomous plans and decisions at the workplace. Still another instrument with the same theoretical background has been developed to give guidance when deciding which part of a work activity should be computerised and which should not. It is called the KABA-method (‘contrastive task analysis’) (Dunckel 1989).

These methods are of great value when identifying shortcomings in workers’ situation from a psychological point of view. They do not, however, give much support in identifying other problems concerning use and usability of computer support systems. Some of the conceptual framework and the findings provided by these methods have been influential in respect to the IT standardisation work mentioned earlier (specifically ISO 9241 and ISO 13407). The action regulating theories had also been important inspiration to some of the researchers in the ITQ team (e.g. Sandblad 1987). But in the ITQ project, they had to be combined with vocabularies and findings from the kind of organisational workplace studies presented above, from relevant findings from Participatory Design and standardisation studies, as well as from the pilot studies that provided current insights on quality problems and opportunities.

4.2.3. User experience of IT support as prime source for quality assessment

An important part of the methodology for assessment of workplace software quality was derived from management oriented Quality Award institutions like the Malcolm Baldrige Award and its Swedish counterpart, the Swedish Quality Award. These elaborate screenings of an organisation’s quality processes have much in common with the broad member questionnaires the trade union organisations traditionally have depended on for understanding membership opinions.
on a wide spectrum of issues. Thus it was not a coincidence that the methodological question of how to assess end-user experience of workplace software to a large part was answered by how the early membership surveys were performed in the UsersAward programme. It had been decided early on in the project that it was the experiences of real end-users that would provide the prime empirical source for assessing each software package that applied for a users’ certificate. Therefore, standardised questionnaires, combined with in-depth interviews and expert screenings, were the tools the certification procedure would depend on.

Time and cost constraints for the certification procedure forced assessment methods like participatory observation and in-depth expert evaluation to play a limited role in the actual certifications. It was the goal of the LO leadership that, if a viable procedure was to be developed, it should not be dependent on the participation of researchers. Rather, a consistent and well-documented process would require that the members of the team performing the certification would have a basic HCI education, a fair amount of professional experience in the field, and that they had attended a course for accreditation.

These were the research positions at the beginning of the ITQ project, the hypothesis – that both artefact and usage had to be assessed – and the practical constraints for the envisioned certification. The IT Map had revealed a list of urgent problems and the IT Prize, another of the supportive activities, highlighted many new opportunities. Both problems and opportunities were discussed with union members, in the user panel as well as on user conferences. Thus, the IT Map and IT Prize had supplied an initial list of quality aspects. It was the role of the pilot studies to investigate the relationships between these aspects and to provide additional examples and arguments to underpin a final list of quality criteria.

5. Pilot studies for criteria articulation

Six pilot studies were carried out in the ITQ project. The goal was to make the pilot studies action oriented. They should be carried out at workplaces with industrial partners that would ideally benefit directly from the studies. The studies should not run for more than nine months. By addressing concrete problems and possible solutions in a concise way, each study was geared towards providing insights that would help articulate quality criteria and identify reasonable levels of performance.

The first three studies presented were centred on new possibilities of simulation, information visualisation and mobile IT support, while the following three studies focused on problems in the deployment phase and problems of systems integration documented in the IT Map. Here we can only report the basic premise for each study, the context of workplace usage and the quality aspects investigated. The summary also gives a background to the effort to develop a shared knowledge base, personal contacts and a mutual understanding between union participants, management representatives, software suppliers and researchers.

5.1. Simulation and visualisation for daily planning (Arvika gingleri)

Operators and personnel in charge of daily planning at the Arvika foundry had envisioned a lightweight simulation technique to help control the daily flow of production. A 3-D visual requirement specification (see Figure 1) was developed and tested iteratively with workers from all teams involved. From this specification, an application was built in Taylor ED (Enterprise Dynamics), which was deployed in a step-by-step manner, successively adding new features that allowed for rapid feedback on alternative plans in the daily planning meeting. Among the problems encountered were the following: a fragmented layout of modelling objects and troubles with handling windows in the simulation package; instabilities in the exchange of data between simulation software and existing (standard) control software; and lack of standards for such data exchange and for object definitions.

At the Arvika foundry, interaction designer Robert Ferm was responsible for designing the 3-D visual requirement specification used to gather concrete demands on the simulation interface from operators. The operators came from four different stations along the line and the visualisation was used, together with supplementary performance requirements, as a blueprint for building the simulation in the simulation software environment. At the Sandviken steel plant in Sandviken, the same technique was used to engage 30 operators in the design “from scratch” of a control system for reporting production performance and interruption data. Here, the aim was to link existing logistics and software modules to the visual interface itself. Among the lessons confirmed from Arvika were that the operators took a great interest in co-designing the interface to their daily work tools, that a stylised 3-D visualisation of their environment helped this engagement considerably, and that the iterative design process helped balance system features. The study had an impact on our understanding of the following quality aspects: deployment motivation, user participation in deployment, overview of functionality, adaptability to other IT tools, overview of work tasks and supports exploration. The study is reported in Ilar et al. (2002).
5.2. Communication for systems overview
(Volvo Umeåverken)

TellUs, a popular and efficient program which helped operators supervise local production, had been developed in-house (Volvo Data AB) at the Volvo truck plant in Umeå. However, this software ‘exposed’ shortcomings and non-productive overlaps between other control systems. A web-based prototype, ITbryggan (IT-bridge), was built in the pilot project, which demonstrated, with maps and an integrated discussion forum, a support tool for workers’ overview and informal dialogues on ‘what IT systems supported what tasks’ in the workflow. The prototype re-used familiar patterns from the plant environment, such as providing visual navigation between systems by projecting the scope of their implementations on the familiar outline of the truck plant. The dialogues registered in the prototype became a ‘database’ of structured answers from 25 interviews about problems and possible solutions in terms of system integration. The study problematised the following: user participation in deployment, overview of functionality, adaptability to other IT tools, internal communication and feedback from users. The study is reported in Walldius et al. (2002).

5.3. Mobile access in care services (Nybro kommun)

One of the pilot studies concerned how IT support systems can be used to improve work efficiency and environment in the care of severely mentally handicapped persons. The objectives were to analyse how the support systems could improve possibilities for planning, documentation, communication, follow-up and evaluation in care delivery activities. The involved staff categories normally have very little experience of IT of any kind, so we had to investigate in detail what requirements must be fulfilled in order to develop usable and efficient support systems. They also have a very mobile work, so this pilot study had the special mission to investigate demands related to functionality and usability in mobile work situations.

The method used was based on cooperation between the researchers and an active working group with care delivery professionals. In a series of seminars the present work was described and analysed, ideas for new work procedures and detailed scenarios were developed and finally specifications for technical support systems were formulated. During the seminars, the working group could develop their insight step by step and was finally able to specify and evaluate requirements for both the new work procedures and the support systems. The results of this pilot study broadened our understanding of quality aspects such as overview of functionality, system access, system extends team authorisation, internal and external communication. The study is reported in Sandblad and Löfberg (2002).

5.4. Deployment methods for ERP systems (Intentia)

This pilot study focused on the deployment of an ERP system common in Swedish industry (Movex, Intentia), which includes a specific deployment methodology (Implex). The study comprised a survey, covering 205 users and managers in 33 companies, and two case studies within the engineering industry. The study showed that the deployment methods used by software
houses and related deployment consultants are of significant importance for the actual usage of ERP systems. This will not least affect the possibility to support decentralised work and workshop oriented information systems. The study clearly stressed the importance of involving end-users during the entire implementation process, particularly in the initial phases when the business processes are analysed and the basic configuration of the system is decided. This participation needs to be supported by an ambitious training strategy. The study also provided strong arguments for coordinating implementation of IT and organisational development into a common change process. In companies deploying such an integrated process, the ERP system is perceived to support work development and improve overall performance. The study, however, also revealed the fundamental conflict between the standardised business logic and processes codified in the ERP system and the customers' need for a system that supports the unique logic and organisation of the industry and the firm. The study gave an overview of current user satisfaction in respect to business, customer, and owner benefit of deployed system; deployment motivation, user participation in deployment and work process re-design; and feedback from users. The study is reported in Bengtsson and Ljungström (2001).

5.5. User experiences from deployment of large ERP systems (SAP)

In this study we focused on how the users perceived one of the most comprehensive implementations of SAP R/3 ever made in Sweden. The studied company was a pilot within the ABB group appointed to evaluate the entire system. Despite management providing top priority and massive training of personnel, the benefits were hard to find. The implementation had not led to further development of work processes, and some responsibility had even been centralised. The results were in line with previous experiences. For example, one study of ERP systems implemented in 24 Danish manufacturing enterprises shows that ERP systems potentially can be supportive for teamwork and decentralisation, but that this potential is exploited only in very few cases (Koch and Buhl 2001). One reason, confirmed in this pilot study, is that the ERP systems have facilities that may be configured to support teamwork, but comprehensive support for that kind of solution are lacking. Furthermore, the ERP providers as well as consultants implementing them do not use teamwork as a concept; thus, team-related demands are not considered during system configuration. However, an ERP system is not static, the perception and the use of the system changes over time, and these facts provide possibilities to further develop and re-configure the system in order to support work development. The study gave valuable insights into current user satisfaction regarding all the quality aspects investigated in pilot study 5.5. The interviews with users and management are reported in Walldius and Lind (2002).

5.6. New architectures for enterprise application integration

For this study, Paula Kökeritz at IVF, Industrial Research and Development Corporation, made a pre-study of the enterprise application integration (EAI) concept. A core problem addressed by EAI is the enterprise-based integration of old and new systems for efficient handling of information. The study found that EAI, at least in theory, offers good techniques for flexible integration of applications in an enterprise. The user can change or modify applications if certain boundary conditions are satisfied. Those conditions are set up during the implementation phase, depending on conditions found necessary for current and coming activities. It is a long way, though, to the full realisation of EAI within most enterprises. The needs of the activities must be matched with systems and information flows, into a general data model. This is a tedious or even an almost impossible task to complete in practice. Hence, many enterprises will just implement EAI for the most critical activities, which means that the users and the enterprises, so far, mainly have to rely on more pragmatic solutions to the integration problems. The EAI philosophy urges system providers to create systems that are open to integration with complementary IT support, e.g. simulation, production planning, personal administration, customer contacts and business follow-up. This provided important input on the project’s articulation of quality aspects regarding business, customer, and owner benefit of deployed system; user participation in deployment; and adaptability to other IT tools. The study is reported in Kökeritz et al. (2001).

5.7. Summary of findings in relation to the certification process

The six pilot studies summarised above, and the design of the certification process in which the studies resulted, represent the core of the research effort carried out during the ITQ project. In parallel with these studies, the research team also took part in the visits to the nominees of the yearly IT Prize contest. Here the IT Map questionnaire was used to assess user satisfaction at each nominated workplace and, subsequently, to provide the jury with a screening of each nominee. The
use of this questionnaire 2000, 2001, and 2002, in interviews with users and management, gave the research team an ongoing feedback on the topics dealt with in the pilot studies and on the quality criteria. As will be detailed in the next section, the quality criteria are presented in six groups: total benefit, deployment process, technical design, support for work tasks, support for communication and cooperation, and quality assurance. Important findings concerned the criteria under the heading deployment process, which focuses on the level of user involvement and the degree to which a system can be adapted to the local processes for work, communication and cooperation.

5.7.1. The decisive importance of the deployment process
The pilot studies focusing on simulation and visualisation (5.1–4) showed that:

- a strong engagement from the users could lead to a shift of focus in the deployment process, from the IT tool as such to issues of process understanding and production techniques.
- by giving the users access to an experienced interaction designer who could represent their view of relevant production processes in an expressive and accurate way, the deployment phase could be shortened and the user understanding of the role of the IT support could be heightened.

The studies focusing on the deployment process as such (5.5–6) all underlined the importance of putting considerable efforts into involving the users in all the implementation activities, including ‘system positioning’, i.e. system adaptation to the actual enterprise, and appropriate training to support the ongoing development of the system use. Thus, there is an urgent need for well-thought-out training strategies as a vital part of the deployment process.

- Education and training is perhaps the single most important quality criterion during deployment.
  The buying organisations seem to have to bear too much of a responsibility for this quality aspect. There is a lack of adequate support for competence development of the users as a creative part of the system deployment.
- The importance of education and training in turn shows the need for some kind of quality assurance for all personnel responsible for competence development linked to the deployment process.

These findings are well in line with the basic hypothesis of the project that each certification had to assess both the software artefact as such and its situated usage. As shown below, the certifications that have been carried out to date provide additional insights on this basic principle.

6. User Certified 2002: rationale, procedure and criteria

6.1. Rationale
The quality aspects deemed relevant to assess apply to both the software as artefact and the method in which the software has been deployed and maintained in the client organisation. Hence, the aim of the set of criteria is that it should embrace both tangible characteristics of the software package and its associated documentation (declared design principles, principles for deployment, functionality, cost, documented efficiency measures, support management, etc.) as well as end-user experience of how well the software provider has managed to live up to the declared levels of performance.

6.2. Procedure
A software provider who has applied for certification of a certain software package is asked to fill out a self-declaration regarding the package and its intended use. In this declaration, the provider suggests three workplaces at which the use of the package can be assessed. After that, the evaluator team carries out interviews and questionnaires at the three workplaces.

In the interviews and questionnaire, each criterion of the defined set of 29 quality criteria (seven additional criteria in the management version) is presented in the form of a statement to be confirmed on a value scale between 1 (total dismissal) and 6 (total agreement). The assessment is done on the three workplaces, out of which at least two workplaces have to qualify to the stipulated level (Figure 2). At each workplace, three end-users are interviewed and asked (1) to judge the statements in the questionnaire with a value between 1 and 6, and (2) to give a short motivation to their level of agreement. Then at least three representatives from management are interviewed in the same way. (All interviews are sound-recorded.) These interviews are then accompanied by a questionnaire to a panel made up of 10% (at least 10 persons) of the end-users at the worksite.

The next step of the certification process is a hearing, conducted by the UsersAward evaluators, in which the software provider answers the evaluators’ questions about user problems encountered at the three workplaces. Based on all this information, the evaluation team makes the evaluation and assessment in cooperation with the researchers from CID/KTH who verify the interpretation of the results.

The users are considered satisfied as a whole when at least two of the investigated workplaces meet the
following levels of confirmed criteria statements in the questionnaires.

- A mean value of at least 4.0 on 80% of the statements for all users.
- A mean value of at least 4.0 on 67% of the statements for each user category.
- A mean value of at least 4.0 on 67% of the statements for both men and women.

The criteria on user categories and gender are applicable only if there are at least five users in each group.

A successful certification ends with the writing of a certification protocol in which quantitative results as well as qualitative information, in terms of quotes from users and comments from the evaluation team, are presented.

6.3. Criteria

(1) **Total benefit**: 1.1 Business benefit, 1.2 Customer benefit, 1.3 Owner benefit

Summary: the benefit of the deployed IT support is satisfactory from the point of view of better quality, higher productivity, development of competence; for customers and clients; and for owners.

(2) **Deployment process**: 2.1 Deployment motivation, 2.2 User participation in deployment, 2.3 User participation in work process redesign, 2.4 Training, 2.5 Competence development, 2.6 Enterprise application integration, 2.7 Deployment time plan, 2.8 Deployment user–procurer–supplier cooperation, 2.9 Human resource allocation.

Summary: the IT support is deployed from a clear rationale, taking the users’ ideas into account in an active process, giving the users adequate training and possibilities for competence development.

(3) **Technical design**: 3.1 Overview of functionality, 3.2 Flexibility and robustness, 3.3 Trust in the system, 3.4 Security, 3.5 Personalisation, 3.6 Help facilities, 3.7 Redo facilities, 3.8 Adaptability to other IT tools, 3.9 Access to system information, 3.10 System access for registration.

Summary: the IT support provides good overview, flexibility, adaptability, integrity, help, undo/redo and access of information.

(4) **Support for work tasks**: 4.1 Overview of work tasks, 4.2 Task support, 4.3 Engaging to use, 4.4 Stress reduction, 4.5 Supports exploration, 4.6 Supports follow-up of work.

Summary: the IT support provides good overview of work tasks, means for testing alternatives and doing follow-up, is engaging, and reduces (or at least does not increase) stress.

(5) **Support for communication and cooperation**: 5.1 Extends individual authorisation, 5.2 Extends team authorisation, 5.3 Internal communication, 5.4 External communication with suppliers, 5.5 External communication with customers.
Summary: the IT support helps to enhance the individual’s and the team’s levels of authority and independence, the level of cooperation in and between teams, with other parts of the organisation, and with suppliers, customers, and clients.

(6) Quality assurance: 6.1 Feedback from users, 6.2 User re-adaptation support materials, 6.3 Supplier self-declaration conformance

Summary: there is a continuous feedback of user needs to the relevant support organisation.

7. Outcome and discussion

It was obvious from the start of the ITQ project that research efforts aimed at developing a certification method for workplace software would have to take into account the strong and conflicting stakeholder interests of the domain. Although the articulation of common overlapping values was not a formal ambition in the early stage of the project, we now find that a preliminary identification of stakeholder interests is an important task when presenting and discussing the outcome of the project. Hence, we will first briefly report the outcome of the project in relation to how it was received by end-users, buying organisations, software suppliers and trade unions and then discuss possible contributions of the project from the point of view of the participatory design tradition.

7.1. Outcome of the certification programme and stakeholder response

In 2002, two certifications were performed to assess the viability of the method that is now given the name User Certified 2002. One time scheduling software, TimeCare (Time Care AB), passed the tests in May–June at a department store in central Stockholm (Åhlens Odenplan) and at an emergency clinic at a hospital in Dalarna (Falu Lasarett), some 300 km north of Stockholm. The second software package to receive the User Certified 2002 certificate was an ERP package, Monitor (Monitor AB), designed for small and medium-sized manufacturing firms. It passed the tests in November–December, at a manufacturer of electromechanical equipment (Mekanotjänst AB in Järvsö) and at a firm producing hydraulic equipment (Stacke Hydraulik AB in Skillingaryd).

Both these software packages had earlier been nominated by users for the UsersAward IT Prize. Time Care became the winner of the 2000 contest and Monitor reached the final round in the 2002 contest. This fact confirmed one of the initial ideas behind the IT Prize contest, that it could work as a ‘rehearsal’ for software providers who were confident about the satisfaction of their customers, but who wanted a more comprehensive documentation of how actual users received their software during its critical deployment process (Lind and Walldius 2001). In terms of the interplay between the IT Prize contest and the certification, both Time Care and Monitor also reported definite rise in sales, first from the publicity around the contest, then continued positive customer response from the successful user certification.

A third software package, Take Care, a medical record system developed by Profdoc Care AB, passed the certification in March 2005. To conclude the account of the essential practical outcomes of the project, it should be noted that LO and VINNOVA agreed to finance a continued development work based on the ITQ project for the period 2003–2007, to be led by the newly formed development company UsersAward AB, owned by LO, in cooperation with TCO and KTH.

7.1.1. End-user response

End-users at the assessed workplaces judged the method as relevant and well worth engaging in. In all six workplace assessments carried out as part of certifications, and in all the more than 30 workplaces visited as part of the IT Prize contest, end-users and management found the criteria, the questionnaires, and the investigation procedure fair and comprehensive enough to reflect their experiences of problems related to IT usage, overall work environment and learning. On almost all these occasions, the interviews engaged the participants for longer than the planned 60 minute and the questionnaires handed out to the sampled users further added to a data set that both confirmed recurrent problems and made local conditions stand out. This wealth of qualitative data on situated software usage was important since the resulting protocol should not only report the fact that the software package had passed the test. The goal was to attain a sufficient richness of detail by letting the spoken words of end-users resound to fellow end-users at the sites of new potential buyers.

7.1.2. Response from the buying organisations

If a reception marked by strong engagement resulting in expressive situated data about IT usage, work context and learning is accepted as a viable sign that the certification measured up to the interests of the end-users, then a corresponding claim can be made in relation to the buying organisation as stakeholder. In all interviews with management, and in virtually all contacts with management representatives before and
after the assessments, the participants showed the same strong overall engagement. Other signs to the same effect were the willingness of management to involve a substantial part of the personnel in the assessment process and the interest shown by management for the results of the workplace assessments.

7.1.3. Response from software suppliers

With respect to software suppliers as stakeholders, the challenging question was whether individual suppliers would apply for the User Certified 2002 certificate and, provided that they passed the test, whether they would use it in advertisements and PR materials. As noted above, this turned out to be the case, both for the two initial packages certified in 2002 and for the third package, certified in 2005. These acts of actively applying for and then systematically using the certificate in marketing assures us that software suppliers have indeed seen the certification as a means of strengthening their competitive advantage. Thus, we have succeeded in finding an area where the interests of software suppliers overlap with the interests of end-users and buying organisations. A further indication of this effect is the active promotion of the UsersAward certificate done by IT Företagen, the major national industrial organisation for IT suppliers, in connection with the finals of the IT Prize contest in 2003. Its smaller affiliate, SPI2000 (Håkansson 2000), responsible for quality issues and initiator of a quality self-declaration procedure based on ISO standards, has also shown an active and positive interest in the certification process. However, the limited amount of software suppliers that have applied for the test to this date is a clear sign that the process has to be further developed in order to bring it within reach of many more suppliers in Sweden and abroad.

7.1.4. Response from trade unions

The fact that LO has taken on the responsibility to finance the bulk of development work needed to establish the User Certified programme through UsersAward AB is a clear signal that LO now regards the IT tools as a crucial element of influence, in order to improve work environment and lifelong learning. The motives behind the LO strategy have been clearly declared by Wanja Lundby-Wedin, the chairman of LO, in her annual greetings to the finalists of the IT Prize contest. Wanja Lundby-Wedin has also accepted to chair the Board of Directors of the development company UsersAward AB, in which TCO is also represented.

That the interest in engaging in IT quality issues goes beyond the central organisations LO and TCO is clearly shown by the active participation of five industrial unions in the IT Map survey and the participation of five health care unions in the subsequent Health Care IT Map (Vård-IT-kartan; Lind et al. 2004).

7.1.5. Response from society at large

In terms of meeting the interests of society at large, beyond possibly contributing to productivity and work environment in buying organisations, we see VINNO-VA’s decision to co-sponsor the newly formed development company and to finance a follow-up of the certification research as a positive indication.

7.1.6. Need for further research on stakeholder response

It is important to underline that our claims above, that the certification method has met some key overlapping interests of end-users, buying organisations, and software suppliers, in no way implies that the certifications could prove that the deployed software packages measure up to those interests, beyond what is shown in each certification protocol. What we do claim is that we have significant indications that the certification process has matched some of the important stakeholder interests. Important questions remain for investigation: for example, in what respect the productivity has indeed increased as much as testified by management; whether this increase indeed can be ascribed to the quality of the certified software; and whether this increase indeed is sustainable. Our task has been to develop the certification method and to produce transparent data which other researchers, with other methodologies, in their turn can evaluate. The three certification protocols, in Swedish, are accessible at the UsersAward AB website, http://www.usersaward.se.

7.2. A life cycle perspective on user participation

7.2.1. Certifying software as artefact and process

Most previous experience of involving workplace users in IT development, including the cooperative/participatory design practice, has focused on the design and software development phases (Bedker et al. 1987, 2000). The experience described here highlights the importance of also strongly involving the users and their organisations in the processes of deployment, ongoing development and maintenance (including support and evaluation efforts) of the IT support.

It may be argued that it was the inheritance of the TCO model, which centred on quality aspects of
existing, standard products with a well-defined research focus on ergonomic, energy, and environmental effects of computer screens, that helped widen the scope of research of the ITQ project. However, the complex process aspects of software deployment and usage required an even broader involvement of end-users in order to establish a viable set of quality criteria and levels of acceptance.

The certification procedure was designed to cover both artefact aspects (in the supplier’s self-declaration and in the questionnaire’s statements on technology) and process aspects (in the rest of the questionnaire statements and in some sections of the supplier self-declaration). Standardised questionnaires were combined with interviews and the role of the experts in the evaluation group was focused on performing the assessments and the hearing with the supplier and to report the assessment in figures, graphs, quotes and comments in the final protocol. The concluding section of the protocol was reserved for the evaluation team to comment on the match between the declared qualities of the software support (in the supplier self-declaration) and the end-users’ experience of that support, as expressed in the questionnaires and interviews. Important questions that relate directly to the certification procedure and its ability to cover the process aspects of software are the following: to what extent the chosen level for acceptance was deemed fair and balanced by the stakeholders; the general compliance of the certification process with current ISO standards; and its adaptability for covering the even greater process complexity in which the software of tomorrow will be entangled.

One indication that the set of criteria, and the level for passing the test, were relevant and well tuned to end-user demands was that in all three certifications performed, one out of the three workplaces did not accept the investigated software. This track-record of the certification process, that it in all cases accepted only two out of the three deployments the software suppliers had deemed exemplary is, in our view, a good sign for the future. It indicates that the set of criteria are indeed sensitive for the dynamic process aspects of software deployment. In all three cases of non-acceptance, low user satisfaction rates related to the deployment phase were crucial for the outcome.

Another lesson learned from the certification work is that only three software suppliers have ventured to apply for the certificate. This implies that the overall requirements of the certification are too demanding to have any substantial influence on the Swedish design, development and use of software. Thus, one of the most important challenges in the development of the next User Certified version (scheduled for 2006) is that the overall requirements shall be moderated in such a way that more suppliers will choose to apply.

An obvious issue for debate has been, and will continue to be, the choice of a level of 80% accepted criteria on two of the three deployments for passing the certification. The principle to require two successful deployments was derived from the certification programme for Internet usage, designed and carried out by the Internet Engineering Task Force (IETF). Judging from the tremendous scalability of the Internet software infrastructure, it seems as if this simple formula has managed to strike a fair balance between general accessibility for software suppliers and high quality standards. Much the same argument can be made about the balance, and pedagogic simplicity, of setting a standard of 80% acceptance, rather than a more relaxed 67% or a more rigid 90% acceptance (corresponding to accepting two rejections out of 10, rather than three or one). Although the reluctance of software suppliers to apply for the User Certified certificate points towards a lowering of the acceptance level, we are inclined to think that this moderation should not be done in the formal levels of acceptance but in a clearer framing of what kind of software deployment and use each certification actually measures.

The screening and re-use of the ISO 9241 and the ISO 13407 standards confirmed the soundness of the interactional approach to IT quality assessments, that software has to be investigated in its situated context of use and that both artefact and process aspects have to be covered. An even more elaborate stance regarding measuring process performance in relation to impact on stakeholder values during the full software life cycle is taken in the newly agreed standard ISO/TR 18529:2000 (Ergonomics. Ergonomics of human–system interaction – Human-centred life cycle process descriptions (International Organization for Standardization 2004)). What is particularly interesting with the principles informing that standard is that they to a large extent coincide with the principles informing the value sensitive design (VSD) approach, an approach proposed by Batya Friedman and applied for example in the design of large public IT installations with demanding exposures to a broad spectrum of strongly held stakeholder interests (Friedman et al. 2002).

The VSD focus on stakeholder values and their key role for matching user contexts with appropriate technological solutions makes it a promising method for informing the necessary modifications in the upcoming User Certified (UC) 2006 version (Walldius et al. 2005). Our hypothesis today is that the VSD method can help to make the UC 2006 more accessible for software suppliers through a clearer definition, in the supplier self-declaration and in the (adaptable) questionnaire, of what kind of software – in terms of its supported activities, users and outcomes – can apply for the certificate. The idea is that software
suppliers who have a good contact with their end-users should be able to declare the services they can provide in a precise way, thus avoiding the risk of over- or under-promising in the self-declaration. In this way, the self-declaration will become ‘a flexible, transparent and readily testable yardstick’ against which different kinds of software can be measured on their own terms and merits.

Questions on analytical ambitions are highly relevant for the design of any certification procedure. It is important, though, to note that the ambition of UC 2002 does not go further than identifying a set of criteria that, for pedagogic but not for analytical reasons, have been grouped together into what we have termed ‘criteria areas’. This means that the criteria are not aggregated to ‘factors’ as in many assessments procedures building on ISO standards (e.g. Prümper 1999). Although the intention of grouping criteria into areas was not analytical, a first analysis of the overlap between the UC 2002 and the ISONORM assessment processes shows that most of the areas in fact have a sufficient internal co-variance that makes the potential analytical use of UC 2002 wider than expected (Prümper et al. 2005). Our own analysis of co-variance measures of larger questionnaire samples confirm this study (Bengtsson 2005). Another indication is a brief study of the outcome of the questionnaires for the IT Prize which confirms that the 80% level is a pragmatic division point between finalists and non-finalists (Sundblad 2005). Thus, while the analytical ambitions remain low in relation to, for example, ISONORM and similar methods, screenings and comparative experiments from other research groups should provide a successively larger common ground, also in respect to analytical uses of UC 2006.

Both end-users and software suppliers will have to deal with ‘standard ERP systems’ that become more and more modular and that require an increasing amount of localisation measures in the form of, for example, parametric tuning. How should the self-declaration part of the certification be structured so that end-users and procurers can determine to what kind of situated use such packages can be put? And what role will deployment consultants play in coming years? Will their understanding of how to localise and fine-tune tools determine the outcome to a greater extent than the software as such? If so, how would a corresponding user-driven certification programme for deployment consultants have to be designed? To turn the question of modularisation yet another turn, if the advocates for end-user programming are right, i.e. if more and more of the customising and adaptation work will depend on end-users having to do most of the tailoring themselves, how will quality assurance have to respond to such a situation (see, for example, Letondal 2004)? These are some of the intriguing questions that will be raised in the near future. As part of the follow-up work, besides taking part in user activities, certifications, and upgrading to a new version, the research group has followed two additional lines of study, standardisation and public procurement, which are relevant for the above questions.

7.2.2. The certification in relation to standardisation and public procurement

International standards provide an opportunity for increasing consistency in the information technology systems that are being developed. One of the major players in international standardisation for ergonomics and human factors is the International Organization for Standardization. The hallmark of the ISO brand is that standards are developed on equal footing, voluntary, market-driven, consensus-decided and with a worldwide reach. This means that it is not sufficient with a user need for a standard for it to be developed – there must be a market for the development of such a standard. This means that no matter how urgent and important specific recommendations might be, if there are no advocates for such guidance from the market, it will not make it to the standards in the end.

During the development of the UsersAward certification process, we analysed its compliance with international standards within software ergonomics (ISO 9241:10–17) multimedia user interfaces (ISO 14915) and accessibility of human–computer interfaces (ISO 16071). All of these standards have in common that they provide product-specific guidelines for ergonomic design of user interfaces.

In addition to these product-specific guidelines, the development of the UsersAward certification programme revealed a need for focusing more on the processes within which systems are designed, developed and introduced into the work setting. Hence the UsersAward certification process has been developed to encompass process-oriented guidelines that assure a user-centred deployment and use process. The major standards work to relate to is ISO 13407 on human-centred design and ISO 18529 that provides means for assessing processes in respect to all stakeholder interests involved during the full life cycle span of the system under consideration.

Even though the standards provide valuable input to the certification, it is virtually impossible to have a set of guidelines that fully cover all quality aspects that the certification process would want to encompass. It is possible for a software product to fully comply with the relevant ISO standards and still not adequately support an efficient and healthy work situation in a
given context. In addition to that, guidance has been defined within a specific context and therefore its general applicability must always be challenged. Also the process of developing and refining international standards is tedious and time consuming and does therefore not provide the support that is needed for a certification process that requires a swift and ongoing adaptation to the rapidly changing conditions of technology and work.

For the future it will be interesting to investigate the potential in the development of ISO 20282 on ‘ Ease of operation of everyday products’ that has the explicit goal of providing means for measuring and comparing the usability between different deliveries of a system or comparing two systems relating to one another (International Organization for Standardization 2005). The UsersAward research group has followed the new initiatives taken within the standards community and arranged seminars and workshops on the possibility of aligning the certification with existing and upcoming standards. Such aligning efforts concern both the ‘issuing part’, i.e. the extent to which the User Certified certificate complies with different standards, and the ‘receiving part’, i.e. the way in which the certificate is used proactively in procurement processes, by individual buying organisations and in public procurement agreements. With regard to the latter, the research group has taken part in adapting the self-declaration component of the certification to the process of public procurement negotiations. Today, this work has resulted in the inclusion of usability criteria in five public procurement agreements, criteria which build on the self-declaration part of User Certified 2002 and which apply the situated use perspective integral to the certificate. This is also the beginning of a parallel development to that of the public use of the TCO’92 certificate, a fact that is further discussed in Thorén (2006).

7.2.3. The need for interdisciplinary worklife
IT research

The research patterns we have discussed amount to a re-emphasis of the evaluation phase, which was an integral element of the original cooperative design approach as performed in, for example, the Demos, Daisy and Utopia projects (Bodker et al. 1987, Sandblad 1987, Sandberg et al. 1992). It is no coincidence that in all those projects there was an institutional manifestation of the interdisciplinary cooperation between worklife studies and HCI research. The UsersAward research group again exemplifies this institutional link, through the participation of the Department of Industrial Economics in Gävle and through the earlier involvement in cooperation with worklife research at both the KTH and the Uppsala HCI departments. It is the ambition of the group to strengthen these links and to promote research on design, development, and use of ICT as central subjects for worklife studies.

One possible strategy to re-establish the link between HCI and worklife studies is to work for a deeper integration of ICT quality issues in the regular health inspection and quality management work done at enterprises, public agencies, clinics and organisations. Such research could explicitly aim to support work environment inspectors, usability professionals, ICT managers, procurers, and user organisations in their efforts to demonstrate the key role of ICT support in the overall quality management. The benefits for the HCI field would be the opportunity to validate new usability strategies proposed for procurers (Artman 2002, Markensten 2003) and new methods for software deployment, integration, and maintenance (Brödner 2006, Floegel et al. 2006, Taxén 2006). The benefits for the quality managers and personnel would be to get a better access to a broad spectrum of research from ICT design and deployment projects.

The new ICT work tools have a potential for human exploration and communication that virtually no earlier family of work tools have been close to. This potential enables an employee participation in the design and deployment of new tools and new organisational solutions that in turn can provide for healthier work environments. But outside the field of HCI studies, the workplace use of information technology is still mainly seen as a technical matter, focusing on derived criteria such as efficiency and productivity. Consequently, the role of ‘the human factor’ as studied in non-HCI-informed worklife research, is mostly that of the victim – victim of reduced work content, monotonous work situations, negative stress, musculoskeletal injuries, or unemployment. The HCI field has not managed to complement that image with the image of the user as a sensitive and inventive social agent who, given the right resources, can organise and change her own working conditions for the better. The need for the HCI field to combine its resources and demonstrate the reach of its applied knowledge has recently been expressed by prominent researchers (Seffah and Metzker 2004, Shapiro 2005). The authors of this article fully subscribe to these calls for broad, practical demonstrations of how HCI tools and methods can contribute to a better working life.

To make health aspects of good, and bad, work tools stand out more clearly is not the only challenge for broad ICT quality initiatives. To make the economic opportunities, and risks, more visible is another important challenge. It has been shown by Brynjolfsson and Hitt (1998), and further discussed by
Brödner (1999), that the actual costs for the information technology as such is marginal in comparison to the resources employed for adapting it to its local situatuse use by involving management and end-users. Furthermore, when successfully adapted, the gains in efficiency and overall productivity depend less on the overall technical capacity than on how well the IT tool supports the communication between the people who realise the new organisational concepts and new, more efficient ways of working. To integrate this kind of critical economic analysis into HCI research will help to pave the way for the acceptance of proactive ICT quality frameworks on a broader scale.

8. Conclusions

8.1. Conclusion regarding the certification process

In terms of theoretical conclusions from the practical assessments of the certification process, the results support our basic premise and findings from the pilot studies about the intimate relationship between technology and organisation. Our first conclusion concerning the certification process is thus the following: in order to support employee participation in work development the certification process needs to focus on three things: (a) the built-in features of the software, (b) the deployment process as an ongoing re-design effort, and (c) the actual situated usage of the computer system. To include the deployment process and the actual situated usage is absolutely crucial. We have learnt that workplace software may be configured and used to support teamwork, but this option or potential is all too often not systematically evaluated by the providers or consultants implementing the software.

A second conclusion, confirmed by three certification processes, is that the buying organisation has to form integrative processes in which the organisational development and the implementation of IT systems are co-ordinated. The buying company needs independent competencies in order to discern which are the critical processes to preserve and enhance (Artman 2002, Brödner 2006). When external consultants are employed to implement workplace software, this analysis is often standardised according to design paradigms that may not fit the client. Our findings also emphasise the importance of forming a training strategy that supports users’ involvement in both the deployment process and in the ongoing re-design, maintenance and upgrading of the deployed system.

8.2. Contributions to the Scandinavian IT design tradition

The initiative to start a joint research and development project came from a strong user organisation, LO, a confederation of 16 trade unions representing more than two million workers. Earlier initiatives have been more focused on issues within specific branches of industry, such as the Utopia project which was initiated by the Nordic graphic workers’ union. With the broader scope of the UsersAward network, the potential for mobilising members across branches, and even across national borders, has increased. This provides the research group with a strong motivation to engage fellow researchers, nationally as well as internationally, in a long-term, interdisciplinary exchange. As the user organisation has now made a strong commitment to cooperate with German, Austrian and Danish counterparts, it is important that a similar international network of research exchange is formed in order to support the joint research and development process of the UsersAward network.

The LO initiative was prepared through studies that surveyed member priorities in respect to the need for concrete ICT policies. This resulted in a very ambitious proposal for the joint research and development effort that, from the start, had an international scope through its name, UsersAward. Thus, the goal of the project, to institute a process for user-driven software certification, was inherited from the TCO hardware certification, but the means for reaching that goal involved a series of new elements that had not been tried before in this area.

The forming of a user panel of experienced workers which met bimonthly to advice and help direct the project was one of the new elements in the UsersAward project. Another new element of the R&D process was the organisation of five regional user conferences that summoned local trade union representatives and end-users to exchange experiences; software vendors to promote their innovative and useful packages; and researchers to report their research findings and learning from the discussions. A complementary mechanism for grounding the project in a broad user movement was established through user satisfaction surveys, the IT Maps, carried out by LO and its member unions.

Another innovative element was the organisation of the yearly Users’ IT Prize Contest which has a value in itself as provider of ‘good examples’ and also proved to work as planned in the project design, as a ‘rehearsal’ for user-oriented software suppliers who would get inspired, after having made it to the final round in the IT Prize contest, to try to qualify for the ultimate users’ award, the much more demanding certificate ‘User Certified’. The two first packages to get certified had both qualified to the IT Prize finals, Time Care in 2000 and Monitor in 2002.

We have seen that work environment problems, such as stress and musculoskeletal disorders caused by
monotonous IT-supported work, is becoming more and more common in today’s working life (Kira 2003). Especially problems related to high demands in combination with low possibilities for self-direction and low social support can cause severe stress and health problems (Karasek and Theorell 1990). Here it is important to prevent a negative development caused by badly designed IT systems. Although the UsersAward certification is not primarily aimed at solving such problems it is our belief that it can contribute to heighten the awareness of the interdependencies between low-quality IT support, monotonous work, and bad health.

It is also our belief that a certification according to the UsersAward criteria in due time can contribute to improved quality in software used in work settings. Therefore, it is very important in our future research to continuously follow and evaluate how well the UsersAward certification process lives up to its objectives and if it can lead to a positive trend concerning work-related IT support systems. It is on our research agenda to follow the process and especially study the validity of the selected criteria, the methodological quality of the certification process and the impact of the certification on the quality of available IT support systems used in professional settings.

8.3. Further development: the international perspective

We have discussed the coming challenges involved in introducing the User Certified 2002 certification programme, and the 2006 upgrade, in the marketplace on a sufficiently broad international scale. In our conclusions, we also point to the necessity of establishing a sustainable international research network that can facilitate the processes of national adaptation and introduction to national user organisations and software providers. We have emphasised that such a network will have to mobilise researchers from both working life studies and from HCI and its related disciplines.

This first comprehensive account of the ITQ project and the UsersAward network can be read as an invitation to all researchers who share the underlying values, to participate in the forming of this international network. Reports on new certified software, on upgrades and adaptations of User Certified 2002, as well as on studies that problematise and/or deepen the scientific foundation of the programme, are reported in the traditional channels of the scientific community, i.e., at conferences, in journals, and at the websites of the universities that participate in the network (e.g., http://cid.nada.kth.se/en/ao/ao_ua.html). The coordinating organisation, UsersAward AB, has recently expanded their website (http://www.usersaward.se) and taken the necessary steps for helping to launch corresponding national sites in other countries, all with their own areas dedicated to the publication and exchange of national and international research. A first international research workshop, User-driven IT Design and Quality Assurance, UITQ 2005, was arranged in Stockholm, 24–25 May 2005. This event produced important input to the network’s future quality assurance research, including the evaluation of a first international version of User Certified 2002 (Prümper et al. 2005). A second workshop is scheduled for the Work With Computing System 2007 Conference, WWCS 2007, to be held in Stockholm in May 2007 (http://www.wwcs2007.se/).

We hope that a joint effort of user organisations, researchers and competitive software providers, so successfully pioneered in the TCO certification programme, can be replicated on an international scale within the coming two years. Here we report the work done in Sweden in such a way that user organisations and researchers will not have to start from scratch in new research and networking processes. The extent to which the article provokes written and verbal feedback will show how well we have succeeded in this task.

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Note

1. Criteria in italics are only included in the interview/questionnaire to management.

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