When Enterprise Resource Planning Needs Software Ergonomics –

Some Typical Scenarios

Jörn Hurtienne*, Jochen Prümper+, Matthias Rötting*
* Chair of Human-Machine Systems, Technische Universität Berlin
+ Business and Organizational Psychology, HTW Berlin

In companies, Enterprise Resource Planning (ERP) software supports the integration of all facets of business management, including planning, manufacturing, human resources, sales, and marketing. Although ERP software promises great benefits to ERP-deploying companies, its full potential in terms of productivity is not exploited well. Several reasons account for this, among them is the reluctance to invest in software-ergonomic measures that depart from standard implementations. Further reasons include a lack of specific usability management methodologies and a lack of knowledge about applying these methodologies. We propose a bundle of measures that could alleviate the situation: (1) A focus on scenarios that offer low-risk environments for integrating software-ergonomics into an ERP implementation project. (2) The development of methodologies that integrate usability management with standard ERP software implementation processes. (3) The dissemination of software-ergonomic knowledge and methodologies, as well as education. All three measures are discussed using the example of SAP-software implementation projects.

ENTERPRISE RESOURCE PLANNING AND SOFTWARE ERGONOMICS

In companies, Enterprise Resource Planning (ERP) integrates all facets of business management, including planning, manufacturing, human resources, sales, and marketing. This integration is usually done using ERP software tools that have access to a common database. Typically, the advantages of applying ERP software are

- better transparency of business processes, of costs and revenues through integrated and continually updated information,
- efficient planning in real time that means a better exploitation of resources, e.g. of the sales force,
- higher speed and efficiency of business processes, e.g. shorter response times of the customer service or shorter order lead times,
- enlarged functionality and automatisation of data processing,
- reduced costs of system administration through a standardised system landscape, and
- reduced administrative effort through working with efficient functionality and without media breaks or redundant data entry.

Customer success stories, however, rarely mention "software-ergonomics", "usability" or "employee satisfaction" as the results of an ERP software implementation.

One of the big players in the market of ERP software is the SAP AG. Worldwide there are more than 120,000 installations of SAP solutions and more than 12 million people use SAP software. Although usually referred to as standard software, companies cannot expect to simply install a SAP system and be ready to use it. As usual with ERP software, SAP software first has to be customised to the structures and the processes in the company. This customisation process can take up to two and more years to be completed. Not always does this result in good software ergonomics. Often SAP software implementations are not as efficient, effective and satisfying to use as would be possible (cf. Hurtienne, Abele & Prümper, 2007). Some examples include:

- 80% of SAP clients express disappointment in the benefits attained, the measurability of benefits and the competency of users (Doane, 2004).
- One fifth of implementation projects are cancelled before implementation. In 40% of the completed projects companies indicated that they did not reach their goals within a year's time (Kohnke, 2005).
- Users of ERP software of smaller vendors are often more satisfied than users of SAP software. A frequent and consistent wish of users is that the software should be more flexible and user-friendly (cf. Bayer, 2006; Niemann, 2006).
- The software-ergonomic quality of the same package varies broadly between companies – indicating different degrees of (mis-)match between SAP-software and the business processes to be solved with it (Hurtienne, Prümper, & Linz, 2002).

How is it possible that projects that implement the same software sometimes end as a success story and sometimes result in a failure? Whether a software project is implemented successfully or not depends in large parts on the role of user participation and usability during the implementation process. This is in contrast to a pure business and technological understanding of project management. To avoid unproductive, error-prone and dissatisfying work the specifics of the company, the users, and the working situation need to be taken

into account. Adapting software through a systematic process of usability management can help to provide users with an efficient and easy-to-use SAP solution (Abele, Hurtienne, & Prümper, 2007).

Current discussions about the "productivity paradox" (Brödner, 2002) show that investments in hard- and software do not suffice *per se*. Whether ERP software is used productively depends on how the software is implemented. The question is not so much *whether* investments in ERP software pay off, but *how* ERP software is used in the best way that a company's investments are profitable.

Software ergonomics is often considered as the fit between the user, the task, and the software within an organisational environment (figure 1). An optimal fit can be achieved by modifying each of these aspects. Common to all three is their focus on the "human factor" in software implementation projects. Thus, one can alter (1) the work tasks and the organisational environment, i.e. adapting the business processes to the software. This approach is usually necessary during SAP implementation projects and is called organisational change management (Doppler & Lauterburg, 2005; Galoppin & Caems, 2007; Kohnke & Bungard, 2005). (2) The software-ergonomic fit can be established via user training. User training is often part of the change management effort as users do not only have to be trained in operating the new software but also in understanding new business processes (Scherer & Schaffner, 2003). (3) Usually, the core field of software ergonomics and usability management, the third alternative is changing and adapting the software to the users and their tasks through a process called customisation.

The first two options for achieving software ergonomics, i.e. organisational change management and user training, have often been identified as being critical for subsequent productivity rises (cf. Brynjolfsson, 2003). Changes in the software, however, are usually discouraged. This is in spite of the evidence of the success of usability measures. The cost-benefit ratio of applying usability methods can easily reach 1:100 (Karat, 1994). Just by streamlining data entry processes in a business administration system, user productivity can be doubled (Hurtienne & Prümper, 2007a, case study 1). Users also will make fewer errors and less time will be spent on error recovery (Marcus, 2005). A usable system also reduces the costs for training and documentation. Case studies report 35% reduction in training and 30% reduction in supervisory time (Dray & Karat, 1994). Usability of a product can also lead to dramatically dropping time and number of support calls at helpdesks (Ehrlich & Rohn, 1994). A usable system also prevents accidents and injury (Mauro, 2005). Employees working with software rated low in usability have a three times larger probability for emotional and cognitive strain; and they are also more apt to report psychosomatic complaints (Hurtienne & Prümper, 2003).

If there are so many benefits of software-ergonomic activities, why are they rarely employed in ERP implantation projects? Possible reasons include:

1. The benefits of usability management are not known in general or it is not clear how much can be gained when usability management is applied in a specific project. The results might not be visible and the company might not have any experience with applying usability methods to know better.

2. Companies do not know how to adapt the ERP software – either because they lack the appropriate training or they have outsourced such knowledge to IT consultants. It could also be that they perceive changing the ERP system as being infinitely difficult – such as learning a new programming language (e.g. in the case of SAP software the ABAP [Advanced Business Application Programming] language).

3. There is a lack of usability methodology, or – as there are many usability engineering methods already published – there is a lack of knowledge of how to adapt these methodologies to the specifics of an ERP implementation project.

4. The rumour persists that departing from an ERP standard solution incurs a large amount of extra cost for changing and testing the software. Modifications might threaten the stability of the system, and could introduce liability issues – companies do not want to be responsible for system failures. Due to these reasons even in-house consultants recommend keeping the pre-defined ERP standard processes resulting in typical 'one-giant-size- fits-all' solutions.

As most of our previous research focussed on SAP software, we will discuss these reasons in terms of the knowledge gained from SAP implementation projects. Reason (1) in this list is a real problem – and also an anachronism. While companies have designed every single worker movement at the assembly line to achieve higher throughput rates, the topic awaits to be discovered in the design and customisation of business software. We expect, however, that reason (1) is slowly vanishing as more companies are aware of the general benefits of usability management. Furthermore, templates are available that allow specific benefit estimations for individual projects (cf. Bias & Mayhew, 1994, 2005).

Reason (2) is an observation from our own projects. SAP system administrators in companies often did not know how to make simple ergonomic adjustments in the SAP software. Neither do users know the adjustment possibilities available to them (e.g. personalisation of input masks, bookmarking frequently used processes, etc.). Once administrators and users are trained, they use these possibilities for adapting the systems to their needs (Hurtienne, Abele, Floegel, Prümper, & Stein, 2004a).

Perceiving the modification of SAP software as rather difficult was valid in the early days of SAP software, but the SAP AG has continually relieved the situation. New developments like NetWeaver, x-Apps, or BusinessObjects actually offer a large range of customisation possibilities that are far from learning a new programming language. Ergonomic customising will be both necessary and easier to achieve with the new trend towards modularised SAP software. However, this not necessarily means that it is done at all or done in the right ways (see reasons 1).

Reason (3) provides the ground for developing specialised usability management methods for ERP-projects that adapt common usability engineering methods to the specifics of ERP implementation projects. These measures, for instance, need to be integrated with the structures and dependencies of current SAP implementation strategies.

The rumours behind reason (4) are hard to extinguish – and as only a few companies dare to depart from the standard the

word about positive effects can not spread. This problem will, however, be partly resolved by the new developments in SAP software that are so flexible that customising cannot be foregone. However, in the current climate of scepticism this might be difficult to enforce.

What can be done if waiting for the self-healing powers of time is not an option? In the current risk-adverse climate we propose the following: (A) identify low risk scenarios in which the application of software-ergonomics and usability management is likely to yield high ratios of benefits to costs. (B) Determine appropriate methodologies that suit different phases of a SAP implementation project. (C) Disseminate information and educate. All three measures are discussed in turn.

LOW-RISK SCENARIOS FOR USABILITY MANAGEMENT

If the strategy for the usability management of a specific implementation project is clear, the direct costs can be easily calculated. The prospective value of usability management is not easily measurable because the effects of several measures might superimpose or mutually influence each other and long-time effects are difficult to estimate. And then, benefits are not only financial benefits, but less measurable things like a better image of the company because of more efficient customer service or a better health of the users. However, some general applicable scenarios can be identified in which investing in usability management is highly likely to yield large benefits.

The greatest value is generated when usability management is applied to core business processes. Core business processes can be determined from a quantitative or qualitative perspective.

From the quantitative perspective, core business processes are those processes that are handled by a large number of users and are repeated several times a day. Typical examples include transactions in accounting, entering goods receipts, and updating time sheets. In such mass procedures time savings sometimes multiply to enormous values so that investments into software-ergonomic improvement will always pay off. If these core processes are neglected in the scoping of usability management projects, companies risk losing significant amounts of time and money; and not only in the case of faulty customer relationship tools, they will lose customers.

From the qualitative perspective core business processes are the processes critical to the functioning of the business. They can be critical in three ways. They can be
- processes with high demands on quality, e.g. error-free data entry,
- processes with high demands on safety and security, e.g. processes with high financial risks, or
- processes with a strategic benefit, e.g. to reach market-leadership by having the shortest order lead times.

Data quality will be ever-more important as data are typically entered only once in ERP systems and then will be re-used repeatedly by several other ERP modules that are employed in other departments of the company. Hence, if the data entry process lacks usability, faulty data pervades the rest of the system. Business intelligence solutions that connect to faulty data will produce faulty decision. So, if data is involved in important and strategic decision-making the point of data entry should be considered a core business process in usability management.

Business processes with high demands on safety and security also rely on good quality of the data, but the whole process needs to be fault- and tamper-proof. For instance, financial auditors need to check the creditworthiness and solvency of prospective customers and they need to be protected from incorrect decisions that can be very costly to these companies.

Especially with business processes that are highly relevant strategically, the question is whether using the SAP standard – that the competitor is also highly likely to use – can realise any strategic benefits and whether it is able to set up imitation barriers against the competition. A more broad-minded handling of deviations from the SAP standard can be thoroughly valuable – if this results in a custom-tailored and efficient-to-use software application (cf. Schwarz, 2000).

Business processes that are highly demanding of the user do benefit from usability management, too. Often, in these contexts, working with SAP software is only one task among many others; the task requirements change frequently; the time-pressure is high and interruptions are frequent. Often these jobs can be found in dynamic working contexts like call centres, media agencies, and emergency wards. Also, if the fluctuation of users is very high, ergonomic software can contribute to massive cost savings for training and support activities.

In a further scenario, usability management always yields high benefits, if it is clear from the beginning on that the SAP standard solution will not cover the business processes of the company. In these cases there are often a number of other good reasons to still implement SAP software (e.g. integration with other SAP modules used by the company). When the standard SAP "best practice" model needs to be abandoned, usability management can help to arrive at an optimal solution for the company and its business processes by effective modification of the software.

On the one hand, SAP software becomes increasingly flexible and there is larger freedom in choosing the desired functionality in current developments. On the other hand, the complexity of planning and tailoring the application landscape is also growing. Usability management will therefore become increasingly important. It can help companies to detect requirements for modification in the daily routines of work and it can reduce uncertainties regarding the question which modifications are necessary at all.
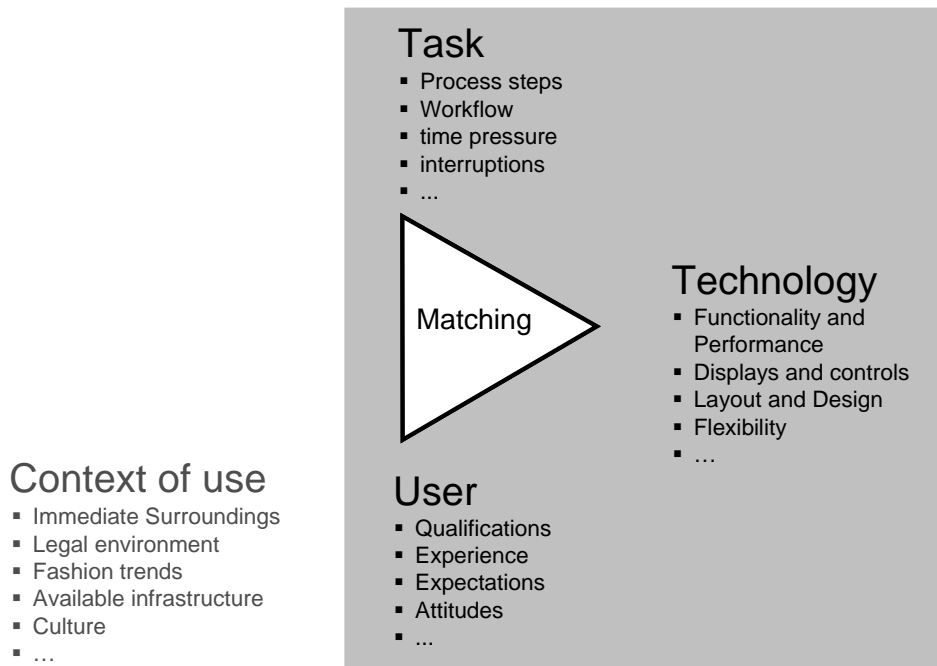
Task
- Process steps
- Workflow
- time pressure
- interruptions
- ...

Matching

Technology
- Functionality and Performance
- Displays and controls
- Layout and Design
- Flexibility
- ...

Context of use
- Immediate Surroundings
- Legal environment
- Fashion trends
- Available infrastructure
- Culture
- …

User
- Qualifications
- Experience
- Expectations
- Attitudes
- ...

Figure 1: The software-ergonomic triangle (after Frese & Brodbeck, 1989)

Usability Management of SAP Projects
Process Model

Project Planning	Requirements Analysis	Specification	Realisation	GoLive & Optimisation
Usability Goals	Context of Use Analysis: - Tasks - Users - Technology	Work Process & Dialogue Design	Testable (Sub-) Processes	Real Life Evaluation and Optimisation
Project Scope and Tasks		Ergonomic Role Layout	Evaluation of (Sub-) Processes with Users	
Participation Plan			**Final Integration Test**	
Project Standards	Requirements	Evaluation of Spec with Users	Evaluation of Integrated Work Processes with Users	
Ergonomic Milestone **1**	Ergonomic Milestone **2**	Ergonomic Milestone **3**	Ergonomic Milestone **4**	Ergonomic Milestone **5**

Training
- **User Training**
- Qualification of Project Participants
- Practice System

Project Completion
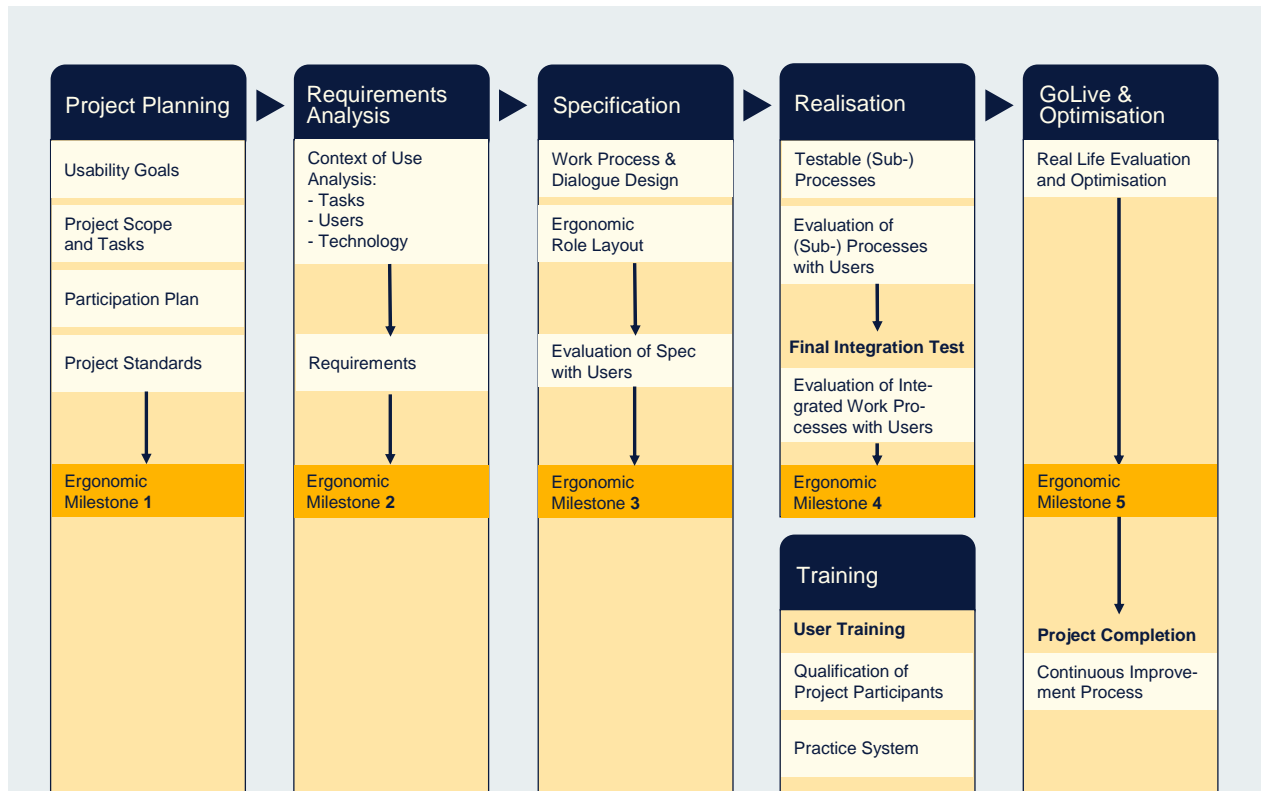- Continuous Improvement Process

Figure 2: Usability management process model (cf. Abele, Hurtienne, & Prümper, 2007)

USABILITY MANAGEMENT METHODOLOGY

To integrate usability engineering methods into an ERP implementation process, we have developed and tested a process model for the usability management of SAP projects (figure 2). The model gives a thorough overview of methods and possibilities for software-ergonomic optimisation in SAP projects and is designed as a modular system. Depending on the specific goals of the project single modules can be realised or not.

The usability management process consists of the five phases *Project Planning*, *Analysis of Requirements*, *Specification*, *Realisation*, and *GoLive & Optimisation* that are passed through successively. An additional phase *Training* runs in parallel to the whole process and will be relevant at selective times. The phases each contain several modules that offer comprehensive possibilities to optimise the ergonomics of the system and working tasks, through system design, task and process design, as well as user qualification. Please note that in the following only modules are discussed that are additional to today's SAP implementation projects.

Each phase is completed by an Ergonomic Milestone that coincides with the milestones in other (non-ergonomic) strands of SAP implementation projects. The Ergonomic Milestones guarantee that the ergonomic activities of one phase are completed successfully and satisfactory before starting the next phase. In the following sections an overview of the phases is given along with the modules they contain. For a more elaborate account of the process model, the tools it incorporates, and real-life examples see Abele et al. (2007).

Project Planning

In the *Project Planning* phase the general conditions for integrating usability management into the SAP implementation process are agreed and declared as mandatory for the project. This phase contains the four modules
- Usability Goals
- Project Scope and Tasks
- Participation Plan
- Project Standards

In the module *Usability Goals* measurable success criteria for the implementation project are determined and incorporated in the project. Determining the *Project Scope* means to identify the core business processes (see above) that should be included in the usability management activities. From the usability goals the *Project Tasks* are derived that determine how the success criteria are to be achieved. This also involves estimating the costs of the project as well as determining the times and resources needed. Of course these planning activities need to agree with the planning activities of the general implementation project.

In the module *Participation Plan*, the composition of the project advisory boards, the participation of the works council, and, above all, the participation of the prospective users of the SAP software are specified. As software-ergonomic designs are not possible without user participation, this module is highly relevant to any usability management process. Eventually, in the module *Project Standards* procedures are stipulated that serve the general management of the project, the handling of conflicts, and how quality control is achieved. It

also regulates the information flow and documentation.

The result of the *Project Planning* phase is a project plan for the overall implementation project that includes agreed and binding usability goals, agreements on project scope, tasks and resources, the participation plan, and the agreed project standards.

Requirements Analysis

The goal of the phase *Requirements Analysis* is to determine the requirements that need to be met to fulfil the usability goals determined in the planning phase. Again, the prospective users of the ERP software play a central role. Ergonomic requirements can only be established if it is known who the users and what their tasks are, as well as how and in what contexts these tasks are solved. The mere consideration of documented business processes does not suffice. Therefore this phase contains the modules:
- Context of Use Analysis: Tasks, Users, Technology
- Requirements

During the *Context of Use Analysis* the project team attains a general idea of the ergonomically relevant characteristics of the prospective user group(s) and their tasks, as well as of the current technology used to solve these tasks. More specific information is gained from analysing the flow of work directly at the work place of the users. Such analyses provide detailed accounts of how and under what circumstances users are currently solving their tasks. This information can then be used to derive ergonomic requirements for the design of the prospective work with SAP software. In the *Requirements* module, the resulting requirements are collected in a workshop with users where they are systematised, prioritised, and documented for the next phases.

The result of this phase is the requirements specification that substantiates the rather general usability goals in a more specific manner.

Specification

In the *Specification* phase, the ergonomic requirements are transferred into concrete, realisable design prescriptions for the customisation of the SAP software. This means to align the ergonomic requirements with the possibilities for technological as well as organisational implementation and find the best solutions possible.

The phase consists of the modules
- Work Process and Dialogue Design
- Ergonomic Role Layout
- Evaluation of Specification with Users

To enable productive and strain-less work, single tasks and the whole work flow need to be designed to be ergonomic. On the one hand this is done in the module *Work Process and Dialogue Design* by defining effective, efficient, strainless, and qualification-relevant work processes and software dialogues. On the other hand this is done in the module *Ergonomic Role Layout* by matching future working tasks, user roles, and authorisations under an ergonomic perspective.

The resulting specification document contains the prescriptions for design developed in these modules and it provides an image about the prospective work with SAP software in the company. The *Evaluation of the Specification*

with Users is done in workshops. In these workshops users simulate their tasks according to the work flow diagrams, screen prototypes and other illustrations documented in the specification. Thus, errors, flaws, and inadequacies are easily detected at a time when they can be resolved with relatively little effort compared to later stages when they are already cast in software.

The result of this phase is an evaluated specification that contains clear, explicit, consistent and realisable prescriptions for the ergonomic design of work processes, dialogues, and role layouts.

Realisation

During the *Realisation* phase, the SAP software is customised in a way that using it after the GoLive is effective, efficient and satisfying. Therefore it is important that the ergonomic specifications are transferred to the actual design of the technology. To ensure this, prospective users test parts of the system that are already built. This testing involves realistic work tasks and work situations. Software-ergonomic flaws and errors that would lower the usability in everyday use can thus be identified before going live.

This phase consists of three modules:
- Testable (Sub-)Processes
- Evaluation of (Sub-)Processes with Users
- Evaluation of Integrated Work Processes with Users

In the module *Testable (Sub-)Processes* the system is prepared technologically and is filled with realistic data that can be manipulated during the evaluation sessions. Then, in the module *Evaluation of (Sub-)Processes with Users* usability tests are conducted. From the test results ergonomic measures are derived that, after a technological feasibility check, are incorporated in the redesign of the (sub-) processes. The last module, *Evaluation of Integrated Work Processes with Users*, takes place after the final integration test in the technical strand of the SAP project. Here, the work flow and the interfaces for interdepartmental cooperation are tested from the users' perspective.

Training

Training activities are directed at two different target groups. The first group consists of people involved in the implementation project, i.e. the project team, the advisory board, the works council. The goal is that these people have a command of ergonomic knowledge to be able to fulfil their role concerning usability management activities. The second group are the prospective users of the system. They are supported in retaining, deepening and applying the knowledge gained from the user training taking place outside the usability activities. Therefore, *Training* contains the modules
- Qualification of Project Participants
- Practice System

Qualification of Project Participants means the target-specific training and awareness-raising of those involved in usability management activities. The content of such training are the basic principles of software-ergonomics and the respective methodology. The goal is to enable project participants to understand, evaluate, and to conduct software-ergonomic project activities.

Users are provided with a *Practice System* at which they can deepen their knowledge acquired during SAP user training. Normally a Practice System consists of the already realised parts of the prospective SAP system filled with realistic data.

GoLive & Optimisation

Many ergonomic flaws become visible only after implementation during the daily work with the software. The phase *GoLive & Optimisation* has the goal to identify and resolve any upcoming ergonomic issues with the SAP software. Further, in this phase the organisational environment is prepared for continuous system optimisation. The respective modules in this phase are
- Real Life Evaluation and Optimisation
- Continuous Improvement Process

The module *Real Life Evaluation and Optimisation* supports users in documenting the problems they encountered during their daily use of the new system. From these problems measures for system improvement are derived and realised.

After the completion of the implementation project the context of use will change during the life course of the system: users get more skilled in using the system, new work tasks are added, the software is updated, new organisational or legal regulations take effect, and so on. Such developments usually lead to new software-ergonomic requirements that need to be detected and responded to. The module *Continuous Improvement Process* takes this into account and creates an organisational environment in which new and modified requirements and suggestions for improvement are continually collected and processed to maintain the software-ergonomic quality of the system.

The Right Time to Employ Usability Management

When is the right time to apply usability management during an ERP implementation project? First, usability management can be applied before starting an implementation project. This can be done in a separate "discovery and evaluation" project in which the company specific requirements are defined that ERP software has to meet. This is usually done before any decision for or against any specific ERP vendor is made. Such a project mainly uses modules from the second and third phases of the process model, i.e. requirements analysis and specification, to determine whether SAP software is a possible solution able to meet the business requirements of the company.

Second, in an ERP implementation project, usability management is preferred to start with the general project. However, starting usability management activities can also be postponed to a later phase of the implementation project. If, for example, the implementation project has progressed into the realisation phase, usability methods from the phases "Realisation" and "GoLive & Optimisation" can still be applied.

Finally, if the ERP software has been implemented without usability management, the process of "Usability Care" is recommended, described in the next section.

The Curative Approach: Usability Care

For maximum effects on cost, effort and user satisfaction it is usually recommended to take a preventive approach, i.e. including usability management early in and integrated with the normal ERP implementation project. As this might not be possible, also a curative approach after going live is possible. This process of Usability Care then has three phases (Linz & Stein, 2007):

- Ergonomic Analysis
- Customising & Qualification
- Evaluation of Effects

During the phase *Ergonomic Analysis* three steps are employed to achieve a reasonably complete picture of how the ERP software is currently used. First, as a *screening* tool, all users fill in a questionnaire covering the ergonomic quality of the ERP software used to perform their tasks (e.g. ISONORM 9241/110; Prümper, 1999). It is also helpful to collect data on what tasks the users are actually solving as it helps prioritising the measures developed in later phases. As the knowledge of the users about the software will have great impact on their questionnaire ratings it will be important to quantify how much and what they know about user-specific "adjusting screws". This screening data will be largely quantitative and points out potential problem areas. To pinpoint specific problems with the software, in the next step, a *context-of-use analysis* (see above) of a few selected workplaces is administered. Finally, the results of the questionnaire screening and the details of usability problems found in the context-of-use analyses are fed back to the users in a *focus group* workshop. In this workshop users categorise and weigh usability problems according to their severity.

In the second phase, *Customising & Qualification*, the list of deficiencies identified in the analysis phase becomes the basis of concrete interventions. Adjustments to the system are prepared by *feasibility checks* followed by their *implementation*, while users and system experts undergo further *training*. Various system settings can be adjusted by system administrators through the use of so-called software-ergonomic "adjusting screws". These adjustments need to be tested and documented until they are finally implemented into the productive system. IT staff and system users are trained in parallel into how these adaptations impact daily work processes supported by the ERP system.

In the final phase, *Evaluation of Effects*, all participants in the project (users, system experts and decision makers) complete *questionnaires* that measure how successful the changes are at enhancing the productivity and quality of work, and whether and where there remains room for improvement. The questionnaire results can then be compared to the results of the first analysis to identify areas of successful improvements. Conducting a second *focus group* in addition is recommended to also gain feedback on the qualitative aspects of the changes made.

Although possible, Usability Care should not be run as a one-time-only process. It rather should be the prelude to establishing a Continuous Improvement Process as discussed above.

DISSEMINATION

The best methodology does not help, if people do not know it and do not know how to apply it. We therefore used the methodology in a number of SAP implementation projects and, in the case of Usability Care, at customer sites that already employed SAP systems (Floegel, Linz, & Prümper, 2005). During these projects, the education and training of project participants was inevitable (as specified for the module *Training* above). However, to disseminate the knowledge further we published the methodology in magazines for *usability professionals* (Müller, Hurtienne, & Prümper, 2008a), *works council representativess* (Müller, Hurtienne, & Prümper, 2008b), *IT managers* (Theißing & Prümper, 2008) as well as at conferences addressing *scientists* and *practitioners* (e.g. Abele, Hurtienne & Prümper, 2006; Floegel et al., 2005; Hurtienne et al., 2004a, 2004b). The process models of usability management and usability care were published as a book (Abele et al., 2007) that was well received, among others with the usability specialists of the SAP AG (Petrovic, 2007).

But just providing information cannot be all there is – the methodology was also taught in workshops with SAP users and SAP administrators organised by the DSAG (German-speaking SAP User Group). Members of works councils have been trained in specially tailored workshops. SAP consultants received training in usability management, e.g. in a two-day seminar at SAP University. To also reach the future generation of IT mangers and IT professionals our group regularly runs usability management courses for students of business and information systems at the University of Applied Sciences (HTW) in Berlin. For the curricula of these courses see Prümper and Müller (2006).

CONCLUSION

Although beneficial, software-ergonomic activities are not a standard part of implementation processes of ERP software. We have identified several possible reasons for this and derive three measures from the status quo. The first measure is the identification of scenarios where investments into usability are likely to pay-off. The scenarios are:

- business processes with a high frequency and that affect a large number of users,
- business processes with high demands on quality and safety,
- business processes with a strategic benefit,
- business processes that poorly fit the 'best practice' standards defined in ERP software, and
- business processes that are highly demanding of the user in terms of time-pressure, interruptions, etc.

The second measure is to provide methodologies that are ready-to-use and that can be integrated seamlessly into current standard processes for the implementation of ERP software. We have proposed two methodologies – Usability Management as a preventive approach applied during an implementation project and Usability Care as a curative approach to be applied at any time after an implementation project. Both methodologies have been developed together with SAP consultants and have been tested successfully in companies implementing or deploying SAP software.

The third measure is to disseminate the information which

has been done through a series of publications and presentations for practitioners as well as education for SAP consultants, SAP deploying companies, and students in university courses.

What is the outlook on these three measures? First, a collection of case studies illustrating the concrete costs and benefits of usability management should be made publicly available. Second, the current approach to usability management and usability care needs to be updated continually, as SAP software and ERP software in general are continually evolving, becoming more flexible, and being extend to new markets (e.g. small and medium-sized companies), etc. Third, we have to extend the dissemination activities to a broader audience. Our focus so far was on reaching a German speaking audience. However, as ERP software implementations have become a global business, further dissemination activities need to include publications, workshops and tutorials in the English language. The overall goal of all these activities will be reached when software-ergonomics is an integral part of ERP implementation that further enhance the productivity of future ERP systems.

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