

The EU Directive 90/270 on VDU-Work:
a European State-of-the-Art Overview

Report over the situation in

Austria

The EU Directive 90/270/EEC on the Minimum
Health and Safety Requirements for Work with
Display Screen Equipment

edited by

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The EU Directive on VDU-Work: a European State-of-the-Art Overview over the situation in Austria

"The EU Directive on the Minimum Health and Safety Requirements for Work with Display Screen Equipment in Practice - a European Overview"

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Foreword

The EU Directive 90/270/EEC on the minimum health and safety requirements for work with display screen equipment gives general guidelines on responsibilities and identifies areas for legislation. It does not provide measurable ergonomic standards. These values are being identified in standards such as ISO 9241 and EN 29241.

The International Standards Organisation (ISO) has announced a set of standards called ISO 9241 which provide specific values on which legislation may be based. It also provides system manufacturers, employers and employees with a scientific basis for planning ergonomic working environments. The standard currently comprises 17 parts: Part 1 General Introduction, Part 2 Task design (the way jobs are designed for people working with display equipment), Parts 3-9 Hardware and physical environment, Parts 10-17 Software and usability.

The European Committee for Standardisation (CEN) has decided to issue its own standard, EN 29241, which will be virtually identical to ISO 9241. In this context EN standards are particularly relevant because CEN member countries, which include both EEC and EFTA, have jointly decided that EN standards will replace national standards (e.g. BS 7179) as soon as they are published. ISO-standards are not always introduced as national standards.

Of course, the Directive outlines minimum standards. Many countries will have existing legislation that already meets or exceeds the proposals.

Each member country will review the Directive and having interpreted it to suit local conditions, they will create new legislation. The new ergonomic laws should be in place as soon as possible. Local legislation will refer to local standards bodies' interpretation of ISO 9241 and EN 29241.

The principles behind ergonomic legislation are simple and founded in common sense. However, far reaching implications for manufacturers and employers ensure that their implementation is complex.

The aims of this book are threefold:

- (1) to present the actual state of the national legislation from a theoretical, political and a practical point of view,
- (2) to discuss the range of possible evaluation criteria,
- (3) to give a state of the art overview of the methods and tools in practice.

The first authors will give an overview of the national activities and forthcoming of the legislation process. The second author will introduce and discuss the strength and weaknesses of the presented national approach.

We hope that this report will help to harmonize the implementation and practice of the EU Directive 90/270/EEC in Europe.

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Abstract

The EU-Directive 90/270/EEC of May 1990 requires companies to provide several features of interactive software systems that are used for task accomplishment and user adaptation. The directive has been developed in order to increase productivity at VDU-workplaces as well as to increase human comfort and safety when tasks are accomplished through interactive computer systems. The directive should have been transformed to national law of all member states of the EU until 1993. Austria has included the entire directive into the Austrian Law for Occupational Health and Safety. In order to develop an EU-conform instrument two projects have been launched in sequence: (i) Scientific Foundations for the development of an EU-conform technique, and (ii) Development of a Prototypical Instrument for Evaluation. In the following we summarize the objectives and results of these projects.

1 Scientific Foundations for the Development of an EU-Conform Instrument

In the project Scientific Foundations (Stary et al., 1995), several aspects of operationalizing the directive have been investigated:

1. In how far has the directive been incorporated into national law in the EU-member states?
2. How are existing principles from software ergonomics related to statements of the directive?
3. How can existing instruments and principles be evaluated to contribute to the development of an instrument for evaluating VDU-workplaces according to the EC-Directive?

4. How can the findings of 2. and 3. be integrated to proceed in the development of a proper instrument for checking VDU-workplaces against the minimal requirements stemming from the EC-directive?

For the first question the responses to a request to the corresponding institutions of each EU-member state have shown that only 8 out of 12 EC-states have met the deadline and incorporated the directive into national law(s) by 1993. Moreover, neither a straightforward methodology have been developed for the implementation of the directive, nor a survey has been available about the actual organizational settings (companies, institutions) where these methodologies should be applied. We rather identified a huge demand for both developing instruments to be used in a straightforward way and providing accurate results, and elaborating the organizational, economical, and political constraints to put the directive to practice.

In section 1.1 we will detail the interpretation of the directive according to existing clusters of principles known from software ergonomics. In section 1.2 we summarize the results of the review of existing techniques and their use for further developments to develop a straightforward technique.

1.1 Analysis of the Directive

The directive is part of a set of guidelines to improve the safety and work conditions of employees at their work places: It sets up a minimal requirements for planning, the selection, configuration, installation, and modification of software and the design of work tasks involving VDUs:

- a) The software has to be adapted to the tasks that have to be accomplished.
- b) The software has to be user friendly and to be adaptable towards the knowledge, skills, and experience of users; without knowledge of employees no quantitative or qualitative measurements are allowed to be taken.
- c) The software has to provide information about the relevant events and (sequence of) activities at the workplace.
- d) The software has to display information in a format and speed that is convenient for the end users.
- e) Fundamentals of ergonomics have to be taken into account, in particular, concerning human information processing.

The directive integrates several aspects: organization of work, mental processes, and information technology. For instance, in order to check whether the tasks assigned to a VDU-workplace are supported appropriately, requires knowledge about the organization of work as well as knowledge about the tasks including software support to accomplish them.

However, the directive addresses several human and technical factors: The directive is focused on the organizational perspective of tasks and users in statement a) and c), whereas statement b), d), and e) emphasizes human characteristics. Technical aspects are involved in all of the statements.

The directive does not indicate how the statements should be implemented. Similarly to standards, several goals have been listed that should be achieved, without referring to an instrument to achieve the goals in the social, economic, and organizational setting of an enterprise. It is not clear, who should perform the evaluation, what kind of qualifications are required, what kind of tools should be used, etc., although it is known for instance, that measurements require a lot of effort in preparation and implementation, if such complex requirements as listed in the directive should be met.

In the following the fundamental clusters from software ergonomics, as listed in (Oppermann et al., 1992) (Stary, 1996) are related to the statements of the directive:

- task appropriateness
- capability of self-descriptiveness
- controllability
- conformity
- robustness
- adaptivity
- learnability
- enhancing cooperation and communication
- safety and security of data.

Task Appropriateness / Usability / Functionality

An interactive system is oriented towards tasks, when the users are supported in accomplishing their tasks effectively, namely, minimizing the effort for interaction.

Task Appropriateness concerns statement a) (adaptation towards tasks): Task appropriateness describes the support of tasks in a way that the complexity, type and amount of information has to be adapted according to user needs.

Task Appropriateness concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): On one hand, task accomplishment requires a certain level of skills, on the other hand, not all users can be expected to have the same level of skills and experience. Hence, task-oriented software has to provide entry points for users with different skills and experience for each of the tasks.

Task Appropriateness concerns partly statement c) (information about events and activities): If a task requires transparency of the work flow, then task appropriateness includes information about it.

Task Appropriateness concerns statement d) (adaptation of information towards users): If users are not able to process information according to their individual conventions, skills and experience, they will not be able to use the software properly. Hence, task appropriateness includes the adaptation of the display of information towards user requirements.

Task Appropriateness concerns statement e) (fundamentals in ergonomics) : Tasks should be accomplished in a straightforward way without being disturbed by hard-, software or organizational problems. Software should minimize the effort for learning how to interact with computers and how to accomplish tasks by providing only the relevant information for users.

Capability of Self-Descriptiveness / Self-Explanation

An interactive system provides the capability of self-descriptiveness, if its users may get explanations about the purpose and the functionality of the system, and if each activity of the interaction is understandable without further interpretation through feedback of the system or through user-requested information in each step of interaction.

Self-Descriptiveness concerns partly statement a) (adaptation towards tasks): Immediate understandability of interaction steps comprises the transparency of tasks, since they are part of the functionality of an interactive system.

Self-Descriptiveness concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): The capability of self-descriptiveness is considered to be part of user-friendliness, since it enhances the transparency of what is going on between users and interfaces. In addition, self-descriptiveness requires adaptivity, in order to

provide task-relevant information and immediately understandable feedback (taking into account the user's skills and experience).

Self-Descriptiveness concerns statement c) (information about events and activities): Self-descriptiveness provides a causal and temporal framework, how information about (sequences of) activities has to be provided for users. It concerns task-relevant features of an interface as well as the interaction itself (e.g. what happens in case of a double-click with the mouse when the cursor is located on an icon).

Self-Descriptiveness concerns partly statement d) (adaptation of information towards users): Self-Descriptiveness does not concern the adaptation of information towards users directly, it rather details the way how users should have access to explanations.

Self-Descriptiveness concerns partly statement e) (fundamentals in ergonomics): Human information processing is influenced by ergonomic features of the interface, in this case by the availability, flexibility, and the understandability of explanations.

Controllability / Usability

An interactive system can be controlled if the users are enabled to determine the speed of interaction, the selection and sequence of interaction steps and objects of work, including the way and amount of in- and output.

Controllability concerns statement a) (adaptation towards tasks): Tasks to be accomplished interactively include a certain degree of freedom concerning the way how the tasks are actually accomplished. An interactive system can be controlled if the previously given degree of freedom for each task can be maintained when the task is supported interactively.

Controllability concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): Controllability is considered to be part of user friendliness.

Controllability concerns statement c) (information about events and activities): Controllability is defined as means to control the speed, the type of information and the input and output concerning the way of presenting information about events and activities. Hence, this information display should be user-controlled.

Controllability concerns statement d) (adaptation of information towards users): Controllability is defined in a way that users can regulate the speed of dialog sequences as well as the form and the way of output of the system. This definition comprises the requirement to display information according to the users format and speed. If an interactive system can be controlled directly by users the speed and the format of outputs can be individualized.

Controllability concerns statement e) (fundamentals in ergonomics): The individual control of system parameters supports the individual adaptation towards user needs. This adaptation is required since users have different access to tasks and interaction media.

User Conformity / Reliability from the User's Perspective

An interactive system is considered to be conform with expectation, if users are enabled to create expectations concerning the behavior of an interactive system. These expectations are based on the knowledge concerning task accomplishment, individual qualifications, skills, and expectations. Users acquire these knowledge according to the transparency and the consistency of an interactive system in the course of dialog sequences.

We consider an interactive system *transparent*, if sequences at the user interface are understandable by humans. This understandability concerns tasks as well as interaction styles and media.

An interactive system is considered to be *consistent*, if the structure of a user interface as well as the behavior of an interactive system follow certain rules. Hence, similar

situations, such as the input of similar activities, lead to similar system behavior and information display.

Conformity concerns statement a) (adaptation towards tasks): Conformity towards expectations in the context of computer supported workplaces means transparency concerning task accomplishment and workflow, as well as their consistency. Hence, software should always support task accomplishment in the same way (due to the reliability from the user's perspective).

Conformity concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): Conformity towards expectations is one aspect of user-friendliness. Moreover, if user have the same knowledge about tasks and interaction styles the interactive system should behave the same way.

Conformity concerns statement c) (information about events and activities): The transparency of an interactive system concerns information about task-relevant as well as interaction-specific behavior.

Conformity concerns partly statement d) (adaptation of information towards users): Transparency and consistency are not related directly to the individualized display of information, since the statement addresses the display and output of explanations only in general terms.

Conformity concerns statement e) (fundamentals in ergonomics): User interfaces that are user-conform support the effective use of interactive systems by minimizing the cognitive workload of users. This minimal workload can be achieved through expectation arising from consistent system behavior.

Robustness concerning Errors / Tolerance and Transparency of Errors

An interactive system is considered to be robust against errors if in case of wrong inputs the intended output can be achieved directly or with minimal corrections. In order to achieve robustness users have to be provided with explanations. Hence, misconceptions and errors can be avoided.

Robustness concerns partly statement a) (adaptation towards tasks): In order to achieve the intended result of task accomplishment although inputs may be wrong software has to be adapted to the tasks. The context of tasks and interaction styles have to be known to the system.

Robustness concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): Robustness concerning errors is one feature of user friendliness. Robustness is one way to adapt software to different skills and experiences of users, namely by being tolerant towards errors and misconceptions at the user interface. Tolerance concerns task accomplishment as well as the use of interaction media.

Robustness concerns statement c) (information about events and activities): The property of transparency concerning errors allows information about these errors in the context of user tasks and interaction styles. In addition, it may lead to tolerance for task accomplishment.

Robustness concerns partly statement d) (adaptation of information towards users): Since robustness is not related directly to individual displays of information it concerns only partly this statement. The statement only explains the general guidelines for the output of explanations.

Robustness concerns statement e) (fundamentals in ergonomics): Tolerating errors and conformity of expectations in the case of wrong inputs allow users to concentrate more effectively on the perception of task- and interaction-relevant information.

Adaptivity / Flexibility / Capability to Individualize User Interfaces

We consider an interactive system to be adaptable if it provides mechanisms for developers and users to react dynamically on modified requirements. These requirements may concern tasks, user (groups), manipulation facilities of problem domain data, interaction styles and media, as well as their combinations.

An interactive system is considered to be adaptable towards individual needs, if it supports the process of adaptation to individual needs and capabilities of users in the context of a given task.

Adaptivity concerns statement a) (adaptation towards tasks): Adaptivity concerns all organizational changes that are related to the task accomplishment by users. Hence, qualifications concerning the tasks at the workplace and the organization of those tasks should be incorporated in flexible software. Secondly, the knowledge and the skills of users are concerned, since they have to accomplish the tasks. Adaptive software has to be adaptable to the tools and the subjects of work as well as user profiles. This goal should be achieved with minimal effort.

Adaptivity concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): In this statement the adaptivity is addressed directly. In particular, the capability to individualize software is one of the major principles of user-friendly interactive systems. The dynamic capability to be flexible to user skills and experiences requires usually major efforts in development, in particular, if the context of tasks has to be considered.

Adaptivity concerns statement c) (information about events and activities): As soon as a interactive system can be adapted towards tasks and interaction styles, information about the activities of the interactive systems and events is required. Hence, considering the events and activities in the context of adaptivity, the statement is fully involved.

Adaptivity concerns statement d) (adaptation of information towards users): On one hand adaptivity is directly related to the individualized display of information, since the statement in general addresses the output of explanations and consequently the display of adaptive behavior. One the other hand, the adaptation towards the display of information according to the format and speed of users corresponds to two issues of flexibility which details the criterion through the statement.

Adaptivity concerns statement e) (fundamentals in ergonomics): Adaptivity is a property that reduces the demand concerning flexibility on behalf of the users, and therefore the cognitive efforts for users. This reduction may happen in the context of task accomplishment and/or the manipulating interaction features.

Learnability

We consider an interactive system to support learnability, if users are enabled to learn interactive task accomplishment within an adequate time span. The process of learning is considered supportive, if users are supported with explanations and guidance in course of that process.

Learnability concerns statement a) (adaptation towards tasks): Since users do not have to learn the tasks per se but also the way how an interactive system is supporting the task interactive system has to provide facilities that support the learning process of interactive task accomplishment.

Learnability concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): Learnability is one of the major properties of interactive systems that are user-friendly. Learnability concerns different skills and experiences of users, and should lead to several entry points where users can catch up with their knowledge.

Learnability concerns statement c) (information about events and activities): As soon as users learn they should be supported with explanations and guidance from the interactive

system. Activities in that context means information about learning progress and support to improve it.

Learnability concerns partly statement d) (adaptation of information towards users): Learnability is not related directly to the adapted display of information, since in the statement only general hints for the display of explanations are given. There is no direct link to learning processes.

Learnability concerns statement e) (fundamentals in ergonomics): Learnability is inevitable if users should learn to accomplish the tasks interactively, and to use interaction styles and modalities appropriately. Support of learning processes reduces the effort to learn task accomplishment and the handling of interaction media.

Support for Cooperation and Communication

An interactive system supports cooperation, when users are enabled to accomplish tasks in teams or cooperatively. An interactive system is considered to support communication, if users are supported in setting up and maintaining social relationships with each other.

This principle concerns partly statement a) (adaptation towards tasks): It cannot be stated in general that tasks have to be accomplished in cooperation among users. Support for cooperation is essential for computer-supported cooperative-work applications. If task accomplishment cannot be specified through cooperative subtasks there is no direct relationship from the statement to the criterion. The same statement holds for support of communication, since there may be tasks that do not require mutual social relationships, since a task has to be performed by a single user.

This principle concerns partly statement b) (user friendliness, adaptivity, no implicit performance measurements): In case of computer-supported groupwork support of cooperation and communication is part of user friendliness. These properties of an interactive system cannot be identified without knowing what kind of social and organizational environment users are involved when accomplishing certain tasks.

This principle concerns partly statement c) (information about events and activities): As soon as users accomplish tasks cooperatively communication and coordination should be supported by an interactive system. This support includes information about the dialog history concerning particular steps of users as well as collaborative activities that have been taken place between users. Since we cannot make such a claim in general for interactive systems, the activities only eventually involve collaboration among users.

This principle concerns partly statement d) (adaptation of information towards users): Neither the support for cooperation nor the support for communication is directly related to the individual display of information, since the statement in general refers to the output of information and does not address social or organizational prospective of task accomplishment.

This principle concerns partly statement e) (fundamentals in ergonomics): If cooperation and communication are effective means to accomplish tasks, the display and generation of information has to be understandable not only for a particular user but also for a group of users. Hence data, interaction styles and tasks have to be communicated among users. In case of single-user support cooperation- and communication facilities have not to be provided.

Data Integrity and Security

An interactive system is considered to keep integrity constraints if only permitted users are allowed to access and manipulate the data relevant for their task accomplishment. In addition, the data have to be reliable, complete, and correct. An interactive system is considered to be secure if users are not controlled electronically in their performance and behavior.

Data integrity and security concerns statement a) (adaptation towards tasks): The software has to be adapted towards the security and the integrity of the data that are manipulated within task accomplishment. If data are used to accomplish tasks exclusively the software has to be adapted towards tasks. Since each task is accomplished by users the functions that represent subtasks have to be reliable to beware of misuse of data.

Data integrity and security concerns statement b) (user friendliness, adaptivity, no implicit performance measurements): Data integrity concerns implicit control of user performance and user behavior. The statement excludes control without knowledge of the users. Moreover, the prevention of misuse of data through software functionality is one aspect of user friendliness.

Data integrity and security concerns statement c) (information about events and activities): If activities of users as well as events concerning the use of data can be traced in a way that is understandable for users misuse of data integrity and security can be made transparent. In the same way all the activities concerning the administration of user profiles, access rights, and data manipulations become transparent. In that sense information about all activities concerning data security and integrity are available.

Data integrity and security concerns partly statement d) (adaptation of information towards users): Since the statement only concerns the display of information in general, there is no direct relationship between data security and integrity and the statement.

Data integrity and security concerns statement e) (fundamentals in ergonomics): Data integrity and security are essential ergonomic requirements, since they help to insure high quality result when using software as well as privacy when interacting with computers. In addition, all the information about activities concerning the security and integrity of data have to be available in an understandable form.

The content of Table 1 turns out that

- All of the clustered principles with the exception of support for cooperation and communication are related directly to at least three of the statements of the directive.
- Controllability and adaptivity are crucial issues, followed by task appropriateness, conformity, learnability, data integrity and security.
- Support for cooperation and communication is of minor importance, due to its strong relation to a certain organization of work, namely group work.
- The statements concerning user friendliness, adaptivity, controllability and principles of ergonomics are related to seven out of nine clustered principles (most of them also identified in standards, such as (DIN 66 243, 1988) (Abernethy, 1988), since they are located at a very high level of abstraction.

After having identified the relationships between traditional principles from software ergonomics and the statements of the directive the next part of our investigation has been focused on existing techniques to evaluate VDU-workplaces. The following Table 1 gives an overview about the results of the cluster-analysis of ergonomic principles and the statements of the EC-directive.

Table 1. Statement of the Directive

Cluster of Software-Ergonomic Principles	a)	b)	c)	d)	e)
Task Appropriateness	x	x	o	x	x
Self-Descriptiveness	o	x	x	o	x
Controllability	x	x	x	x	x
Conformity	x	x	x	o	x
Robustness	o	x	x	o	x
Adaptivity	x	x	x	x	x
Learnability	x	x	x	o	x
Support for Cooperation and Communication	o	o	o	o	o
Integrity and Security of Data	x	x	x	o	x

Legend: x statement is concerned, o statement is concerned partially

1.2 Reviewing techniques for evaluation

In order to evaluate existing approaches for checking principles from software ergonomics a scheme has been developed. The scheme is based on:

- 11 domains describing the fundamental review principles, such as the set of measurements.
- Each domain comprises several items for description, such as references for the domain 'identification'.
- For each criterion of an evaluation technique several characteristic items have been acquired: name, definition, usability for quantitative or qualitative measuring, domain, and use for the analyzed technique.

Although there exist several studies reviewing existing evaluation techniques, e.g. (Bastien and Scapin, 1992) (Cuomo and Bowen, 1994) (Hampe-Neteler and Rödiger, 1992) (Houwig et al., 1993) (Jeffries et al., 1991), the approach has extended previous ones, taking into account not only the measurements of a technique but also its orientation and context of application. The latter may address one or more of the identified perspectives

- *organization of work* addressing the global as well as the individual organization of work.
- *technology* considering all devices and software functions used for task accomplishment.
- *social and cognitive issues* comprise cognition, cooperation and communication.

The following table shows the relationships of the identified orientations to the statements of the directive. Since all measurements and methodological proposals can be assigned to one of the addressed layers, the development of a proper instrument can be performed in a structured way.

The following table gives an overview of the analyzed evaluation techniques according to the domains and items discussed above. Highly developed techniques are EVADIS II (Oppermann et al., 1992), MUSiC (Corbett et al., 1991), KABA (Dunckel et al., 1993), ABETO (Technologieberatungsstelle, 1994) and TCO (TCO, 1992). However, most of

them are either product-oriented, such as EVADIS or completely user-oriented, such as MUSiC. For the development of an EU-compliant instrument, both aspects will have to be integrated according to the directive.

Table 2. Statements in the Directive.

Dimension of Evaluation	a)	b)	c)	d)	e)
Task / Organization	x				
Software / Devices			x	x	x
Individual / Society		x		x	x

The results from the first project have shown that there existed no comprehensive instrument for the EU-conform evaluation. We have given an overview of existing techniques and the dimensions addressed.

Table 3. Statements in the Directive.

Dimension of Evaluation	a)	b)	c)	d)	e)
Task / Organization of Work	EVADIS II MUSiC PROKUS Erg.Checker Layout Appr. Job C. Model Checklist SW-Checker KO-Kriterien ABETO KABA AN-Sicht RHIA/VERA				
Software/ Devices			EVADIS II ABETO Erg.Checker KO-Kriterien	MUSiC PROKUS AN-Sicht	Layout. Appr. Checklist PROTOS
Individual/ Society		(*)		* EVADIS II Usa-testing AN-Sicht SW-Checker ABETO KO-Kriterien	MUSiC PROKUS Erg.Checker Layout Appr. Job C. Model Checklist

2 Towards the Straightforward Implementation of the Directive

In the second project the organizational, economic, and political constraints have been acquired, and a novel technique satisfying these constraints has been developed (Stary et al., 1997). We first present the results from the practical experiences with techniques for evaluation in the context of the directive in section 2.1, and then overview the structure and application of EU-CON (EU-Conform Evaluation and Design of VDU-Work) in section 2.2, a technique that should meet the requirements from the content point of view as introduced in section 1, as well as the requirements for practical use as presented in section 2.1 (see Appendix).

2.1 Empirical data about handling the Directive

In the course of structured interviews with governmental and consulting institutions, companies, and unions four different issues have been addressed. For each of them we will list the main results, in order to reflect the organizational and political requirements for the development of a compliant technique.

1. How important are statements concerning software ergonomics that are handled within issues of occupational health and safety?

According to this question it had to be found out in which way the governmental regulations on occupational health and safety are actually implemented and how the particular statements are interpreted by responsible staff members.

2. How is the evaluation of VDU-workplaces actually performed?

It had to be identified which measurements and instruments are utilized in order to implement relevant aspects of VDU-works.

3. Who is responsible for evaluation and what kind of external organizations or experts have to be involved for execution?

In this context the roles of people directly or indirectly involved in evaluating software have to be acquired.

4. What happens with the results of an evaluation?

Similarly to the question on how government regulations are interpreted for each measurement it has to be clarified how its results can be used for improvements in quality management and work conditions.

2.1.1 Handling Software Evaluation in the Context of Occupational Health and Safety

- (a) The statements of the governmental regulations are considered to be important. However, the implementation of the governmental regulations as well as experiences of enterprises in handling ergonomic principles are missing.

Although the number of workplaces with interactive software solutions is increasing the governmental regulations have not been implemented in most of the cases. All of the statements in the governmental regulations are considered to be important since they are a first step towards improvements at the workplaces. There is more engagement in implementing the regulations as soon as the responsible staff members consider software development as implementing a model of work.

Within enterprises the statements of the governmental regulations are considered to be redundant and fuzzy. Additional regulations for the statements are required, in order to implement the entire set of regulations. There are no indications on how to develop a

proper instrument or which instrument could be used within an enterprise. Finally, issues concerning principles of software ergonomics are rarely discussed within enterprises since software is still considered to be just another tool for task accomplishment. In most of the cases it is still neglected that software can be adapted to individual user needs and particular tasks.

One problem in the context of finding instruments for evaluation is the actual measurement of psychological principles. However, these principles could be addressed, since software is used by individuals in a particular context. Surprisingly, members from the industry council do not consider software to eventually cause occupational safety- or health problems, as long as principles from hardware ergonomics can be met. Members from trade unions on the other hand stress out the particular importance of reducing health risks and psychic damage caused by software.

Consulting agencies have already identified the importance of implementing the principles of governmental regulations in the area of software ergonomics. However, they have also identified a lack of understanding, as well as misconceptions when dealing with regulations concerning software ergonomics. They also expect from the government additional regulations in order to find out certain priorities for the principles as well as a limitation of issues important for interacting with software at the workplace. Governmental regulations for handling software in an enterprise context is of high importance due to several reasons:

1 Software is not just another tool

First, software is a vital factor for all the processes occurring in an enterprise. It is not only the reliability of software for a workplace, but also the pre-programmed structure of data and processes that actually influence the daily work within an enterprise. As soon as the management as well as software developers are committing themselves to model the organization and the flow of work when implementing software solutions the principles from software ergonomics come into playing and have to be discussed within the design process. As a consequence, software can be adapted towards actual work tasks as well as user needs when users are participating in the development process.

Secondly, as long as software is developed by technology-driven aspects there will be no inclusion of principles oriented towards humans for user interface development. In the case of technology-driven software development user needs as well as tasks actually to be performed are not the starting point for software development. The starting point is a set of functions that are implemented with the help of certain platforms and development environments. However, following this strategy the likelihood for acceptable products is decreasing the more technology-driven development is performed.

As a consequence, the requirements set up by user needs and enterprise processes should be acquired very early in the development process and should be the starting point for further decisions concerning the application of technology. In the cases process models are neglected software is developed just like another tool for task accomplishment. All the benefits that could have been achieved through the appropriate application of technology can not be achieved and the intended business strategy is likely to fail.

2 The missing implementation of principles from software ergonomics may lead to damages of the individual health that may be not removable.

Stress, for instance through hindrances in the workflow according to software functions, may influence the quality of work results. This fact becomes even more important as soon as different processes are nested within each other.

The motivation for improving performance at a workplace is actually decreasing as soon as basic ergonomic principles are neglected in the course of software development. In

contrast, as soon as basic ergonomic principles are handled in a proper way in most of the cases software leads to higher productivity and improvements in quality management.

- (b) The evaluation of software at workplaces may lead to improvements in quality management as well as to a reduction of failures.

Enterprises indeed implementing the governmental regulations do not only meet legal requirements, they also try to improve their internal quality management as well individual health conditions. However, when it comes to mental overload and stress there are no instruments that could be applied in order to improve work conditions. Consultants provide some instruments to indicate psychic hindrances for the successful use of software. However, they fail in providing concrete measurements and qualifications, e.g. for the medical staff employed by the enterprises.

- (c) Standard software has to be treated isolated and can not be adapted towards the needs of enterprises. This is not the intended use of standard software.

Investigated enterprises as well as the consultants and governmental responsables consider standard software to be more or less inflexible. This type of software is considered not to be adaptable easily to individual user needs and processes of an enterprise. The responsables would like to have some quality checks that are performed outside of the enterprise in order to rely on principles that can be met objectively. However, software developers are not very interested in aspects of software ergonomics since some human-oriented measurements can not be performed in a straightforward and representative way. In addition, as soon as software can be evaluated objectively there is still the open question in how far the software should be flexible and adaptable to individual needs and work processes of an enterprise.

First experiments with evaluations of standard software have led to results that show the required adaptation of standard software as well as the possibility of such a process. In the cases where standard software has been evaluated and checked for usability, the functions not required for the individual workplace have been removed or disabled. According to these improvements in the course of introducing standard software users tend to use the software in a more natural way.

From the technical point of view standard software has the goal to provide a standardized set of functions and data structures that can be applied in many different application domains. However, this goal does not imply that the use of these functions has also to be standardized. Software developers providing standard products have already recognized this need and allow users a lot of adaptations and individual sequences. This process is called *customization* and allows to adapt to individual user needs and enterprise processes.

- (d) The governmental regulations are interpreted in relation to the enterprise-wide software.

This interpretation is required, since the intentions behind the particular statements are not very clear. The governmental regulations are not sufficient for a complete implementation of the statements concerning occupational health and safety. Additional regulations are currently developed and should give indications in how far existing instruments can be used to check the minimal standards. Two different aspects have to be improved concerning the implementation of the regulations: redundancy, and level of abstractness. Some of the statements contain redundant information. This fact leads to already identified principles, and thus, provide no additional input for checking the work conditions or the interface.

On the other hand, principles located at different levels of abstraction are not easily to grasp and will lead to inconsistent measurements. The background for the particular requirements in the regulations is not very transparent. This missing transparency may be overcome as soon as the principles addressed through higher level goals can be refined. It has been stressed by all interview partners that the additional regulations should clarify both issues addressed above.

2.1.2 How to Evaluate Software

We now summarize the interview results concerning the practical approach towards ergonomic measurements.

- a) Enterprises that are evaluating work places according to particular classes of work places often neglect user-oriented principles.

Since the government does not like to prescribe a certain implementation of the directive there is a lack of indication on how to perform the measurement of principles from software ergonomics. If an enterprise is interested in a very effective and fast evaluation it tries to find out particular work places equipped with the particular software product, and then applies a standard procedure for a more or less standardized work place. The responsables expect a reduced the amount of time to be spent for each of the workplaces as well as a complete meeting of the governmental requirements. However, the people who are actually involved in task accomplishment are not participating in a sufficient way. If only one work place is under consideration in a representative way all the other users who are not participating in an evaluation process have no possibility to deliver their judgments. The trade unions know this dilemma and propose to find out some principles which can be measured objectively and are oriented towards the functions in an exclusive way, and to measure some subjective measurements, which requires to involve the users. Both the principles applied for measurements concerning the properties of software as well as judgments of users may involve quantitative as well as qualitative data.

Handling this question and optimizing the effectiveness and effectivity will lead to a strategy that allows to deliver the judgment of each user as well as to find out in the planning phase in how far a particular software actually meets the minimal requirements from a functional perspective. Actually, several factors are involved in human-computer interaction:

- Individual needs of users: skills, experiences, preferences and intentions.
- Characteristics of work tasks: reliability of data, timeliness of results, integration of tools, different types of tasks, etc.
- Functionality: robustness, conformity, explainability, adaptivity and support of group work, if required.

As a consequence, any instrument measuring occupational health and safety has to take into account that the main topic of interest is the user interface, and all of the factors have to be measured in an integrative way instead of measuring them isolated. The latter requirement is also stated in the planned additional regulations of the government.

- (b) In order to evaluate software within an enterprise particular strategies and instruments are developed.

The reason for this development is the lack of existing instruments that can be easily used and adapted towards enterprise processes. Although there exist some approaches for measuring occupational health and safety at a work place for the implementation of the principles in software ergonomics there is almost no indication how to handle the results. But actually the results of the measurements are the interesting input that enterprises need to improve the work conditions.

As soon as the results of measurements do not lead to direct advice and regulations that may be implemented effectively, none of the instruments will be used in the intended way. The existing approaches for measurements do not give any indication concerning the efficiency of the instrument since empirical data are missing. The reason for these missing empirical investigations is that the government did only implement the directive in the national law without providing any further inputs to put the regulations to business practice.

- (c) Help should be available in the course of evaluation. This help should be easy to handle, understandable, easy to use and efficient.

Since there is no instrument in the moment that can be applied directly in the context of business processes, help is required from responsible government institutions as well as consultants. On one hand the reasons for hindrances at the workplace should become evident in the course of measuring, on the other hand direct user support to remove hindrances should also be available. The following list of requirements for business-oriented measurements has been acquired. Any technique for evaluation should

- support quick measurement
- automatically analyze the results of measurement
- be accurate (i.e. implement the governmental regulations in a straightforward way)
- be comfortable and complete
- allow easy recognition of hindrances in the course of interaction
- provide direct feedback about the required changes to remove hindrances.

The expenses for measurement and (re)design should be minimal. The measurement for a particular workplace should not last longer than one hour.

2.1.3 Role Assignments and Requirements for Qualification

In this context the requirements for experience and skills have been analyzed and acquired. Governmental regulations require enterprises to assure health and safety at a workplace through the acquisition of possible risks. In addition, at workplaces where software is used ergonomic user interfaces have to be provided.

(a) Evaluation is expected to be initiated from the management.

The initiative should come from the enterprise management. Responsible roles are physicians, security staff members and ergonomists. Middle management or top management should assign evaluation tasks to the security staff members who are responsible for the implementation of the guidelines and principles from the governmental regulations. Unfortunately, in most of the enterprises principles and techniques from software ergonomics have never been applied. Members from the security department are not educated and skilled in applying measurements from software ergonomics. However, first results are available from the development of particular instruments. The more basic ergonomic knowledge has been integrated into these techniques the more likely are improvements at the workplace.

Medical staff members have been handling physical needs of employees up to now. They are not prepared to evaluate principles from software ergonomics. Particular education for these people is required. However, medical staff members are those persons to whom employees could indicate some hindrances and cognitive overloads.

People from technical departments, such as computer specialists, are usually responsible to install software and to control the production of software. They are actually not interested in implementing particular principles, in particular when standard software is used in an enterprise. They only feel responsible for the technical background and the error-free execution of functions.

People representing staff members at the work place are also not educated very well in the field of software ergonomics. Although these people should represent the entire number of employees they can not control and monitor the process of software installation and planning in a proper way. They are rather kept busy through other tasks, such as the loss of work places due to the recession. However, they have identified the principles from software ergonomics to be important for the use of software at the workplace and have committed themselves to be educated in this field.

External experts are usually called to verify evaluation results or to perform additional evaluations if there is absolutely no knowledge available within an enterprise. In addition,

external experts are required for particular problems that do not involve technical, organizational or cognitive problems. For all of the evaluators skills and experiences in software ergonomics are required, in order to enable improvements of the work conditions in the enterprise.

(b) The cooperation with the people from the government is highly appreciated.

All of the investigated enterprises uttered their interest in cooperating with the government for implementing the statements of governmental regulations. They also complained about the missing support coming from these institutions. Some consultants proposed an outsourcing scheme for governmental institutions that are responsible for implementation of laws. As such people from the government would become consultants for enterprises. At the moment these people fail to provide the required information to implement government regulations.

(c) The participation of employees in the course of evaluation is stressed out differently.

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

From the point of view of software-ergonomic measurement the participation of users is required. The reason for this involvement is given through the orientation of the directive and governmental regulations towards user-specific measurements. Only the users may provide information about how they feel supported through the capabilities of the system. For instance, if a user has problems with spatial relationships to be handled at the graphical user interface, it could be an individual problem that essentially requires modifications at the user interface, such as the use of the windowing system. Improvements of health and safety should focus on those people who have difficulties in interacting with computer technology.

2.1.4 Handling the Results of the Evaluation

The last step of each evaluation procedure concerns the interpretation of the results and the consequences related to the results. Besides meeting ergonomic requirements improvements in the quality management for product development, and safety management of people at workplaces are considered to be the major targets of software evaluation.

(a) Results from evaluations have not necessarily to explain the reasons for difficulties, as long as they provide practical tips and procedures to be followed for the removal of hindrances.

(b) Enterprises are particularly interested in results of evaluation procedures that can be implemented directly.

Besides meeting the ergonomic requirements potential improvements should be implemented immediately. If possible, external consultants should, according to the results, optimize the application of software. Improvements are considered to be possible in the organization of work as well in technical belongings.

A major requirement to handle results effectively is the possibility to actually introduce new concepts in an organization. In order to succeed in the implementation of improvements the reasons for hindrances should also become evident. From the point of

view of software ergonomics it is not so efficient to have a list of activities in order to remove possible hindrances, it is rather required to know why certain improvements have to be performed. Hence, the reasons for hindrances should also become transparent in the course of evaluation.

- (c) The qualification and education of software users is considered to be a means to reduce hindrances and problems in the course of interaction.

In enterprises sometimes people are educated in order to use software without failures. However, the technical possibilities should be explored extensively before education programs are developed. It could be cheaper to adapt existing software to user needs instead of trying to adapt people to software functions. Only those cases should be handled through skill management and education that can not be solved through technology. In particular, the use of standard software allows a wide range of adaptation to individual skills and needs. However, responsible persons in the enterprises tend to provide additional education in case of problems, instead of investigating adaptation features.

2.2 EU-CONform evaluation and design of VDU-work

Based on the results from the previous activities a novel technique has been developed to enable practitioners a straightforward, but sound measurement and redesign of VDU-workplaces. In the following we describe the methodology, the concept, and the measurements.

2.2.1 The Procedure

The application of the EU-CON technique is a novel, two step procedure, since it covers evaluation and (re)design: First, the users are guided through an evaluation procedure, in order to indicate troubles of usability. Then, evaluators (usually, ergonomists) help to identify the reason(s) for the troubles user are experiencing, and try to remove hindrances of effective and efficient interaction. As a consequence, the identification of hindrances leads to improvements at the VDU-work place. The improvement process is guided by a handbook to support this process actively.

According to its intentions EU-CON supports more than the traditional evaluation phases: preparation, execution, result preparation, rework. The latter phase is usually not part of an evaluation technique, e.g. see (Stary et al., 1995).

- (1) The *preparation phase* consists of briefing the users, handing out the questionnaires for evaluation, and task identification. The users are briefed by the supervising evaluator about the goals, contents, and the procedure of evaluation. Then, the users receive the questionnaires for the individual evaluation of the VDU-work. The questionnaires are accompanied by some information material, namely the briefing sheet and the manual for answering the questionnaires. The task identification has to be performed by the users themselves, since the questions allow any type of granularity. For instance, for a particular user text editing might be considered to be a relevant task to be evaluated, whereas report generation based on a text editing system might be a task for evaluation for another user. Both may use the same text editing software.

Both for the briefing and for the task identification tools are provided, namely the briefing sheet, and the manual for answering that guides the user through the entire identification and question-answering process. It contains for each of the questions up to five examples how to answer them, or how to identify critical issues, such as the tasks to be evaluated.

- (2) The *execution phase* follows the task identification and is performed by the end users. In case the briefing sheet and the manual does not provide sufficient explanation of the questions or input for answering the questions, the supervisor should be able to

advise the users filling out the forms. When the users have completed the questionnaires they return them to the supervisor who continues with the evaluation.

- (3) The *tuning phase* provides an integration of results. It is divided into a detailed evaluation of the questionnaires and an interpretation of the detailed results. Both activities are supported by tools, namely the handbook for evaluation and engineering. For the detailed evaluation of results hints to identify hindrances for certain types of answers are provided. For the interpretation of the results 'alert sheets' are provided. Each of these sheets contains a table with identifiers of the questions and the possible answers. Each option of a question is an identifier of a cell. Those cells are marked that identify options indicating troubles for end users. Hence, the evaluator is able to identify with one glance those 'hot spots' that requires further evaluation and/or redesign of the user interface. Hence, the second activity in this phase, namely the interpretation of the detailed results is supported in a straightforward way. The evaluator should be able to estimate effectively how much rework of the user interface is required.
- (4) The *rework phase* follows the identification of troubles. First, possible reasons for the troubles are identified. These may address the cognitive, social, organizational, and/or technical dimension of human-computer interaction. Each question indicating troubles is analyzed with the help of the handbook for evaluation and engineering. Once the evaluator has been able to identify the reasons for troublesome situations at the interface, the next step has to be a detailed discussion with the end user that have identified these troubles. Again, the handbook for evaluation is intended to support this step. It provides information which dimensions of the interaction should be discussed with the end user.

After agreeing what kind of improvements should be implemented at the user interface, these improvements have to put into practice. These improvements may either concern

- technical features, such as the handling of windows;
- the cognitive dimension, e.g., improving the help function;
- the social setting of the work place, e.g., the personal contact to other users;
- the organization of work, e.g., the transparency of data structures,

or a combination of the addressed dimensions. After having performed these improvements the evaluator is obliged to control whether they have been successful or not. In case the user still identifies problems accomplishing the intended tasks the rework activities have to be iterated, as long as the user indicates troublesome situations.

2.2.2 The Components and Tools

EU-CON consists of several components:

1. An Guide for Evaluation
2. A Handbook for Evaluation and Engineering.

The guide for evaluation consists of several parts: a questionnaire addressing the statements of the directive, the one-page information sheet for briefing, and the manual to facilitate the answering of the questions. The questionnaire comprises a set of questions for each of the five statements of the directive. In addition, general, questions about the participation of end users in the development process, the installation and planning phase, as well as about the experiences user rate themselves, are provided.

The one-page briefing sheet should be read by the users when being informed by the evaluator. It comprises the main idea of the evaluation as well as hints how to facilitate the identification of deficiencies. In particular, it refers to the national law for occupational health and safety and lists the five statements of the directive that have become part of law. The briefing concludes with some hints how to handle the questionnaire and references to help in case of troubles.

The manual contains all the questions of the questionnaire. Each of them is extended with typical answers user may give. It addresses particular application domains of software, such as office support or production processes. The first part of the questionnaire, namely the identification of user tasks has been emphasized. It provides examples for different levels of granularity, in order to qualify the users finding out the adequate level of abstraction to identify their task.

The handbook for evaluation and engineering consists of several parts:

- (a) background knowledge about the evaluation of user interfaces according to the EEC-directive and the regulations of the national law;
- (b) overview how to utilize the briefing sheet, the questionnaire, the manual and the handbook;
- (c) fundamental design principles and measurements from software ergonomics that are measured through the questionnaire;
- (d) the extended questionnaire with all questions and additional material. This material gives background to each of the questions and guides the evaluation and (re)design process. Finally, references to standards and fundamentals in human-computer interaction and software ergonomics are provided.

2.2.3 The Contents

For each of the statements in the directive a set of questions has been developed. The questions mostly involve particular principles addressed by the statements of the directive and has been based on the conceptual findings described in section 2. In addition, the empirically acquired requirements for instruments to be used in enterprises have been taken into account, in particular, concerning the ease of use.

For instance, task appropriateness for a particular task is measured through the question (among others): 'Do you think the task could be performed with less effort? Could you skip some information provided by the software, or change the functionality improving the effectiveness or efficiency of task accomplishment?' On one hand, users have the opportunity to suggest improvements as far as they know or think to know them. On the other hand, adequate solutions can be recognized, namely, in case the answer to these questions is 'no'. The handbook for evaluation and engineering captures both cases and guides the evaluator interpreting the answers. The end user is provided with sample answers in the accompanying manual of the evaluation guide.

The number of questions decreases from statement one to five of the directive. The reason for this fact is given through the redundancy of the principles that are affected.

First tests with the methodology have proven the benefits of the novel concepts. 70 people were involved in test cases. The test cases have been distributed equally over insurance companies, banks, production industries and trade companies. The tasks comprised

- office activities
- administration
- management
- software development and distribution
- trading.

The first tests have lead to improvements in the structure of the technique, in particular the guide for evaluation. Problems that had to be overcome concerned the understanding of questions concerning the events of starting task accomplishment, the transparency of workflows, and the adaptation towards the individual completion of tasks.

3 Conclusions

The standards, directives, and the methodologies for evaluating workplaces providing computer support are more or less isolated. Even when the development of an evaluation technique has been focused on the integration of different disciplines several problems occur:

1. *Terms and methods are not defined in an uniform way:* The terms and the methods may have different meanings. In order to avoid further diversification, clusters of principles have been identified, and different dimensions of VDU-work have been distinguished.
2. *Lack of empirical validation:* In most of the cases, empirical experiences are missing. This fact makes it difficult to compare evaluation techniques, in particular, if they do not stem from occupational psychology.

After having achieved the results mentioned above, a second Austrian project has been launched that has been targeted

- to capture the organizational and political constraints for the practical use of evaluation techniques
- to develop a technique for evaluation that meets the acquired constraints, takes into account the scientific results from the first project, and implements the EU-directive in a straightforward way.

The project has led to EU-CON, a technique that implements the directive on human-computer interaction in the required way. It relates existing work with the idea of the directive to improve occupational health at the VDU-workplace. However, the following novel concepts had to be implemented for holistic measurement and adequate redesign of user interfaces:

- *An additional phase for improvements:* EU-CON supports the (i) preparation of the evaluation, the (ii) acquisition of data, the (iii) evaluation and interpretation of results, and the (iv) controlled rework of VDU-workplace design. The last phase is not common for evaluation and engineering techniques. EU-CON bridges the gap between evaluation and redesign.
- *A structured set of tools properly designed for each of the phases,* and tuned for a smooth transition from measurement to redesign. Again, most of the techniques for engineering or evaluation focus either on proposing design principles or on implementing measurements. This conceptual bridge had to be captured.
- *Tasks have to be identified* for the measurement of suitability for tasks, the major measurement of the directive. Usually, it is assumed that a particular perspective capturing a particular granularity of tasks is sufficient to check task appropriateness. EU-CON supports individual adaptation, since the user is encouraged to identify his/her perception of tasks.
- *Applicability in any problem domain:* EU-CON can be utilized for any type of VDU-workplace. The adaptation towards each case is achieved by the task identification performed by the end users.

Summarizing the results, we have achieved insights into the practical use of existing techniques for evaluation and proposed a comprehensive evaluation and engineering technique that supports sufficient methodological and empirically valid input for evaluating and designing workplace equipped with interactive systems. Future activities will concentrate on checking the reliability, objectivity, and validity of this technique in a long term test.

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Austria: Work with Display Screen Equipment – Law and Practice

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1 Law

1.1 EU Display Screen Equipment Directive 90/270/EEC

Directive 90/270/EEC of 29 May 1990 on the minimum safety and health requirements for work with display screen equipment was adopted by the Council of the European Communities as the fifth individual Directive within the meaning of Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers. The Directive as implemented in Austria is the first measure of its type to give any substantial weight to the idea of worker protection in the office world.

1.2 Display screen work in the Employee Protection Act [ASchG]

1 January 1995: ArbeitnehmerInnenschutzgesetz (Employee Protection Act) - a set of basic legal requirements, including the main items from the various directives.

Sections 67, 68: general focus on display units (not all minimum health and safety requirements included, e.g. minimum standards in Annex, specific definition of breaks in daily work routine).

Details in the ArbeitnehmerInnenschutzgesetz will be gradually regulated through additional decrees.

Two sections (67 and 68) of the Federal Law on Safety and Health Protection at Work make reference to display screen work and Directive 90/270/EEC. The text of the law is quoted here (in italics) with comments on them.

Display screen workstations (Section 67 ASchG)

(1) A display screen within the meaning of this provision is a component with a screen for alphanumeric or graphic display, regardless of the display process employed. Display screen workstations within the meaning of this provision are workstations in which display screen equipment and the data input keyboard or other control unit and, if applicable, a data storage medium, form a functional unit.

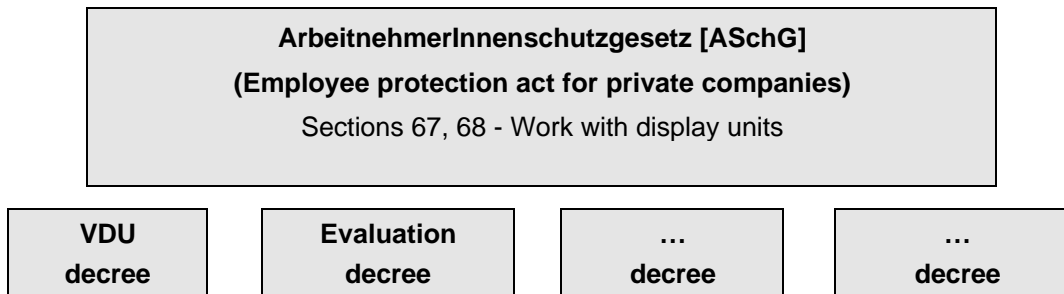


Figure 1.

(2) Employers are required to design display screen workstations in an ergonomic fashion. Only display screen equipment, input or data recording devices and peripheral appliances that are in line with the latest technological findings and that comply with ergonomic requirements may be used; suitable desks or work surfaces and seating are to be provided.

(3) Display screen workstations are to be dimensioned and designed so as to provide sufficient space for the user to change position and vary movements. Suitable lighting is to be provided so that reflection and glare are avoided.

When and how is ergonomic design necessary? The design requirements formulated here are based on the minimum requirements in the Annex to the Display Screen Equipment Directive. According to the Directive all existing workstations must meet these requirements by 31 December 1996 (Article 5 of Directive 90/270/EEC). Workstations installed after 31 December 1996 must meet these requirements immediately. The time and material requirements of the Directive are not taken over in their entirety in the ASchG. The material requirements will be included, at least to the minimum level set out in the Directive, in the forthcoming decree on display screen work (VDU decree). The draft version of the decree of 9 September 1996 has a different time frame, however, for meeting requirements, with a 1998 deadline for screen, keyboard and work desk, and an additional two years (until 2000) for software. All other provisions will be effective as soon as the decree comes into force.

(4) Paragraphs 2 and 3 are applicable to portable computers if they are regularly used at a workstation.

How do the provisions apply to portable computers? Computers used regularly in a single location are subject to the requirements in the Annex to the Directive. In this case there are clear design imperatives: for example, the requirement that the keyboard be "a separate unit from the screen" and that "the arrangement of the keyboard and the characteristics of the keys shall be such as to facilitate the use of the keyboard", thus calling for an additional external keyboard; or the requirement that the screen "must swivel and tilt easily and freely to suit the needs of the operator", which is only possible with an external monitor.

(5) *Deviations from paragraphs 2 and 3 are admissible where necessary with the following installations and devices, depending on their purpose and the work procedures involved:*

1. *drivers' cabs or control cabs for vehicles or machines*
2. *computer systems on board a means of transport*
3. *computer systems mainly intended for public use*
4. *calculators, cash registers and any equipment having a small data or measurement display required for direct use of the equipment*
5. *typewriters with displays*

What is a display screen workstation? Many of the provisions of the EU Directives are (with good reason) formulated in very general terms, but the definition of what is and what is not a display screen workstation is quite clear. Thus every workstation that fits the definition must be designed ergonomically. The installations listed in Section 67 paragraph 5 subparagraph 1 ASchG are merely deviations.

The frequently expressed implicit or explicit assumption that the employer's obligation to observe the minimum requirements concerning the ergonomic design of display screen workstations according to the definition in Section 67 ASchG depends on the amount of time spent every day at the workstation is not correct. Display screen workstations must always comply with the minimum requirements irrespective of how long a particular employee works at them.

(6) *Paragraphs 1, 2 except for the last sentence and 4 also apply to visual display equipment, input or data registration devices and peripheral appliances, work desks, work surfaces and seating provided to employees by employers to perform their work outside the workplace.*

Teleworking? This supplement to Section 67 was added when the ASchG was modified at the end of 1996. It is designed to ensure that visual display equipment and other appliances used for teleworking also comply with the technical requirements. The ruling does not refer to the workstation environment, e.g. lighting and illumination.

Special measures for display screen work (Section 68 ASchG)

(1) *Particular account is also to be taken in the analysis and evaluation of risks of the possible deterioration of eyesight, and of physical and mental stresses. Suitable measures are to be taken on the basis of this analysis and evaluation to exclude such risks with account taken of the combined effect of the risks.*

What stresses are to be analysed and evaluated? The Directive explicitly includes not only physical but also mental stresses, which must be taken into account when analysing and evaluating the risks and devising appropriate remedies. This results from the fact that computer work involves minimal physical activity but high cognitive requirements. The analysis of physical stresses should at the very least take into account the criteria in the Annex to the Directive concerning information processing by humans (cognitive ergonomics). However, possible mental stress factors go far beyond the cognitive level and include work procedures and psychosocial aspects.

(2) *Employers must take account of the following factors when designing, selecting, introducing and modifying software and when designing activities in which visual display equipment is used:*

1. *The software must be adapted to the work being performed.*
2. *The software must be user-friendly and if necessary adapted to the knowledge and experience of the users.*
3. *The systems must offer employees information on the processes taking place.*

4. *The systems must present the information in a format and at a speed adapted to the users.*
5. *The principles of ergonomics are to be applied in particular to the processing of information by persons.*

What are the requirements for software? This formulation clearly distinguishes between two sets of circumstances. Employers must either see that software ordered by them for use by employees is developed (designed, modified) individually with account taken of the ASchG and decree requirements, or else they must take account of these requirements when selecting software. The factors refer for the most part to ergonomic aspects (interaction), which are based on cognitive psychology principles (perception, memory, thought, learning, etc.). The contents of ISO 9241 Parts 10 to 17 and EN 29241 Parts 10 to 17 are helpful in this respect.

(3) The following applies to employees who use visual display equipment for a significant part of their normal work:

What provisions depend on the length of time spent at the screen? The following provisions (Section 68 paragraph 5 subparagraphs 1 to 4 ASchG) are not relevant to all employees but only to those for whom the criterion "a significant part" applies. The definition of "a significant part" should be clarified in the decree. The draft version of 9 September 1996 defines a "significant part" as two hours.

1. *Employers must plan activities in such a way that the daily work on a display screen is periodically interrupted by breaks or changes of activity reducing the workload at the display screen.*

When are changes of activity/breaks required? In the past the requirement for breaks from display screen work could be defined by inspectors pursuant to Section 11 paragraph 7 AZG. This definition was based in specific instances on the establishment with the involvement of a medical expert of the negative physical or mental effects caused and explained by the specific work in question (i.e. over and above the average amounts to which an employee is exposed) and hence of the pauses for regeneration necessary as a result. With the new requirements in the ASchG the employer is obliged to infer the appropriate measures on the basis of an analysis and assessment of the risks presented by display screen workstations. These measures should, as far as possible, be based on the minimum requirements defined in the ASchG and VDU decree and on scientific findings in the field of workplace design. The "workstation analyses" will show how much time is spent every day at the display screen and whether there is a relevant (legal or work) threshold after which a period for regeneration (change of activity, break) is required. The results of these analyses and appraisals and the measures taken as a result must be recorded in the safety and health protection documents.

2. *Employees are entitled to an eye and eyesight examination before commencing display screen work, at regular intervals thereafter and if they experience visual difficulties that may be due to display screen work.*
3. *Employees are entitled to an ophthalmological examination if the results of the test referred to in paragraph 2 show that this is necessary.*
4. *Employees are to be provided with special corrective appliances if the results of the tests referred to in paragraphs 2 and 3 show that these are necessary.*

When are workers entitled to eye tests/corrective appliances? The text of Section 68 paragraph 3 subparagraphs 2 to 4 ASchG is practically identical to that of the Directive. Further details are provided in the decree. These regulations are not relevant to all employees but depend on the degree of utilisation of the display screen compared with the total activity. In other words, the employer is not obliged to arrange a series of eye tests. The regulation merely grants employees a right that must be actively asserted by them.

- (4) *Measures taken pursuant to paragraph 3 subparagraphs 3 to 4 may in no circumstances involve employees in additional financial cost.*

Who pays for eye tests/corrective appliances? Although employees may not incur any costs as a result of these measures, there is not yet sufficient indication as to who should pay for them and to what extent. It is expected that the decree will contain provisions to this effect. In this context mention is made in particular of the recent discussion on spectacles for visual display units, which must be adapted specifically to the distance from the monitor and requirements for working at the machine.

- (5) *Paragraph 2 is not applicable to portable computers that are not used regularly at the workstation.*
- (6) *Paragraph 2 is only applicable to installations and devices listed in Section 67 paragraph 5 in so far as it does not conflict with the nature or purpose of the installation or the type of work performed.*
- (7) *Paragraph 2 also applies to display screen work outside the place of work.*

A modification at the end of 1996 added to paragraph 7 the requirement for ergonomic software design for teleworking and workstations with display screen in the home.

1.3 VDU decree

The VDU decree has not yet been implemented. The following points in the Directive 90/270/EEC and Sections 67 and 68 above remain to be clarified.

1. Regulations concerning "a significant part" of daily work at a display screen (effect on change of activity/breaks, eye tests, corrective appliances).
2. All minimum requirements on workstation design and work environment contained in the Annex to the Directive.

Table 1.

	Traditional Austrian Approach	New European Approach
Legislation	complete and specific details on "right" and "wrong"	general aims and goals to be implemented individually
Value	partially integrated at company level through responsibility of individual prevention specialists, no company principle, obligation with limited expense and less identification	generally integrated in the company structure through general responsibility, obligation with considerable expense and much resistance
Role of supervisory bodies	clear control and decision powers, less freedom for interpretation, less conflict potential,	unclear control and decision powers, more freedom for interpretation, large conflict potential
Role of employers and employees	clear regulations for action, less need to understand, reactive and passive role, less fear of doing wrong	unclear regulations for action, higher need and less willingness to understand, active and self-managing role, fear of doing wrong
VDU	piecemeal legislation, no overall value	global legislation and value

2 Practice

2.1 Philosophical background

The conflict: legislation normally reflects traditional cultural values. The importation of EU directives on minimum health and safety requirements also entails the importation of a foreign legislation philosophy.

2.2 Consequences for legislation and implementation in general

1. Ongoing basic discussion on the elaboration of the Austrian VDU decree between traditional approach "you must do this" (e.g. including "cm") and new approach "you have to reach this aim" (e.g. excluding "cm").
2. General discussion of the material aspects of VDU ergonomics (equipment and environment) and minimal discussion of immaterial aspects such as psychological stress ("We don't need psychoanalysis at work!") and software ergonomics ("What's that?")

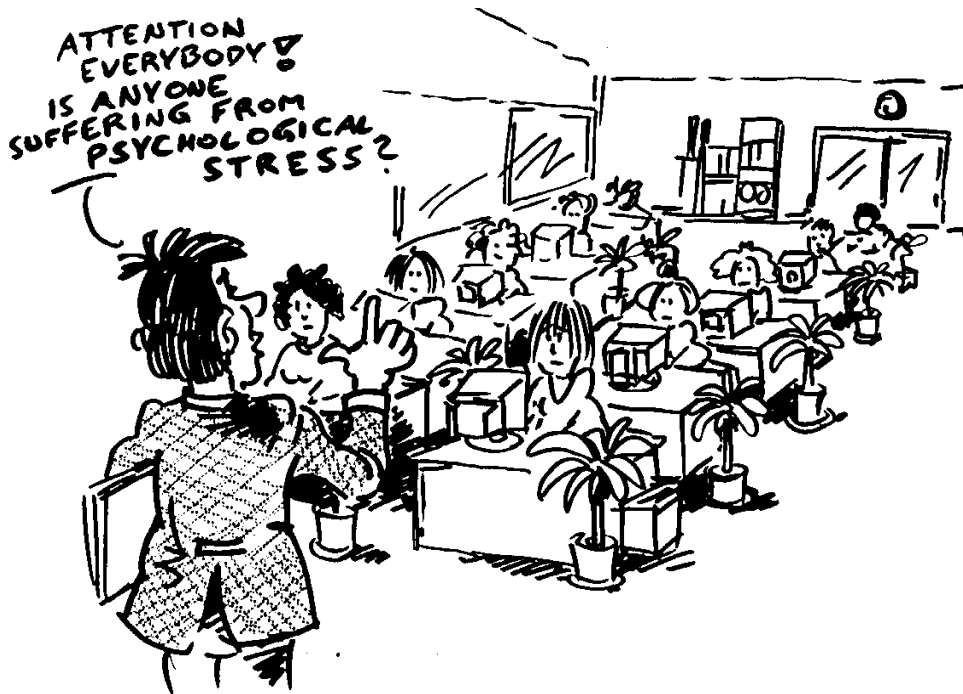


Figure 2.

The draft VDU decree of September 1996 and the discussion leading up to it reflect the conflict of interests concerning the interpretation of the EU Directives, which also characterises the fundamental debate on the ASchG.

- Instead of defining and explaining the protection goals (which would require an understanding of the context) a "recipe" strategy is pursued, preventing the development of a fundamental understanding of the problem.
- Through limitation to the apparently "correct" and "essential", legally valid but in some cases incorrect solutions are produced, as the ergonomic result depends on numerous interactions.
- Technically oriented definitions and formulae are offered. These are frequently difficult for the layman to understand and put into practice (character size in mm multiplied by 170 gives maximum admissible distance from screen).
- There is no allowance for the "human factor" and interactions. The fact that man is not only a physical but also a mental entity and that worker protection involves not only technical but also organisational and social parameters is repeatedly emphasised in the Directives, in relevant EU commentaries and in the ASchG, but is not reflected in the draft VDU decree.
- The mental strain connected with software is the only aspect not to be excluded, although the proposed time scale for implementation of software requirements offers a pseudo-advantage for the companies concerned: any company developing software or having it developed must commence immediately afterwards with evaluating and dealing with the mistakes it has itself caused.

Consequences for workplace analysis

The evaluation difficulties are a typical example of the comprehension problems surrounding the ASchG. The evaluation debate is characterised by terms such as "as simple as possible", "as short as possible" and "as cheap as possible" rather than "as sensible as possible for our needs" and "as useful as possible for our objectives". The quality of the evaluation methods (e.g. checklists, test lists) is measured in terms of length and simplicity and not in terms of the corporate utility that might be achieved.

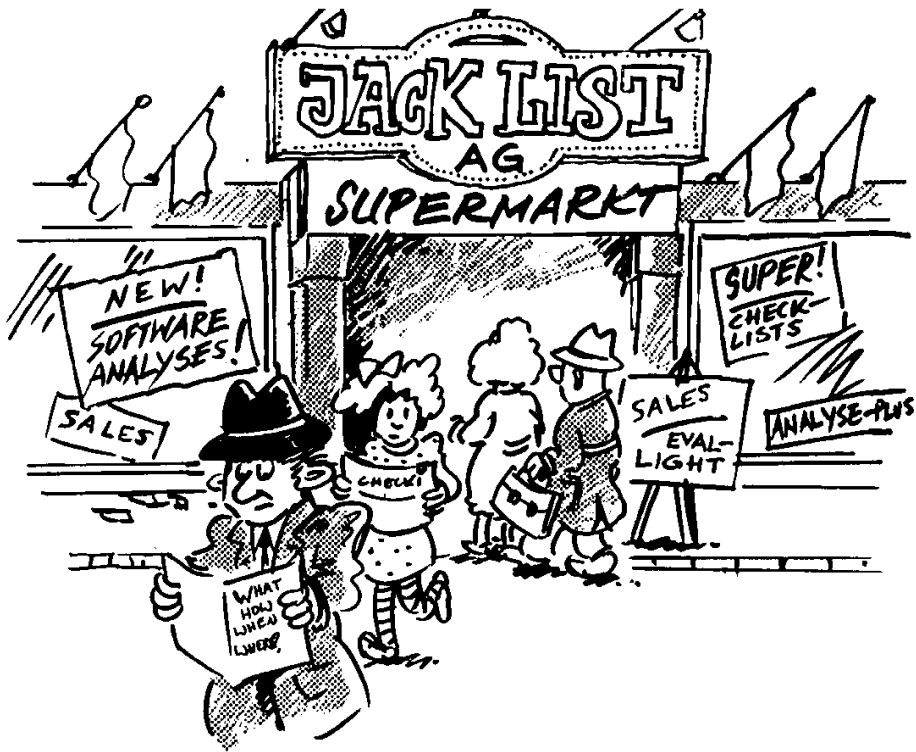


Figure 3.

1. Many companies are waiting for the VDU decree in the hope that it will provide clear guidelines.
2. Growing market for checklists, software products or guidelines for workplace evaluation in general
3. Growing number of self-made "evaluation experts" (all that is needed is a checklist and crash course)
4. Software ergonomics and psychological stress quietly ignored
5. Less discussion on organisational planning, project management and quality of evaluation
6. No gold rush for experts and consultants because the know-how appears to be readily available in form of checklists

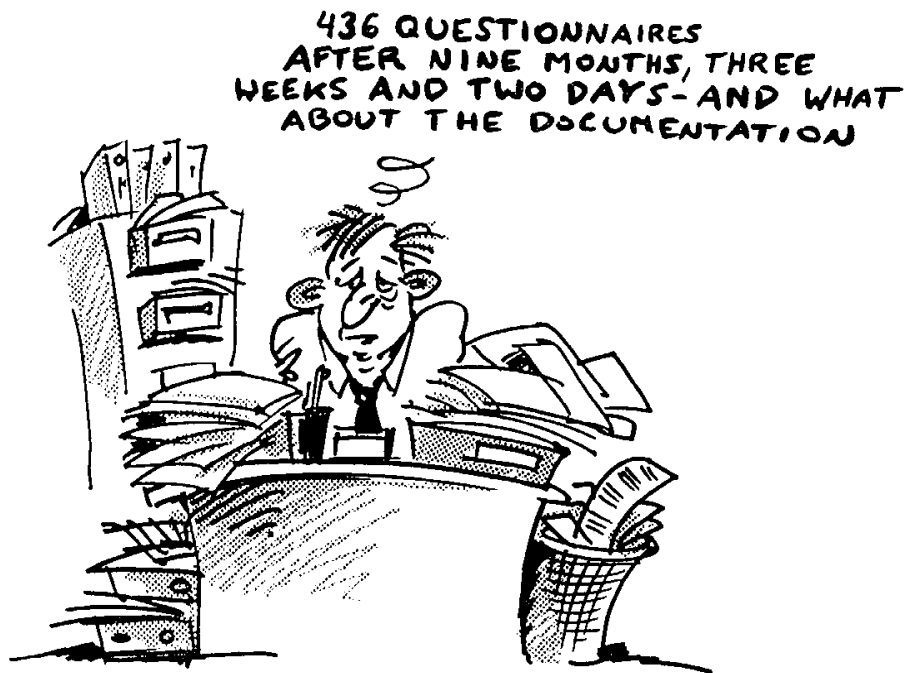


Figure 4.

Consequences for manufacturers and office planners

1. Greater awareness by office product manufacturers and office designers because of pressure from customers, ergonomics as a selling point
2. Less problem awareness by technical hardware sellers (import of MPR II, TCO, TÜV certified products is normal standard) and architects
3. No awareness by software manufacturers (customers know nothing about software ergonomics and therefore do not ask for it)

3 Conclusions and Hopes

Regulation – insight – stimulus

Employers often see the demands made on them by the law as a bureaucratic bloody-mindedness. The typical reaction, a "work-to-rule" attitude, does not serve the purposes of the law nor of the company itself. Legal requirements cost time and money and it ought to be in the interests of every company to obtain some return on this investment.

European surveys confirm that legal regulations often form the primary stimulus for increasing commitment in company health and safety. Europe's companies indicate that such measures, once they have been implemented, have a positive impact on health data, absenteeism, staff motivation, productivity and other factors (European Foundation for the Improvement of Living and Working Conditions: Assessing Working Conditions – The European Practice, Dublin, 1996).



Figure 5.

Evaluation = monitoring of health and safety

Even if this legal framework did not exist, it ought to be in the interests of every company to protect its human resources, which are expensive and valuable, and to prevent any "wear and tear" losses. This is particularly true of highly skilled workers who in a "lean" company are required to show greater flexibility and initiative than hitherto. In addition, the number of services requiring independent action is growing, making workplace quality an increasingly important component of service quality.

It is poor business practice to conclude service agreements for machines and appliances and to service them regularly, to complain of technical breakdowns and faults while failing at the same time to devote equal attention to the most expensive resource in a company, namely the human resource. The analysis of risks and the identification of measures within the meaning of the ASchG (evaluation) should be seen as an opportunity. The interpretation of the Employee Protection Act would be on completely the wrong track if it were restricted exclusively to formal questions (which recipe, which evaluation technique) without any account being taken of the content and purpose.

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Appendix

German Version of the EU Directive 90/270/EEC

Richtlinie des Rates über die Mindestvorschriften bezüglich der Sicherheit und des Gesundheitsschutzes bei der Arbeit an Bildschirmgeräten (Fünfte Einzelrichtlinie im Sinne von Artikel 16 Absatz 1 der Richtlinie 89/391/EWG) (90/270/EWG)

DER RAT DER EUROPÄISCHEN GEMEINSCHAFTEN --- gestützt auf den Vertrag zur Gründung der Europäischen Wirtschaftsgemeinschaft, insbesondere auf Artikel 118a, auf Vorschlag der Kommission, erstellt nach Anhörung des Beratenden Ausschusses für Sicherheit, Arbeitshygiene und Gesundheitsschutz am Arbeitsplatz, in Zusammenarbeit mit dem Europäischen Parlament, nach Stellungnahme des Wirtschafts und Sozialausschusses, in Erwägung nachstehender Gründe:

In Artikel 118a des EWG-Vertrages ist vorgesehen, daß der Rat durch Richtlinien Mindestvorschriften festlegt, die die Verbesserung insbesondere der Arbeitsumwelt fördern, um die Sicherheit und die Gesundheit der Arbeitnehmer verstärkt zu schützen. Nach demselben Artikel sollen diese Richtlinien keine verwaltungsmäßigen, finanziellen und rechtlichen Auflagen vorschreiben, die der Gründung und Entwicklung von Klein- und Mittelbetrieben entgegenstehen.

Die Mitteilung der Kommission über ihr Aktionsprogramm für Sicherheit, Arbeitshygiene und Gesundheitsschutz am Arbeitsplatz sieht die Verabschiedung von Maßnahmen im Hinblick auf die neuen Technologien vor. Der Rat hat dies in seiner EntschlieÙung vom 21. Dezember 1987 über Sicherheit, Arbeitshygiene und Gesundheitsschutz am Arbeitsplatz zur Kenntnis genommen.

Die Einhaltung der Mindestvorschriften zur Sicherstellung eines höheren MaÙes an Sicherheit an Bildschirmarbeitsplätzen ist eine unabdingbare Voraussetzung für die Gewährleistung der Sicherheit und des Gesundheitsschutzes der Arbeitnehmer.

Diese Richtlinie ist eine Einzelrichtlinie im Sinne von Artikel 16 Absatz 1 der Richtlinie 89/391/EWG vom 12. Juni 1989 über die Durchführung von Maßnahmen zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Arbeitnehmer bei der Arbeit. Die Bestimmungen der letztgenannten Richtlinie finden daher unbeschadet strengerer und/oder spezifischer Bestimmungen der vorliegenden Richtlinie in vollem Umfang auf die Benutzung von Bildschirmgeräten durch Arbeitnehmer Anwendung.

Die Arbeitgeber sind verpflichtet, sich über den neuesten Stand der Technik und der wissenschaftlichen Erkenntnisse auf dem Gebiet der Gestaltung der Arbeitsplätze zu informieren, um etwa erforderliche Änderungen vorzunehmen und damit eine bessere Sicherheit und einen besseren Gesundheitsschutz der Arbeitnehmer gewährleisten zu können. An Bildschirmarbeitsplätzen sind die ergonomischen Aspekte besonders wichtig. Diese Richtlinie leistet einen konkreten Beitrag zur Verwirklichung der sozialen Dimension des Binnenmarktes.

Gemäß dem Beschluß 74/325/EWG wird der Beratende Ausschuß für Sicherheit, Arbeitshygiene und Gesundheitsschutz am Arbeitsplatz im Hinblick auf die Ausarbeitung von Vorschlägen auf diesem Gebiet von der Kommission gehört

HAT FOLGENDE RICHTLINIE ERLASSEN:

Artikel 1: Zielsetzung

(1) Diese Richtlinie ist die fünfte Einzelrichtlinie im Sinne von Artikel 16 Absatz 1 der Richtlinie 89/391/EWG. Sie legt Mindestvorschriften in bezug auf die Sicherheit und den Gesundheitsschutz bei der Arbeit an Bildschirmgeräten im Sinne von Artikel 2 fest.

(2) Die Richtlinie 89/391/EWG findet unbeschadet strengerer und/oder spezifischer Bestimmungen der vorliegenden Richtlinien in vollem Umfang auf den gesamten in Absatz 1 genannten Bereich Anwendung.

(3) Diese Richtlinie gilt nicht für

- a) Fahrer- bzw. Bedienerplätze von Fahrzeugen und Maschinen;
- b) Datenverarbeitungsanlagen an Bord eines Verkehrsmittels;
- c) Datenverarbeitungsanlagen, die hauptsächlich zur Benutzung durch die Öffentlichkeit bestimmt sind;
- d) sogenannte „tragbare“ Datenverarbeitungsanlagen, sofern sie nicht regelmäßig an einem Arbeitsplatz eingesetzt werden;
- e) Rechenmaschinen, Registrierkassen und Geräte mit einer kleinen Daten- oder Meßwertanzeigevorrichtung, die zur direkten Benutzung des Geräts erforderlich ist;
- f) Schreibmaschinen klassischer Bauart, sogenannte „Display-Schreibmaschinen“.

Artikel 2: Begriffsbestimmungen

Im Sinne dieser Richtlinie gilt als:

- a) Bildschirm: Schirm zur Darstellung alphanumerischer Zeichen oder zur Grafikdarstellung, ungeachtet des Darstellungsverfahrens;
- b) Arbeitsplatz: Bildschirmgerät, das gegebenenfalls mit einer Tastatur oder einer Datenerfassungsvorrichtung und/oder einer die Mensch-Maschine-Schnittstelle bestimmenden Software, optionalen Zusatzgeräten, Anlagenelementen einschließlich Diskettenlaufwerk, Telefon, Modem, Drucker, Manuskriphalter, Sitz und Arbeitstisch oder Arbeitsfläche ausgerüstet ist, sowie die unmittelbare Arbeitsumgebung;
- c) Arbeitnehmer: jeder Arbeitnehmer im Sinne von Artikel 3 Buchstabe a) der Richtlinie 89/391/EWG, der gewöhnlich bei einem nicht unwesentlichen Teil seiner normalen Arbeit ein Bildschirmgerät benutzt.

Artikel 3: Arbeitsplatzanalyse

(1) Der Arbeitgeber ist verpflichtet, eine Analyse der Arbeitsplätze durchzuführen, um die Sicherheits- und Gesundheitsbedingungen zu beurteilen, die dort für die beschäftigten Arbeitnehmer vorliegen; dies gilt insbesondere für die mögliche Gefährdung des Sehvermögens sowie für körperliche Probleme und psychische Belastungen.

(2) Der Arbeitgeber muß auf der Grundlage der Analyse gemäß Absatz 1 zweckdienliche Maßnahmen zur Ausschaltung der festgestellten Gefahren treffen, wobei er die Addition

und/oder die Kombination der Wirkungen der festgestellten Gefahren zu berücksichtigen hat.

Artikel 4: Erstmals in Betrieb genommene Arbeitsplätze

Der Arbeitgeber muß die zweckdienlichen Maßnahmen treffen, damit Arbeitsplätze, die nach dem 31. Dezember 1992 erstmals in Betrieb genommen werden, die im Anhang genannten Mindestvorschriften erfüllen.

Artikel 5: Bereits in Betrieb befindliche Arbeitsplätze

Der Arbeitgeber muß die zweckdienlichen Maßnahmen treffen, damit die Arbeitsplätze, die bereits vor dem 31. Dezember 1992 in Betrieb genommen wurden, so gestaltet werden, daß sie spätestens vier Jahre nach diesem Zeitpunkt die im Anhang genannten Mindestvorschriften erfüllen.

Artikel 6: Unterrichtung und Unterweisung der Arbeitnehmer

(1) Unbeschadet des Artikels 10 der Richtlinie 89/391/EWG sind die Arbeitnehmer umfassend über alle gesundheits- und sicherheitsrelevanten Fragen im Zusammenhang mit ihrem Arbeitsplatz und insbesondere über die für die Arbeitsplätze geltenden Maßnahmen, die gemäß Artikel 3 sowie gemäß den Artikeln 7 und 9 durchgeführt werden, zu unterrichten.

In jedem Fall sind die Arbeitnehmer oder die Arbeitnehmervertreter über alle gesundheits- und sicherheitsrelevanten Maßnahmen, die gemäß der vorliegenden Richtlinie getroffen werden, zu unterrichten.

(2) Unbeschadet des Artikels 12 der Richtlinie 89/391/EWG ist jeder Arbeitnehmer außerdem vor Aufnahme seiner Tätigkeit am Bildschirm und bei jeder wesentlichen Veränderung der Organisation des Arbeitsplatzes im Umgang mit dem Gerät zu unterweisen.

Artikel 7: Täglicher Arbeitsablauf

Der Arbeitgeber ist verpflichtet, die Tätigkeit des Arbeitnehmers so zu organisieren, daß die tägliche Arbeit an Bildschirmgeräten regelmäßig durch Pausen oder andere Tätigkeiten unterbrochen wird, die die Belastung durch die Arbeit an Bildschirmgeräten verringern.

Artikel 8: Anhörung und Beteiligung der Arbeitnehmer

Die Arbeitnehmer und/oder die Arbeitnehmervertreter werden gemäß Artikel 11 der Richtlinie 89/391/EWG zu den unter die vorliegende Richtlinie sowie deren Anhang fallenden Fragen gehört und an ihrer Behandlung beteiligt.

Artikel 9: Schutz der Augen und des Sehvermögens der Arbeitnehmer

(1) Die Arbeitnehmer haben das Recht auf eine angemessene Untersuchung der Augen und des Sehvermögens durch eine Person

mit entsprechender Qualifikation, und zwar:

vor Aufnahme der Bildschirmarbeit,

anschließend regelmäßig und

bei Auftreten von Sehbeschwerden, die auf die Bildschirmarbeit zurückgeführt werden können.

(2) Die Arbeitnehmer haben das Recht auf eine augenärztliche Untersuchung, wenn sich dies aufgrund der Ergebnisse der Untersuchung gemäß Absatz 1 als erforderlich erweist.

(3) Den Arbeitnehmern sind spezielle Sehhilfen für die betreffende Arbeit zur Verfügung zu stellen, wenn die Ergebnisse der Untersuchung gemäß Absatz 1 oder der Untersuchung gemäß Absatz 2 ergeben, daß sie notwendig sind und normale Sehhilfen nicht verwendet werden können.

(4) Die gemäß diesem Artikel getroffenen Maßnahmen dürfen in keinem Fall zu einer finanziellen Mehrbelastung der Arbeitnehmer führen.

(5) Der Schutz der Augen und des Sehvermögens der Arbeitnehmer kann Bestandteil eines nationalen Gesundheitsfürsorgesystems sein.

Artikel 10: Anpassung des Anhangs

Rein technische Anpassungen des Anhangs unter Berücksichtigung des technischen Fortschritts, der Entwicklung der internationalen Vorschriften oder Spezifikationen oder des Wissensstands auf dem Gebiet der Bildschirmgeräte werden nach dem Verfahren des Artikels 17 der Richtlinie 89/391/EWG vorgenommen.

Artikel 11: Schlußbestimmungen

(1) Die Mitgliedstaaten erlassen die erforderlichen Rechts- und Verwaltungsvorschriften, um dieser Richtlinie spätestens am 31. Dezember 1992 nachzukommen.

Sie setzen die Kommission davon unverzüglich in Kenntnis.

(2) Die Mitgliedstaaten teilen der Kommission den Wortlaut der innerstaatlichen Rechtsvorschriften mit, die sie in dem unter diese Richtlinie fallenden Bereich erlassen haben bzw. erlassen.

(3) Die Mitgliedstaaten erstatten der Kommission alle vier Jahre Bericht über die praktische Anwendung der Bestimmungen dieser Richtlinie und geben dabei die Standpunkte der Sozialpartner an.

Artikel 12:

Die Kommission unterrichtet das Europäische Parlament, den Rat, den Wirtschafts- und Sozialausschuß sowie den Beratenden Ausschuß für Sicherheit, Arbeitshygiene und Gesundheitsschutz am Arbeitsplatz davon. (4) Die Kommission legt dem Europäischen Parlament, dem Rat und dem Wirtschafts- und Sozialausschuß regelmäßig einen Bericht über die Anwendung dieser Richtlinie unter Berücksichtigung der Absätze 1, 2 und 3 vor.

Diese Richtlinie ist an die Mitgliedstaaten gerichtet.

Geschehen zu Brüssel am 29. Mai 1990.

Im Namen des Rates

Anhang zur Bildschirmrichtlinie:

MINDESTVORSCHRIFTEN

Mai 1990

Einleitende Bemerkung

Die Auflagen dieses Anhangs gelten im Hinblick auf die Verwirklichung der Ziele dieser Richtlinie und insoweit, als zum einen die entsprechenden Gegebenheiten am Arbeitsplatz bestehen und zum anderen die spezifischen Erfordernisse oder Merkmale der Tätigkeit dem nicht entgegenstehen.

GERÄT

a) Allgemeine Bemerkung

Die Benutzung des Gerätes als solche darf keine Gefährdung der Arbeitnehmer mit sich bringen.

b) Bildschirm

Die auf dem Bildschirm angezeigten Zeichen müssen scharf und deutlich, ausreichend groß und mit angemessenem Zeichen- und Zeilenabstand dargestellt werden. Das Bild muß stabil und frei von Flimmern sein und darf keine Instabilität anderer Art aufweisen. Die Helligkeit und/oder der Kontrast zwischen Zeichen und Bildschirmhintergrund müssen leicht vom Benutzer eingestellt und den Umgebungsbedingungen angepaßt werden können. Der Bildschirm muß zur Anpassung an die individuellen Bedürfnisse des Benutzers frei und leicht drehbar und neigbar sein. Ein separater Ständer für den Bildschirm oder ein verstellbarer Tisch kann ebenfalls verwendet werden. Der Bildschirm muß frei von Reflexen und Spiegelungen sein, die den Benutzer stören können.

c) Tastatur

Die Tastatur muß neigbar und eine vom Bildschirm getrennte Einheit sein, damit der Benutzer eine bequeme Haltung einnehmen kann, die Arme und Hände nicht ermüdet. Die Fläche vor der Tastatur muß ausreichend sein, um dem Benutzer ein Auflegen von Händen und Armen zu ermöglichen. Zur Vermeidung von Reflexen muß die Tastatur eine matte Oberfläche haben. Die Anordnung der Tastatur und die Beschaffenheit der Tasten müssen die Bedienung der Tastatur erleichtern. Die Tastenbeschriftung muß sich vom Untergrund deutlich genug abheben und bei normaler Arbeitshaltung lesbar sein.

d) Arbeitstisch oder Arbeitsfläche

Der Arbeitstisch bzw. die Arbeitsfläche muß eine ausreichend große und reflexionsarme Oberfläche besitzen und eine flexible Anordnung von Bildschirm, Tastatur, Schriftgut und sonstigen Arbeitsmitteln ermöglichen. Der Manuskriphalter muß stabil und verstellbar sein und ist so einzurichten, daß unbequeme Kopf- und Augenbewegungen soweit wie möglich eingeschränkt werden. Ausreichender Raum für eine bequeme Arbeitshaltung muß vorhanden sein.

e) Arbeitsstuhl

Der Arbeitsstuhl muß kippsicher sein, darf die Bewegungsfreiheit des Benutzers nicht einschränken und muß ihm eine bequeme Haltung ermöglichen. Die Sitzhöhe muß verstellbar sein. Die Rückenlehne muß in Höhe und Neigung verstellbar sein. Auf Wunsch ist eine Fußstütze zur Verfügung zu stellen.

UMGEBUNG

a) Platzbedarf

Der Arbeitsplatz ist so zu bemessen und einzurichten, daß ausreichend Platz vorhanden ist, um wechselnde Arbeitshaltungen und -bewegungen zu ermöglichen.

b) Beleuchtung

Die allgemeine Beleuchtung und/oder die spezielle Beleuchtung (Arbeitslampen) sind so zu dimensionieren und anzuordnen, daß zufriedenstellende Lichtverhältnisse und ein ausreichender Kontrast zwischen Bildschirm und Umgebung im Hinblick auf die Art der Tätigkeit und die sehkraftbedingten Bedürfnisse des Benutzers gewährleistet sind. Störende Blendung und Reflexe oder Spiegelungen auf dem Bildschirm und anderen Ausrüstungsgegenständen sind durch Abstimmung der Einrichtung von Arbeitsraum und Arbeitsplatz auf die Anordnung und die technischen Eigenschaften künstlicher Lichtquellen zu vermeiden.

c) Reflexe und Blendung

Bildschirmarbeitsplätze sind so einzurichten, daß Lichtquellen wie Fenster und sonstige Öffnungen, durchsichtige oder durchscheinende Trennwände sowie helle Einrichtungsgegenstände und Wände keine Direktblendung und möglichst keine Reflexion auf dem Bildschirm verursachen. Die Fenster müssen mit einer geeigneten verstellbaren Lichtschutzvorrichtung ausgestattet sein, durch die sich die Stärke des Tageslichteinfalls auf den Arbeitsplatz vermindern läßt.

d) Lärm

Dem Lärm, der durch die zum Arbeitsplatz (zu den Arbeitsplätzen) gehörenden Geräte verursacht wird, ist bei der Einrichtung des Arbeitsplatzes Rechnung zu tragen, insbesondere um eine Beeinträchtigung der Konzentration und Sprachverständlichkeit zu vermeiden.

e) Wärme

Die zum Arbeitsplatz (zu den Arbeitsplätzen) gehörenden Geräte dürfen nicht zu einer Wärmezunahme führen, die auf die Arbeitnehmer störend wirken könnte.

f) Strahlungen

Alle Strahlungen mit Ausnahme des sichtbaren Teils des elektromagnetischen Spektrums müssen auf Werte verringert werden, die vom Standpunkt der Sicherheit und des Gesundheitsschutzes der Arbeitnehmer unerheblich sind.

g) Feuchtigkeit

Es ist für ausreichende Luftfeuchtigkeit zu sorgen.

MENSCH-MASCHINE-SCHNITTSTELLE

Bei Konzipierung, Auswahl, Erwerb und Änderung von Software sowie bei der Gestaltung von Tätigkeiten, bei denen Bildschirmgeräte zum Einsatz kommen, hat der Arbeitgeber folgenden Faktoren Rechnung zu tragen:

a) Die Software muß der auszuführenden Tätigkeit angepaßt sein.

- b) Die Software muß benutzerfreundlich sein und gegebenenfalls dem Kenntnis- und Erfahrungsstand des Benutzers angepaßt werden können; ohne Wissen des Arbeitnehmers darf keinerlei Vorrichtung zur quantitativen oder qualitativen Kontrolle verwendet werden.
- c) Die Systeme müssen den Arbeitnehmern Angaben über die jeweiligen Abläufe bieten.
- d) Die Systeme müssen die Information in einem Format und in einem Tempo anzeigen, das den Benutzern angepaßt ist.
- e) Die Grundsätze der Ergonomie sind insbesondere auf die Verarbeitung von Informationen durch den Menschen anzuwenden.