

The EU directive 90/270 on VDU-work : a European state-of-the-art overview : report over the situation in Germany

Citation for published version (APA):

Rauterberg, G. W. M., & Krueger, H. (2000). *The EU directive 90/270 on VDU-work : a European state-of-the-art overview : report over the situation in Germany*. (IPO rapport; Vol. 1230). Technische Universiteit Eindhoven.

Document status and date:

Published: 01/01/2000

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

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

Report over the situation in

Germany

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

edited by

Matthias Rauterberg and Helmut Krueger

IPO report no. 1230

Technical University Eindhoven

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

"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 author 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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Germany: Safety and Health when Working with Display Units – Challenges of the EU Directive

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Abstract

This paper is about the current (1996) situation of German legislation regarding the European Directive on safety and health when working with display screen equipment. After a brief review of the main issues and implications of the directive in general, its challenges from a German perspective are described. In the second part of this paper the *SANUS* initiative of the Ministry of Education, Science, Research and Technology is presented. This project is aimed at national information dissemination and substantial support of organisations which want to start up work place assessments according to the European Directive 90/270/EEC.

Keywords: work requirements, work environment, work organisation, health and safety, satisfaction, productivity, usability, hardware, software, German legislation, *SANUS*

1 The Directive in a Nutshell

The EU Council Directive 90/270/EEC of 29 May 1990 "on the minimum safety and health requirements for work with display screen equipment" is the fifth individual directive as referred to in Article 16 (1) of directive 89/391/EEC. By adopting the directive, the member states of the European Union have obliged themselves to "bring into force the laws, regulations and administrative provisions to comply with this Directive" in their respective countries. They shall also "report to the Commission every four years on the practical implementation of the provisions of this Directive, indicating the points of view of employers and workers".

Approaching the end of the first four-year reporting period, this workshop may be considered an informal get-together of national representatives who are in some way strongly involved with the practical implementation meant above. Of course, the workshop can not and will not replace each nation's formal reporting obligations and

procedures, it may however indirectly contribute to this activity by the presentation, discussion and comparison of the different implementation policies and practices in European countries. This paper is about the current situation in Germany, i.e. in the middle of 1996.

Initially, ambiguity and vagueness in the directive - either real or in the eyes of the beholder (Stewart et al., 1995) - caused a lot of uncertainty and confusion within the responsible bodies as well as among employers and employees. In the meantime however, through public discussions, constructive proposals and various activities, the goal of implementing the directive in legislation, in administration, in organisations as well as in industry has come much nearer and the aforementioned feelings of uncertainty and confusion have been reduced to a large extent, although not yet completely eliminated.

The directive sets lower bounds on safety and health conditions at work places with VDU's and formulates procedures to guarantee that violations of these requirements are either prevented or else systematically detected and removed. When an employer "habitually uses display screen equipment as a significant part of his normal work" (Article 2, c), then the employer is obliged to perform an analysis of the work place, "particularly as regards possible risks to eyesight, physical problems and problems of mental stress" (Article 3, 1). Also they will have to "take appropriate measures to remedy the risks found" (Article 3, 1). Furthermore workers at VDU's shall get appropriate information, instruction and training in order to be able to satisfy the minimal requirements on safety and health conditions (Article 6). They shall also be involved in the design or redesign of VDU work places in accordance with the requirements of the directive (Article 3) (Richenhagen, 1995).

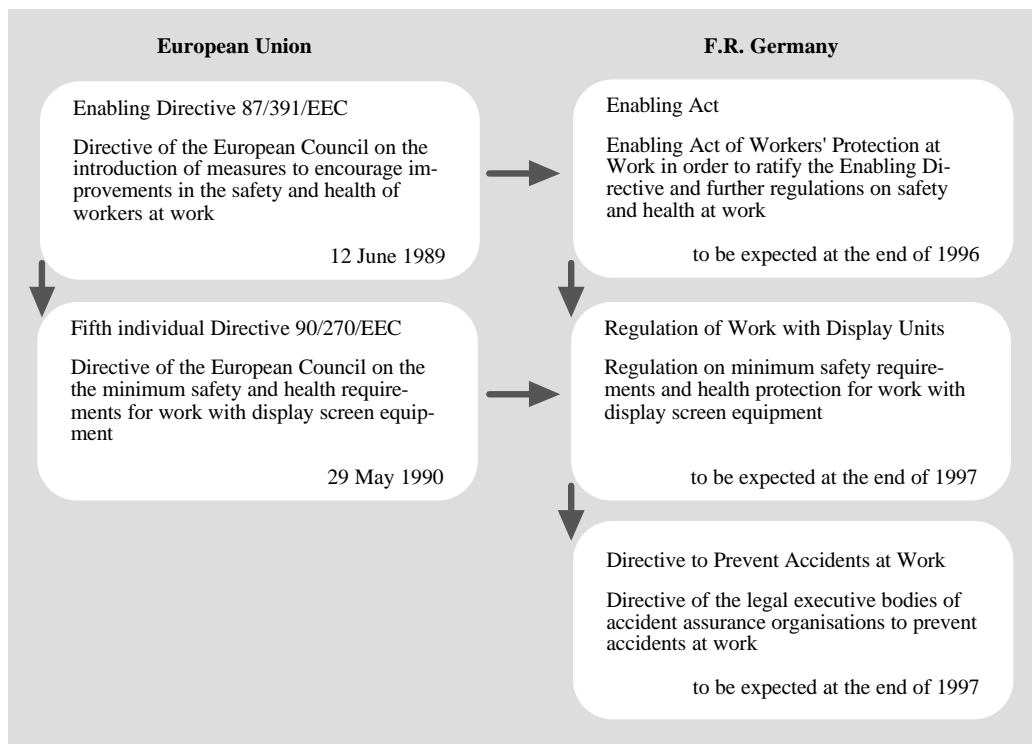


Figure 1. Anticipated Implementation of the EU Council Directives in German Legislation.

In view of the above listing of requirements it is important to recall, that according to article 118a of the Treaty of the EEC, no directive may impose legal, administrative or

financial obligations, which will interfere with the set-up and normal operation of small and medium-sized companies. This basic rule should of course be taken seriously while implementing the present EU directive into practice.

The fifth directive 90/270/EEC should have been converted into national German law before January 1, 1993. The initial intention of government was to implement the enabling directive 89/391/EEC through the so-called *Arbeitsschutzrahmengesetz* (Enabling Act of Workers' Protection) and each of its subdirectives through so-called *Verordnungen* (subordinate regulations). Unfortunately, the German federal diet has not yet passed such a *Arbeitsschutzrahmengesetz*. Consequently, there does not exist a legal base for the implementation of the individual sub-directives (Riese, 1995).

Currently it is being examined, whether the enabling directive 89/391/EEC may be converted into national German law as the *Gesetz zur Umsetzung der EG-Rahmenrichtlinie und weiterer Arbeitsschutzrichtlinien* (Schäfer, 1995). In that case, the fifth subdirective will presumably be taken over one-to-one in a *Bildschirmarbeitsverordnung* ("Regulation of Work with Display Units"). It is still unclear, even controversial, whether the *Bildschirmarbeitsverordnung* will be elaborated in a so-called *Unfallverhütungsvorschrift* (Directive to Prevent Accidents at Work). See the figure below.

In summary, it is unknown at the moment, how long it will still take to transfer these EU Council Directives in national German law and supporting regulations. However, as this conversion is mandatory on the basis of the EEC Treaty, employers are officially advised not to postpone the practical implementation of the implications of the directive (Blüm, 1995). It should particularly be noted, that - irrespective of current German legislation - the directive has already force of law at the level of governmental administrations insofar as they are employers (Riese, 1995).

2 Challenges of the Directive

In Germany, general directives and further regulations for safety and health at work have already been in place for many years (ZH 1/536, 1976). There are actually special regulations and directives for work at display units (ZH 1/618, 1980). However, these specifications almost exclusively relate to office furniture, hardware equipment and the immediate working environment of the VDU worker. Also the testing of eyes and eyesight has been introduced in Germany in the beginning of the eighties (Riese, 1995).

In the sequel we will discuss some of the requirements of the directive which are rather new for Germany.

2.1 Obligations and responsibilities of employers

The directive obliges employers to assess and adapt VDU work places in accordance with its technical annex, taking account of "technical progress, developments in international regulations and specifications and knowledge in the field of display screen equipment" (Article 10). Employers are thus responsible for implementation of the requirements for safety and health at VDU workstations.

The analysis of work places shall deal with four interrelated aspects: work organisation (task division and cooperation), physical environment (optics, acoustics, etc.), hardware (furniture, equipment) and software (more generally: the man-machine-interface).

Either companies perform the analyses themselves or they may consult and hire special service providers. This allows for adaptation of the analyses to the particular characteristics and local circumstances of a company (Görner and Bullinger, 1995).

2.2 Instruction and consultation of employees

Employees shall be instructed and trained in working with their VDU workstations, so that they will be able to act in accordance with the minimum requirements for health and safety. For instance, it is not enough to equip the work places with ergonomically adequate hard- and software: the workers should also know how to use it in order to fully profit from its ergonomic features (e.g. taking an adequate posture on ergonomically designed chairs (Dangelmeier, 1994)). Employees shall furthermore be consulted during design or redesign of work places so as to allow them to express individual requirements or recommendations. This is especially important in the case of design or redesign of user interface and interaction concepts, i.e. the functionality and usability of the man-machine-interface.

2.3 Requirements on work organisation

The directive contains two references to work organisation and mental stress at VDU work places. Article 3 requires that potentially dangerous mental load be identified and eliminated. Furthermore, in article 7 it is stipulated that measures regarding the structuring of work (e.g., breaks, mixed activities) be taken in order to avoid excessive physical or psychic load (caused e.g. by boredom or satiation).

2.4 Requirements on the man-machine-interface

In the appendix of the directive one also finds minimum requirements on the man-machine-interface and on the operating and application systems running on the machine. These requirements have been formulated at a rather high level of abstraction — on purpose so, in order to leave room for technological progress. Implicitly however, those requirements refer to existing national (DIN 66234), European (EN 29241) and international (ISO 9241) standards (ISO-Norm 9241, 1995) (except for the principle that "no quantitative or qualitative checking facility may be used without the knowledge of the workers", which is more an issue of privacy regulations, not genuine human factors of software systems).

2.5 The SANUS initiative

In order to be accepted and supported by those involved the European directive on work with visual display units has to be implemented in a highly effective and efficient way. It should therefore be noted that the obligatory work place assessments do not have to have a thoroughly scientific character. It shall on the contrary be possible for responsible practitioners in office, industry and other organisations to perform these assessments themselves.

Starting from these premises, an initiative was taken by the Ministry of Education, Science, Research and Technology (BMBF) to establish a consortium and fund a project called SANUS (a German acronym for "Safety and Health Protection of Work with VDU's on the basis of national and international Norms and Standards"). The project started in 1994 and will last until the end of 1997.

The consortium has set itself the following goals:

- To develop and evaluate a strategy for work place assessment and work place improvement in industrial and administrative settings

To compile and critically review methods of work place design and assessment covering all furniture and equipment, system and application software, physical environment and work organisation

To act as an intermediary for providers and users of all kinds of methods and tools for the practical implementation of the directive. Relevant methods and tools will be catalogued in the so-called SANUS Handbook

To perform pilot implementations of the directive in chosen organisations which are co-operating partners in the project

To prepare and disseminate information, on request as well as on its own initiative, about all issues and aspects concerning the practical implementation of the directive — by means of conferences and workshops, seminars and tutorials, a project-specific hands-on work group for practitioners, publications and newsletters, both in paper and in electronic form

The consortium consists of the following partners: the Institute of General Psychology and Methodology of the University of Dresden, the Department of Ergonomics and Human Factors of the University of Ilmenau, the Research Group MenBIT of the University of Wuppertal and the Institute of Industrial Ergonomics and Technology Management of the University of Stuttgart (this one being the consortium leader). These four institutes work in close cooperation with the software house ISA in Stuttgart, the engineering company ELK in Krefeld, as well as the counselling and training companies ATB in Chemnitz, ibek in Karlsruhe and GSM in Stuttgart.

2.6 Information dissemination

Project SANUS promotes the communication and transfer of experiences between stakeholders in the field. Several national and international conferences and workshops for practitioners and experts have been held. The lively discussions at these meetings showed, that issues like the development of user-centred software, the assessment of software quality from a combined productivity and usability point of view as well as the measurement of mental work load are in the centre of interest of those involved.

In order to facilitate the transfer of experiences with the implementation of the directive between practitioners in industry and the research teams within project SANUS, the consortium has established a so-called industrial workshop. The workshop provides participants an opportunity to learn more about implementation strategies, methods and tools and their practical application. Further topics for discussion may be proposed by the participants themselves. Up to now four successful workshops have been held.

Latest news about the progress of the political debates and the legal implementation, about pilot implementations in several companies as well as about ongoing work in the project will regularly be published in the project's newsletter.

Finally, reports about work place assessments, overviews of methods and tools for assessment, and more general information about the European directive in Germany are made available through the world wide web (SANUS, 1994).

2.7 Assessment of work places

Whereas adequate requirements and criteria, norms and standards, methods and tools for the assessment of furniture, hardware and physical environment at the work place have been around for many years, this is not true for the assessment of work load and stress at work places equipped with a VDU, for the evaluation of usability and productivity of application software in general and of graphical user interfaces in particular. We will

now present some of the recommendations proposed by project SANUS with respect to assessment.

Furniture, equipment and physical environment

As far as furniture, equipment and physical environment is concerned, 19 assessment procedures were reviewed and evaluated by consortium SANUS on their relevance for the directive on VDU equipment. Based on this review a new, quick and easy checklist was derived:

SAHIB (University of Ilmenau), which is a screening questionnaire, particularly well-suited for use by non-experts and taking not more than 20 minutes to complete

Mental work load and work organisation

Project SANUS offers two psychometric methods and related questionnaires for the assessment and subsequent analysis of work load in relation to work organisation at work places equipped with VDU. These methods can at least partially be applied by non-experts and do not require too much effort on their part:

BEBA (University of Dresden), which is particularly suited for use by small and medium-sized companies, enables the assessment of work load caused by or related to features of the work organisation or task structure

SynBA (University of Wuppertal), which has mainly been applied in large and medium-sized companies, is used to assess whether and, if so, to what extent the work load of a given employee departs from its subjectively optimal level, for which it depends upon computer-supported analysis and interpretation.

Software productivity and usability

A mayor goal of project SANUS has also been advice, training and further development of practical tools for the evaluation and design of directive-compliant application software. Thus, several existing methods and tools for software evaluation were reviewed and analysed as to their relevance for the directive and two new procedures are currently under development:

QS² (IAT), a software screening procedure based upon the questionnaire ISONORM 10 developed by Prümper and Anft, is particularly suited for non-experts and will take at most one hour per work place

SHIVA (IAT) is a computer-aided tool for detailed analysis of application software on the basis of screen shots and dialogue flow diagrams. It can be applied by human factors experts, e.g. as member of a design team

Both procedures allow a conformance check of tested software with ISO 9241, parts 10 to 17 (Ziegler and Burmester, 1995). To further encourage the development of user-friendly and user-centred software as required by the directive it is necessary to provide developers with more adequate tools than exist today. To this end, task-oriented dialogue modules, which will be compliant with the directive, are under development. These task-based modules will go well beyond the dialogue elements as they exist in current industrial standards like MS WINDOWS, OSF Motif, CUA, etc. and will be made available to developers through an on-line style guide as well as through a User Interface Management System.

2.8 Guidelines for practioners

One of the main goals of project SANUS is to develop, test and disseminate a practical strategy for company-tailored implementation of the European directive. Constant feedback on the strategy from the pilot implementations (see below) is considered very

important. The strategy itself will be described in a so-called SANUS Handbook, which will also list the methods and provide the tools to perform complete work place assessments covering work organisation, work load, physical environment, as well as hardware and software at the work place. The first version will be shipped by the midst of July this year.

Much emphasis will be put on the practicality and efficiency of the SANUS strategy, i.e. it should be easy to implement by those responsible within the organisations and it should not put an undue economical burden on those organisations. The strategy will of course differ for organisations of different sizes and structures, e.g., because work place assessments in small companies will most often be done by their owners, whereas as a rule large companies in Germany have their own department for safety and health protection at work.

3 Pilot Implementations

A number of public and private organisations co-operate with the main partners of the consortium of project SANUS. These very diverse organisations are setting up project groups to implement the European directive, are already running work place assessments or plan to improve working conditions and thereby workers' productivity in accordance with the intention of directive.

They are supported by members of the SANUS consortium in a number of different ways, from the supply of information and documentation about various aspects of the directive and its implementation in Germany up to the planning and execution of complete pilot work place assessments by means of the SANUS Handbook.

Up to now 17 medium-sized and large administrative and industrial organisations have profited from this co-operation with project SANUS. The following is only a partial listing: public services and institutions like state offices of safety and health protection, a state library, a state university, a large office in Cologne responsible for collecting the broadcasting contributions, a multinational in Munich, and a number of counselling and engineering companies in the fields of data processing, architectural planning and construction.

Apart from large and medium-sized companies, project SANUS is also involved in work place assessments in small companies, which partially require a more flexible approach. For instance, organisations having from only one up to 17 VDU workstations like city works, a theatre, an optician's shop, a car dealer and a service bureau for gardening or interior design have been successfully supported. New co-operating partners are steadily looked for and invited to join the SANUS consortium.

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Germany: Software Ergonomics - the Legal Framework and the Practice

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1 Introduction

This paper is a report concerning the current situation in Germany with regard to the prospects of the implementation of the European safety and health provisions. The report is based on the experience gained through participating in the work on standardisation of VDT workplaces since 1975 and on regulations since 1978. Although the specific subject matter is called human-computer interaction, in most cases the relevant facts at particular workplaces or in specific organisations may represent the outcome of the interaction between numerous groups of people, e.g., the manufacturers of hardware and software, the so called "systems integrators", the consultants for technology and/or work organisation, the responsible persons for the procurement of hard- and software... The list could be longer, however, even these examples seem to be sufficient for demonstrating that the term "human-computer interaction" is understood too simplistically to fully describe the extent of possible practical problems. Now, new groups are coming onto the scene due to the provisions of the VDT Directive, e.g. "Inspectors of Work", "Safety Engineers" or "Medical Doctors of Work". What are the prospects?

This paper represents the experience I have gained in the course of the last twelve years during which I have held about 240 seminars for practitioners who were interested in VDT work. The number includes about 80 seminars in software ergonomics and a dozen training courses for 125 Inspectors of Work. The opinion on the perspectives of European Directives stems from about 15 congresses on the VDT Directive organised or co-organised by our institute, and from participating in the efforts to find the "German solution" in standardisation and for new regulations.

The views about the perspectives in practice are based on the experience of consultation work in various software projects and also on projects which were planned to include software ergonomics but have never taken place due to ignorance of the benefits of this discipline. During recent years, the interest of practitioners in German industry seems to have faded away instead of being boosted by new legal provisions.

2 Legal Situation in Germany after Transposing the European Directives

2.1 Transformation of the European Directives into German law

The European Framework Directive (89/391/EEC) was transposed into German law after a rather long delay in August 1996, although it should have been in force since the beginning of 1993. The most important political problems behind this delay are some incompatibilities of German legislation on occupational safety and health with the new situation on the one hand and the complexity of the existing national legal provisions on the other hand. Some additional problems associated with the unification of the two German states have also aggravated the situation.

For the transformation of the EU-Directives, the German federal government had planned to create a framework law in correspondence with the role of the Framework Directive and to replace some existing laws on safety and health at the workplace and reorganise others. By doing so, the complex structure of the German provisions would have been streamlined to a great extent. However, the current political and social scenery in Germany made the government plans impossible. Thus, the Directive for work with display screen equipment ("VDT Directive" 90/270/EEC) was transposed into an ordinance to the newly introduced law "Arbeitsschutzgesetz", a name very hard to translate correctly especially in conjunction with a still existing law "Arbeitssicherheitsgesetz" ("Work Safety Law"). The literal translation of the name of the new law is "Work Protection Law".

Thus, the legal provisions on software ergonomics which have been part of the VDT Directive are contained in an ordinance which is not a single issue law and must always be considered together with the provisions of the new law. Moreover, most duties of those who are obliged to act in practice, e.g. Safety Engineers and Medical Doctors of Work, are described elsewhere, e.g. in the Work Safety Law. In addition, some provisions of the VDT Directive address some issues which have been regulated in other German laws.

2.2 Some specialities of German safety and health provisions

The manner that safety and health provisions in Germany are dealt with in regulations of differing legal status deviates to a great extent from that of similar countries. Its structure is not even easy to understand for experts in this area. First, the system to enforce the application of existing rules is "dual" with the state on one side and the so called "Berufsgenossenschaften" on the other. There are 35 "Berufsgenossenschaften" acting in the private sector whereas a similar number of institutions with similar duties and powers are active in the "public service" sector. To make the situation even more complex, an employer from the "public service" may be part of the administration of a municipality, of a local state or belong to the federal state. Provisions for safety and health have been different in various areas depending on the legal status of the employer. The "state" itself is not a central state like in many European countries but a federation. The state authorities for the enforcement of laws on safety and health in industry are part of the administration of the local states, however, most provisions stem from the federal state, e.g. the VDT Ordinance was established by the federal Ministry of Labour. The "Berufsgenossenschaften" can enforce their provisions based on their own autonomous right via their own inspectors who may refer to federal laws but need support from the

state authorities in case of conflicts. The "Berufsgenossenschaften" act within a particular business area, and their provisions on health and safety apply anywhere in the federal state. Thus, the entire system in Germany is a tangle rather than a network.

This dual system does not cover all existing provisions for the protection of workers from health hazards in working environments. As can be seen from its name, "technical work protection", it covers more technical aspects whereas the so called "social work protection" may also be decided on by the so called "social partners", i.e., employers associations and trade unions, who may set rules which are similar to legislation, within the existing legal framework. Such rules may contain provisions for specific worker groups, certain trades etc. The most relevant impact of these stems from the rules on working hours, rest periods, working days of the week or number of vacation days etc.

The following example may help to demonstrate the complexity of the system sketched above: VDT workers of a company experience eyestrain. It is agreed in general that the problem needs an adequate solution by eliminating the cause(s) of the eyestrain in this company. In theory, in the specific work environment, various factors may exist that can result in this problem.

One possible reason for the eyestrain may be the readability of the screen which is addressed partly by the rules of a specific "Berufsgenossenschaft" concerning hardware related issues. Workers in this company would profit from these rules, either if their company falls into the business area for which this Berufsgenossenschaft is responsible, or if the rules have been adopted by their own specific Berufsgenossenschaft.

If the poor readability is caused by poor software, e.g. illegible fonts, or by small characters displayed on a small screen which nevertheless complies with the existing rules, no regulation will directly apply. Another possible reason for poor readability, lighting, is addressed by some federal state legislation and by some rules of "Berufsgenossenschaften". However, none of them would cover a problem caused by a mismatch between the lighting installation and poor space conditions resulting from inadequate room proportions. Nobody is responsible in this case, since room proportions have never been addressed by any regulation. In this case, a workplace may have a lighting that is considered acceptable elsewhere, and the room proportions may also be acceptable if the lighting was suitable, however, their "interplay" under the specific conditions leads to the unacceptable situation. Thus, the problem caused by the interaction of two factors falling into the responsibility of two different administrative bodies. None of them, however, would offer the adequate solution. A further possible cause, too long working periods, can only be addressed by the social partners.

What can be done if each of the single subject matters, evaluated according to specific rules, seem acceptable but only a wholistic solution is appropriate which needs the consideration of all problems named? This means, the adequate solution cannot be found by separately applying specific rules concerning correct lighting, software ergonomics, correct design of workspace etc., but only by an appropriate trade-off between them all. Each authority responsible for single aspects of the problem is likely to consult or try to enforce different regulations, with poor overall success. In addition, the most likely cause for eyestrain, work organisation, has not been subject to rules of any authority for safety and health.

While the reason for this complexity is merely historic, the reason for its survival is very practical. For example, "Berufsgenossenschaften" act within a limited business area, e.g. the metal sector or the chemical industry, and, they introduce specific regulations for the area which they cover. They do not need to consider other business areas with different requirements. This makes their provisions more effective. If some generic rules for all German workers are warranted, they may be set by the association of "Berufsgenossenschaften". Also splitting the enforcement of federal regulations by the state to particular local states has some relevant advantages similar to the idea of thinking global, but acting local. The disadvantages of the system are managed, at least to some extent, by joint committees in which all groups involved cooperate. Also the reason for empowering the "social partners" to introduce legislation-like rules has very

practical reasons with the most important one of them being the thorough knowledge of the specialities of the specific business area. It cannot be stated whether such a non-ideal system within a federal system is worse, as good as or possibly better than a centralized solution, e.g., if work conditions in Paris, Tahiti and Goudeloupe were legislated for by the same state authority - another real situation in the EU.

The problem with regard to the transition from national regulations to the European provisions on safety and health may stem from the basic philosophy of German safety and health system which was a mere accident prevention system until recently. The highest level rules of "Berufsgenossenschaften" are still called "Accident Prevention Rules". In general, their objective did not cover e.g. mental work load. In addition, those who set rules in the name of safety and health do not address organisational issues since issues related to the use of tools are regulated elsewhere. Also the state Inspectors of Work have not been mandated to deal with such issues even if each person among them is fully aware of their importance. Instead, they have had to be more concerned with preventing traditional "accidents" instead of "professional maladies" that may result from work with VDU equipment. For a generalist, a VDT operator's eyesight problems may seem of minor importance if the same person has also to inspect the work of welders. How could he or she consider inadequate software at a workplace in an office a health hazard after having visited the environment of men near a melting furnace? In practice, the duty of the Inspector of Work may be to judge whether the heat and/or the software of the control mechanism of that melting furnace constitute a hazard to the workers there. What is the most likely outcome for the affected office workers?

With regard to software and "software ergonomics" as ruled in the VDT Directive, the solution for a variety of problems may be crippled due to the structure of German provisions since the transposition of European Directives into German laws will only become practically effective after the transformation of the entire system. Completing the paperwork was just the beginning!

Another severe problem may hamper the progress of implementing European provisions in practice although it is not named in too many papers: The philosophy of the European Directives stems from Scandinavian countries where the function of work inspection and the understanding of "rules" and "standards" are quite different from Germany. In this country, the main focus of work inspection lies on monitoring and controlling the activities in work areas or companies and on evaluating them in the light of specific rules (standards, accident prevention rules, safety rules etc.), whereas consulting organisations to find own solutions for a particular company or work area is of secondary importance. To support this approach, rules have to be generic and applicable to a number of companies, if not generally applicable. Monitoring aims at ensuring that the laws and regulations concerning the workplace safety are adhered to by industry. In contrast to this, the political thought behind the European Directives on safety and health treats the same issue in a different way. There, the focus is directed at individual solutions, and the main duty of work inspection should be consulting an organisation in finding a solution that serves the purpose of the regulations.

This distinction is likely to be crucial for the realization of the goals of "software ergonomics" since the approach of the VDT Directive does not address just software but the entire human-computer interface which is more than software. In addition, the provisions of the European Directives in general do not aim at improving specific parts of a work system independently but represent a wholistic approach. Consequently, the German equivalent to the provisions concerning the human-computer interface is worded as "interplay of humans and tools" (author's translation). This means, that specific issues associated with safety and health of these regulations should be dealt with under the notion that optimizing the interplay is the most important goal, not necessarily focusing on specific components of a work system.

2.3 On the structure of European provisions concerning software ergonomics

The European Union today represents a part-reflection of the dream of forming a "Federal States of Europe". Its origin in 1957 was an economic alliance: EEC means European Economic Community. Later, the word Economic was dropped, and by the end of 1995, the current name was introduced, European Union. The EU was born and was meant to become a union in all respects, including the social part of human life. To achieve this progress, some original goals had to be modified, others to be created. The final step was taken with the Single European Act in 1987 including Article 100a, under which Directives concerning unified requirements on technical products are adopted in form of Directives which cannot be changed by the individual member state (e.g. the Machine Directive). They serve the purpose of unifying the European Market. The philosophical basis of the unification with regard to safety and health was that member states of the union do have different provisions for ensuring an appropriate protection of their citizens, however, with the same basic objective. Thus, any regulation concerning a particular product shall be the same within the entire Union.

Simultaneously, a new Article 118a was introduced to form the basis of safety and health regulations in industry (e.g. the Framework Directive and the VDT Directive). All Directives under Article 118a constitute minimum provisions which need to be fulfilled in each country. However, each member state has the right to strive for a higher level of safety and health, but with the restriction that the outcome may not be not in contradiction with the provisions of Article 100a. This means, that one country may identify a product complying with a Directive under Article 100a as hazardous for workers in that country and consequently introduce new rules for the usage of the specific product, but no legislation or standards preventing the free circulation of it can be introduced, a legacy of the former "Economic" Community.

In short, the European Directives with product requirements are mandatory for all member states whereas the rules for the use of the specific product may be different from country to country. The legislation of the EU consists of two complementary parts, one addressing the manufacturer of products and the other addressing the employer who wants to use such a product as a tool for her or his workers.

Such a system is likely to fail if the product design would not allow appropriate usage, e.g., if a poorly designed software causes undue work load under any circumstances. An employer would have no chance of organizing proper usage. To address this problem, the entire legal basis was established on five principles, the first of which is "safety and ergonomics". This means, all Directives on technical products and tools and all standardisation under these Directives shall be based also on ergonomic principles including the principles of software ergonomics. Standards under specific Directives are mandated by the EU and their source is officially published.

However there are no plans for complimentary standards for some of the provisions contained in the Directives under Article 118a including the VDT Directive. Germany, like some other member states of the Union, even opposes the idea of establishing multinational standards in this area since this is considered a restriction on the freedom of finding national solutions, the effect of which may lead to a higher level of safety and health for German workers. Thus, there is no legally binding standard for software ergonomics established under the VDT Directive.

One of the simple but important outcomes of the structure of the Directives under Article 118a is that no agreed method exists that may help to demonstrate the compliance of a product, e.g. of software, with the VDT Directive. Even if a product complies with the most elaborate standard in this area, ISO 9241, the manufacturer cannot claim it would fulfil the requirements of the Directive. This situation, however, is justified in the light of the provisions of ISO 9241-11 on usability where it is stated that a product has no inherent usability, but one in a given context of use. European legislators anticipated this

wisdom long before it was written and seem to have chosen the uneasy but correct way. In practice, however, an employer may choose the best available "knowledge" to act in the sense of the Directive. In this case, complying to ISO 9241 would be the most agreeable way. It must be noted, that there is no direct path for a certain product to comply with ISO 9241 without also taking into account the context of use.

It must be noted that this finding is completely inline with the approach of the European Directives on safety and health, the basic objective of which is not to establish an "optimum standard" but to encourage user organisations to steadily improve safety and health. Accordingly, the title of the Framework Directive is "Council Directive of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work". Its approach may be described as "fitting the task to humans and fitting the tools to tasks".

But: How can we cope with such an approach in a country with the oldest, most complex and elaborate provisions on safety and health in an area like computing where products age faster than their creators?

3 Some Practical Problems

3.1 Who is in charge of what in a company?

The German "Work Safety Law" determines the tasks, duties and rights of "Safety Engineers" and "Medical Doctors of Work" with the first group being in charge of "technical work protection", and the latter in charge of all aspects of safety and health. Normally, in a work environment, e.g. a plant, these groups are represented by two persons who interact efficiently in most cases. However, their specific mission has never been defined as "fitting the task to humans and fitting the tools to the tasks". Instead, they had to act within the framework given by the legislation and standardisation and not to find company specific solutions following high level principles. And, previously, their mandate did not include problems related to work organisation and software.

Given the fact that the interplay of software design and work organization is poorly understood even by ergonomists and the impact of both on safety and health is still being questioned, in the opinion of those parts of the organisation responsible for software and work organisation, those concerned lack both adequate qualification and credibility. Thus, the "Safety Engineer" cannot force his way into the procedure of software development or procurement. To qualify for such a task, the "Safety Engineer" needs thorough knowledge in software, organisation and the impact of both on safety and health. For the time being, there are only few persons in Germany with such abilities. Others may sometimes be successful in negotiating with those who are in charge, however, enforcing new concepts with regard to software and organisation goes well beyond the abilities of most Safety Engineers.

Even more difficult is the task of the Medical Doctors of Work. To act adequately, they need managerial abilities and adequate authorisation. In fact, in big organisations, the medical doctor of work has the status of a director. His or her actions are not subject to directives of others within the same organisation. This is the good part of the real situation. The other part is that the majority of German workers are employed by small companies who cannot employ a director for safety and health. These and many organisations up to 2.000 employees may hire a qualified medical doctor on a part time basis, sometimes even on an hourly basis. The doctor offers his or her services to different companies. It is unlikely that people working under such conditions will be very effective in pushing for development and progress in software and organisation in a particular company. In my experience, it is doubtful whether they even comprehend their

new task given the fact that even most experts still need some time to understand the new reality.

Even with a perfectly functioning cooperation of the "Safety Engineer" and the "Medical Doctor of Work", the implementation of the requirements concerning software ergonomics in a company may fail if their efforts are not effectively supported by the persons responsible for work organisation, the procurement or respectively the design of software. Although they have a mandate for initiatives in the sense of the legal provisions at their disposal the key for success lies in the hands of those who make the tools and the rules for their use.

Such a situation is not unusual in industry. In fact, it is not new at all. The Work Safety Law requires since 1973 that in work areas of a certain size a Work Protection Committee, comprised of a representative of the employer, two members of the elected works council and those responsible for safety and health, must be established. This committee normally cooperates with the persons responsible for VDT work. So far, the situation has been well-organised. However, the new situation requires the involvement of an additional party, the software designers. The problem is that they have not been aware of the fact that their work is subject to legal provisions on safety and health. Moreover, software designers do not even know much about standards outside their area, e.g., the first standard on software ergonomics, DIN 66 234 part 8, was unknown to most software designers who have attended my seminars during the last 10 years although the work on this standard commenced in 1979 and had almost been completed by 1983. Five years ago, the existence of the successor of this standard, ISO 9241 part 10, was almost completely unknown to software designers. Even in 1997, seven years after the introduction of the VDT Directive, the knowledge of software designers of software ergonomics cannot match the importance software ergonomics deserves, to express the situation politely. Sounding somewhat more impolite but true would be to say: Those, who tell us what to do, don't know how; and those who should know how, don't know what.

3.2 How effective will be the inspection authorities?

Currently, the German economy is not only being battered by an economic crisis but also being shattered by the loss of confidence in the innovative power to tackle the problems of the future. While top managers look to East and West to detect new concepts, politicians sing the praises of economic and organisational solutions found in Japan, UK or USA, to name but a few. For people who know these countries to some extent, most reports sound rather more like fairy tales than comprehensive views of reality. The political powers try to fan a wind of change, however, the only thing that changes seems to be the direction the fan blows. In this situation, provisions on occupational safety and health are being questioned from two directions, from the viewpoint of deregulation and from an economic perspective which focuses on costs instead of cost/benefit considerations.

One outcome of the efforts by supporters of deregulation is that one part of the dual system, the "Berufsgenossenschaften", cannot introduce their regulation on the basis of the VDT Directive, an "Accident Prevention Rule". The results of this are crucial in two respects:

- The only legal provisions which expand on how to realize the interplay software and humans are contained in the draft of this regulation. In addition, these provisions have been evaluated by experienced people from industry in terms of comprehensibility and practicability and by groups responsible for IT operations in different business areas and have been found satisfactory. Without them, the only legal basis for ruling actions is formed by the provisions of the ordinance which reflect those of the VDT Directive, generic but not practical.

- The work inspectors cannot take direct legal action on the basis of the VDT Ordinance since it is a law of the federal state which can only be enforced by inspectors of the local state.

Another outcome of the efforts by supporters of deregulation reveals itself by the weakness of possible sanctions in case of violations of the law. The only possible sanction is a fine of DM 10,000 if an employer refuses to offer eyesight-tests. Further sanctions may be ruled by state inspectors if the employer refuses to introduce measures required in the specific case. The path for such a sanction would be that an inspector from the "Berufsgenossenschaft" decides on some measures on the basis of legal provisions which are rejected by the employer. After this step, the state inspector may rule in favor of the requested measures. A sanction may follow after the rejection of the last request. Altogether, it is a long way to go until sanctions are imposed. There is still a much longer way to go until the goal of effective sanctions is reached.

It must be noted, however, that sanctions in general are not highly appreciated since authorities in Germany believe in the power of negotiating to convince the responsible persons instead of enforcing the application of rules. The rationale behind this attitude stems from the experience that if employers feel forced by legal requirements to take some steps they may decide to do nothing more than the minimum that is really required. In fact, "work to rule" does not only represent a method for workers to effectively paralyze an organisation, it is very likely to cause various problems for them if the method is applied a by the employers.

The role of the state Inspectors of Work in general has remained the same under the new legislation. They have been given new tasks, but the manpower was either not changed or was even reduced in some of the local states; a new method for deregulation. Due to the unmanageable economic problems, this situation is not likely to change.

From the point of view of training, state inspectors have not been educated in depth to match the demands of their new tasks. The likelihood of a training that would enable them to detect problems related to software ergonomics is very small since the inspectors are generalists who have to be active in different business areas where even the specialists employed by a particular company do not always know how many applications their company runs and for which purposes. Assuming that the inspector may even be better than the specialists of a given company and she or he may be very knowledgeable in software ergonomics, there is still a considerably big problem to be solved before forcing an employer to change a software: The inspector has to evaluate the problem with regard to safety and health, but not in technical terms, she or he has also to consider the state-of-technology, and, in addition, to take into account whether the benefits would justify the costs of change. She or he also needs to convince the IT-people and organisers of work in that company.

If all goes well with the employer, the IT-people and the organisers of work there is still a problem left with the users. Would they accept changes that may yield benefits in the course of some years?

Under these circumstances, only optimists and daydreamers may expect a sudden change through the impact of Inspectors of Work and of the paperwork that constitutes their mandate. This is the bad part of the story. The good part is: Those who have put the new regulations of the EU into practice have been fully aware of this and of an even more difficult fact: Equal conditions for safety and health for workers in Europe should be achieved without destroying the diversity of working conditions in different regions, which is part of our heritage. Thus, the wind of change was not planned to be stormy, but steady. The same is true for software ergonomics.

4 What to do Except for Blaming Others?

Throughout history, blaming evil, sometimes the devil, has been a common strategy, but not a very successful one. Ergonomists should be aware of the fact that most people do not comprehend their objectives and some people may consider them as intruders in their own domain. In fact, ergonomics has to find its field of application in domains occupied by others, engineers, designers, work organisers, just to name a few.

With regard to software ergonomics, the first step is to make clear what it really means since most people either do not know anything about ergonomics or not much about its principles. Ergonomists cannot rely on any tradition like engineers or experts of medicine, instead, we still have to establish our area of expertise and indicate its limits. Practitioners with some knowledge in ergonomics experience difficulties in applying it to their tasks. Some other practitioners are not aware of the fact that they try to act in the sense of ergonomics. The first step to take from my point of view should be to explain software designers the benefits of ergonomists' way of thinking. In addition, we need to declare the value our profession adds to their work. The ultimate goal would be reached if learning software ergonomics constituted a substantial part of the professional training of software designers.

The next step should be to teach people on how different "standard" applications can be. Many people claim they have to buy or have bought W... as a word processor, and so much for software and ergonomics! In fact, we have to buy and we will need to buy standard products, however, these are not monolithic "programs" in the common sense of a computer program but tool boxes enabling us to tailor applications. The most comprehensive "programs" currently, e.g. SAP R/3, represent powerful tool boxes that require "customisation" that may induce the tenfold cost of the product itself! The truth behind "customisation" is "fitting the tool boxes to tasks". The current opinion in German industry with regard to software can be expressed by this sentence: "We do not need software ergonomics since we have bought a standard application." The task for a software ergonomist is to tell them they didn't! They have bought a standard package of software not an application. The latter will be formed by customizing the package according to the needs of the user organisation and the users.

How to customise or "individualise" a product? The makers of the product mentioned above claim their product would comply with the VDT Directive. If so, the product shall be "ergonomic", and this would also mean it shall be "suitable for individualisation" (ISO 9241-10). In theory, the claim can be verified: Each company can customize the product even to fit the needs of single people within that organisation. However, any problems with the software will first be blamed by the manufacturer on the specific circumstances in the user organisation. To prove the opposite may be possible, but time consuming. During this period, the next release of the "standard" product will inevitably reach the market. Since the manufacturer is not responsible for any changes introduced by the customer it will not consider anything else but their own product specification while designing the "update". Sometimes they name something "upgrade" which destroys everything that a customer has achieved by using the previous product. But: How should the manufacturer act differently from this? For example, can the manufacturer of a truck be held responsible for the customers who put wrong tires on it? No! What about the responsibility of a manufacturer who tells the owner of a truck she or he could use different tires and teaches the same person after three months there was something wrong with the individual selection of tires and it would be wise to return to the standard tires?

The task for the ergonomists in this respect seems to be mediating between the manufacturer and the customer since none of them are wrong and both have justifiable interests. Playing the catalyst in the triangle of interests between tool makers, users and work organisation has always been a promising role for ergonomists, why not for implementing software ergonomics?

In many cases, the problems of users concerning software may have been caused by wrong specification. Surprisingly, user organisations sometimes specify their needs wrongly because of a misunderstanding of ergonomics. In the latest software I have evaluated, some prefixes in some data fields had been placed as suffixes while the opposite had happened to some suffixes. The first impression was that two different software designers would have caused the inconsistency. After a long search for the root cause, the evil was found: Participation of two different user groups without coordination. The ideas of one group had led to placing prefixes wrongly in the screens they were interested in while the other group had caused the problem with the suffixes. The task for the ergonomist in this case is mediating between user groups and those who are responsible for the specification of software. In the case described above, the software designers have been responsive to all the wishes of users involved in the process, but each group of users has been reluctant to accept the ideas of their colleagues from the other group. Other people within the same company are likely to blame the inconsistency on the work of software designers.

In general, my feeling is, the software ergonomists have widely failed in conveying their message to practitioners. However, I cannot judge whether the whole situation is a part failure or a part success. From an optimistic point of view, introducing new bright ideas in industry within 20 years from scratch sounds rather like a success story than a failure. But there is a long way to go until ergonomics is accepted in practice in its systematic approach. Until then, software ergonomists have to bridge the gap between pure theory and pure practice.

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.