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

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Report over the situation in

Italy

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 Italy

"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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Content

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 forthcomings 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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Italy: Ergonomics Legislation – Laws, Standards and Evaluation Frameworks

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Abstract

This contribution will be focused on the Italian Visual Display Terminal legislation with specific reference to the European Directive 90/270/EEC. A brief history of its development will be presented with the most recent changes and interpretation issues as well as critical points will also be discussed. Issues related to the introduction of software ergonomics principles as well as referenced technical norms, both at the national and international level, will also be presented and discussed. Furthermore an evaluation framework for interface software, based on current standards, will be described together with the impact on legislation principles application.

Keywords: EU Directives, Software Ergonomics, Usability, Health, Safety, Decrees, Workplace, Workers, Quality in Use.

1 Introduction

The European Directive 90/270/EEC on the “Minimum Health and Safety Requirements for work with Visual Display Screen equipment” provides general guidance for the application of a comprehensive set of design and evaluation principles and it also allocates specific responsibilities to those who are involved, both as suppliers, acquirers,

users, and evaluators in guaranteeing health and safety in the workplace and in meeting ergonomic requirements (Grieco *et.al*., 1994).

As far as Italy is concerned, a legislative Decree has been issued, named “Decreto Legislativo 19 settembre 1994 n. 626”, (Dlgs. 626/94) inspired by European Directives 89/391/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/679/CEE with the aim of introducing health, safety and ergonomics principles in the workplaces.

This decree has been recently revised following comments and suggestions arising from both Government, Industry, Universities and Trade Unions, and it has been recently re-issued on March 18th 1996 with several modifications in both definitory and technical aspects.

The decree makes also explicit reference to EN and UNI technical standards, named “norme di buona tecnica” and the Italian Standardisation Body (UNI) is playing an important role in fostering the adoption of these standards (Giannetti *et. al*., 1996).

In recent times, other two important pieces of legislation have been added to the previous ones: D. Lgs 14 agosto 1996 n.493, which substitutes D.P.R. 8/6/92 and it is based on European Directive 92/58/CEE on health and safety signals in the workplace and D. Lgs. 14 agosto 1996 n.494 which inherits features from the D.lgs. 626/94 and 242/96 and it is based on European Directive 92/57/CEE on minimal prescriptions on health and safety in temporary or mobile working infrastructures.

All together, the Italian legislation framework presents an unique opportunity for increasing maturity of Ergonomics as a multidisciplinary undertaking towards different but integrated aspects of comfort, health and safety as well as well being of people at work.

There is, nonetheless, an inherent risk in introducing and enforcing such laws and regulations in a cultural and industrial context, such as the Italian one, which is not really that of large enterprises, but more of small and medium enterprises. The costs of infrastructural and organizational changes required by the full application of legislative principles is great and this stands at the origin of a long series of delays and misintepretations of the decree.

2 The Legislation

European Directives have been introduced in Italian legislation with a comprehensive and structured law which re-elaborates and up-dates the provisions on Health and Safety contained in the “Decreto del Presidente della Repubblica 19 Marzo 1956 n. 303” (DPR 303/56). In fact, the Dlgs. 626/94 consists of 98 articles divided into sections and subsections such as those in the following Figure 1.

2.1 The interpretation

Italian legislation, especially Art.3 (letter f), Art.42 (comma 2, letter c). Art.47 (comma 2, letter c) and Art.52 (comma 1, letter c), Annex VII (par.3) , makes reference in Italy for the first time, to the fundamentals of ergonomics for optimal design of workplaces.

The violation of *Art.3* “[…] rispetto dei principi ergonomici nella concezione dei posti di lavoro, nella scelta delle attrezzature e nella definizione dei metodi di lavoro e produzione, anche per attenuare il lavoro monotono e ripetitivo” is not specifically subject to sanctions, while the violation of *Art. 42, 47* and especially *Art. 52* “Obligations of Employer” are subject to both light and heavy sanctions.

In other legislative decrees such as Dpr. 459/96, Dlgs 493/96, Dlgs 494/96 ergonomics has also been introduced and this calls for a better definition of an application framework of ergonomics principles.

Ergonomics may be defined, according to the definition of obligations and principles in the legislative corpus, as the multidisciplinary corpus of knowledge and skills related to the analysis, design and evaluation of complex work system, where humans are both direct or indirect users. The goal of ergonomics as a discipline is to pursue coherence and compatibility with the outside world (objects, services, work and life environments) and human needs and requirements in psychological, physical and social terms, with the secondary, but relevant goal, of constantly improving efficiency, effectiveness and satisfaction of work systems and work places.

TITOLO I:

- Disposizioni Generali (General Provisions);
- Servizio di prevenzione e protezione (Prevention and Protection Services);
- Prevenzione incendi, evacuazione dei lavoratori, pronto soccorso (Fire Emergency and Protection);
- Sorveglianza Sanitaria (Health Surveillance);
- Consultazione e Partecipazione dei lavoratori (Workers Consultation and Participation);
- Informazione e formazione dei lavoratori (Information and Education of Workers);
- Disposizioni concernenti la Pubblica Amministrazione (Provisions for Public Administrations);
- Statistiche degli infortuni e delle malattie professionali (Accident and Professional illness Statistics);

TITOLO II:

- Luoghi di Lavoro (Workplaces);

TITOLO III:

- Uso delle attrezzature di lavoro (Work equipment use);

TITOLO IV

- Uso dei dispositivi di protezione individuale (Individual protection equipment use);

TITOLO V

- Movimentazione manuale dei carichi (Manual movement of burdens)

TITOLO VI

- Uso di attrezzature munite di videoterminali (VDU equipment use);

TITOLO VII: Protezione da agenti cancerogeni (Protection from cancer agents);

- Disposizioni generali (General Provisions)
- Obblighi del datore di lavoro (Employer‘s Obligations)
- Sorverglianza sanitaria (Health Surveillance)

TITOLO VIII: Protezione da agenti biologici (Protection from biological agents)

- Disposizioni Generali (General Provisions)
- Obblighi del Datore di Lavoro (Employer‘s Obligations)
- Sorveglianza sanitaria (Health Surveillance)

TITOLO IX: Sanzioni (Sanctions)

TITOLO X: Disposizione transitorie e finali (Transient and Final Provisions)

Figure 1.

Moreover, what appears to be required in Italian legislation may be stricter than what is required by each individual European directive. For instance, among the most important points which have been introduced *ex-novo* in Italian legislation are postural requirements. In fact, the European directive never explicitly mentions the potential health risks associated to wrong postural attitudes during working hours, whilst only visual stress was widely considered, notwithstanding the results of an important review of the World Health Organisation of 1987, updated in 1990.

Besides, severe inspections at workplaces are to be carried out by competent centres, depending on the Ministry of Health (among 200 recognised centres throughout Italy) and these organisations will have skilled personnel for both sanitary and environmental risk assessment.

But there are also negative points such as the definition of “worker” (Art.2) whose scope has been significantly reduced from “any worker…who habitually uses display screen equipment as a *significant_part of his normal work*” in: “worker who habitually and *systematically* uses display screen equipment *at least for four hours consecutively detracted the allowed pauses (15 mins every 2 hours) for the entire working week.*”.

This is really unfortunate because the pervasive nature of information technology in modern workplaces makes this distinction artificial and inspired by a tayloristic attitude towards workers and workplaces with the consequence of excluding 90% of VDU workers from the potential benefits of the modern legislation, although many Employers are expanding the definition to include VDU workers with an average of 20-25 hours of VDU use per week.

IA recent resolution of the Ministry of Labour appears to further restrict the scope of the legislation only to those who professionally use VDU such as, for instance, data entry personnel.

This interpretation also conflicts with the “General Provisions” (Art.3) where general ergonomic principles in the design and use of modern work equipment should be applied, *irrespective of* the duration or typology of VDU work.

Another interpretation issue arises on “Health Surveillance” (Titolo I) where the legislation sustains potential discrimination based on the distinction between *fit* and *not fit operators for VDU use* with respect to the visual stress.

This approach, in fact, has a high risk to introduce a sort of discriminatory selection, setting up barriers between young and aged workers, since workers with more than 45 years will have to have their sight controlled every two years, even in case of absence of any disease. It also seems oriented to exclude from this occupational activity many operators only for minor ophtalmological deficiencies and/or for environmental incompatibility.

Moreover no effective distinction has been made in the legislation between different display technologies such as CRT, liquid crystal, etc.

Potential risks concern both visual as well as postural stress and physical as well as mental workload.

Employers will be responsible for evaluating these risks and will also be responsible for the procurement of well-designed workplaces, including all workplace features from tables, chairs to hardware and software, so as to optimise the well-being, health and safety of their employees, even allowing pauses and breaks in-between working hours. Employers are also responsible for medical check-ups, especially those for assessing visual stress. Since Italian legislation has introduced specific provisions for postural problems, chairs, tables, as well as workstation have also to be checked. Climate, humidity, lighting, reflections and glittering, noises, radiations are all important ergonomics factors which are to be assessed and constantly monitored by Employers.

Another definitory issue arises from the specific provisions for Public Administrations, both Central and Local (AIPA, 1995). In fact for these very large organisations, employing

millions of peoples, the legislation handles exceptions at various levels. Public Administrations are free to adopt different disciplines on the basis of “specific work needs” and ministerial decrees or regulations may directly rule ergonomic, health and safety requirements in a different way. Furthermore ergonomic, health and safety requirements are considered met at the time when the Public Employer, who may be an office responsible with no specific responsibilities, issues a specific request to the competent office of the Public Administration, with no actual guarantee whatsoever of this request to be filed, answered and executed.

2.2 The amendments

The amended version of the decree (Dlgs n.242 19 marzo 1996) has modified the Art. 50,51,55,58 of the Title VI on VDU and has re-introduced “Annex VII” including Environmental and Hardware/Software Ergonomics, which was omitted in the first version. It also includes new definitions and clarifications, such as:

- new figure of Employer who has to be the most prominent figure in the company. i.e. the person responsible for budget planning and spending;
- new figure of Public Administration Employer who has to be any Office Responsible with or without budget responsibilities (Public Administration will identify within a certain timeframe who is the personnel involved);
- exemption for small enterprises with less than 10 workers through self-assessment of potential risks;
- re-introduction of Annex VII on Environmental and Hardware/Software Ergonomics;
- extension of the deadline for VDU equipped workplace.

One of the major issue concerning the Italian implementation of European Directive was that of the definition of “VDU worker”. In recent times**,** following the opposition of Court of Turin, Italy, European Court of Justice has examined the translation from “a significant portion of his standard working hours” contained in the Directive 90/270/EEC, in the “four consecutive hours, less the pauses under art.54, for a full working week” as it appears in the Decree. The results of such examination, as in the Court of Justice Disposition of 12th December 1996, have been negative and therefore the Italian Senate has revised, at the beginning of 1997, the definition of “VDU worker” enlarging its scope to “20 hours a week independently from the pauses”. In the same Disposition, the issue related to the compulsory health surveillance on sight and eyes of “VDU workers” has also been raised, since in the Italian legislation, this surveillance was compulsory only for “worker fit for VDU use” or “aged more that 45 years” which was in contrast with the principles of the Directive.

2.3 The identified roles

The Italian implementation of the directive is also based on the definition of four main roles such as:

- *Employer*
- *Prevention and Protection Responsible*
- *Doctor*
- *Security Responsible*

The *Employer* is the most prominent figure in terms of responsibility and he/she manages the whole process of risk identification, prevention and handling.

The *Prevention and Protection Responsible* is normally selected by the Employer on the basis of previous experience, competence and skills. A specific gap in the legislation concerns the acceptability criteria of such role and figure, who plays an important role without having specified the content of the job. This role represents the real novelty in the implementation of the directive and it calls for a better definition of Ergonomics curricula.

The *Doctor* has instead clear responsibilities and clear professional curriculum in terms of sanitary checks and evaluation of workers and work conditions on the basis of biological and physiological risks assessment. The limits of such role is that the doctor may only be able to handle medical risks and not risks associated to, for instance, mental workload for software ergonomics.

The *Security Responsible* plays the role of ensuring the dissemination of information in the organisation and essentially plays an organisational role.

A clearer definition of such roles appears to be the key for a successful practical application of the legislation (Tartaglia and Carnevale, 1997). A large debate is taking place in Italy, among University and Industries, around the definition of the basic set of skills and practices needed for such roles, specifically for the Prevention and Protection responsible.

2.4 Education and certification

An important aspect of the ergonomic practice is in fact the professionalism of the ergonomist. In fact, although the relevance of ergonomics and, generally speaking, of quality of life and welfare of the humans interacting with technology is constantly growing, the legislation and related technical norms do not provide sufficient information for the definition of a basic educational and professional curriculum for Italian ergonomists (Fubini, 1994).

The norm ISO EN 45013 “Certification of professionals” introduces different levels for ensuring the professionalism of ergonomists such as the definition of a set of quality procedures for the educational courses, experiences, training and release of certificates as well as surveillance and monitoring of skills.

The *Italian Society of Ergonomics (SIE)* has developed a framework for introducing the registration and certification of Italian Ergonomist which is recognised by CREE (The Centre for Registration of European Ergonomists). Such framework includes the following steps:

1. Creation of an official Body for Certification of Ergonomist which is part of the Italian Society of Ergonomics and it is officially certified by CREE so as to be compliant with ISO EN 45013 norm.
2. Definition of a set of access rules including a proper evaluation, based on certified criteria, of previous degrees, training and experience.
3. Creation of a basic educational framework, based on CREE formation model, consisting of two major parts:

- a framework describing major components and duration;
- a listing of areas of knowledge and topics, to be used to discuss national university programs in relation to the certification process.

The areas of knowledge which are considered in the Italian courses for Certified Ergonomist are the following:

1. Ergonomics Principles

2. Human Characteristics

3. Work Analysis and Measurement

4. *People and Technology*
5. *Applications*
6. *Professional Issues*

Currently there are in Italy only two officially recognised conversion courses, which aim at bridging the gap between current University curricula in several disciplines such as Architecture, Engineering, Anthropology, Medicine, Psychology, Sociology and Ergonomics:

- *Master in ERGONOMIA*, funded by a consortium of Industries and Universities (Corep/Politecnico di Torino, 1996);
- *Corso di Perfezionamento/Master in Ergonomia* at the Politecnico di Milano-Sezione Sicurezza (Politecnico di Milano, 1996).

Other conversion courses are being organised at University of Bologna and Catania.

Following the CREE recommendations (Rookmaaker, 1992) a global period of 6 years *(3 years of education + 1 year training + 2 years experience)* is required for Registration. This is under examination in Italy, where a University degree in related disciplines such as Medicine, Psychology, Engineering, Sociology, may enable future Ergonomist to participate to conversion courses to obtain a Master in Ergonomics. The Italian Society for Ergonomics is the only official Society which may grant its official members, through the fact that it is certified by CREE, the Registration as European Ergonomist and it is acting as National Body for such registration.

2.5 Risk assessment and evaluation frameworks

Point 3 of art. 56 of Decree 626/94 provides for the Ministry of Labour and the Ministry of Health to issue a decree including a guideline on the use of Video Display Units.

Such guidelines have been provided by Italian Regional Bodies, including interpretation of the articles under Title VI of the decree as an attempt to clarify the scope (art.50), the characteristics of the workers and workplaces covered by the decree (art.51), work organisation (art.53), daily performance (art. 54), health monitoring (art.55), worker information and training and adaptation of workplaces to technical specifications and updates. These guidelines put special emphasis on a photometric analysis of workplaces and provides useful directions and methodological indications for evaluating “sight and eyes” as well as “posture and physical and mental distress” (Gibellieri, 1996).

One of the most important aspect of the legislation is that of risk identification and prevention, as it is also mentioned in an interpretation circular of Ministry of Labour and Social Security (Circular n.105 7 agosto 1995) which officially states: “[…] presupposto della nuova disciplina […] è l‘ individuazione di *tutti i fattori di rischio* esistenti in azienda e delle loro reciproche *interazioni*, nonché sulla *valutazione della loro entità* effettuata, ove necessario, mediante *metodi analitici e strumentali* […]”. It includes:

- the classification of risks into classes and categories, therefore developing a reference framework for VDU related risks;
- the definition of prevention activities associated to those risks;
- the implementation of surveillance activities to constantly monitor such prevention process;
- the institution of risk handling activities.

One of the greatest limitation of the Italian legislation concerns the lack of clear and unambiguous references to the actual skills and competence needed to identify and classify the ergonomic risks. In fact Italian traditional University Curricula do not guarantee sufficient knowledge to handle both assessment, prevention and monitoring of

such a differentiated and integrated risk categories. For instance, risks associated to ergonomic requirements of work-places and work practices have to be assessed and evaluated by ergonomists who are specifically involved in the analysis, design and evaluation of interactive systems, services or daily objects.

The basis of Ergonomics is, in fact, the integration of bio-medical, technical and humanistic background which allow the application of antrophometrical, bio-mechanical, physiological, cognitive, psychological, socio-cultural constraints analysis.

The Circular n**.**102/95 is very explicit about the ergonomics requirements of VDU work. It specifically emphasises (p.14-Titolo VI) that ergonomics principles related to human-system dialogue design have to be applied, but without introducing even the simple set of guidelines for such application, neither illustrating the typology of knowledge and skills required both for application of such principles and for evaluation of associated risks.

According to "Annex VII" of Dlgs 626/94 it is the Employer directly which has the obligation of acquiring interactive software which is adequate to the specific end-users tasks, easy to use and adaptable to the end-users experience, which provides feedback at any time to end-users so as guarantee continuous control of the interaction, which works at a pace which is sustainable by end-users, and, generally speaking, which embodies Software Ergonomics principles.

The set of basic criteria for interactive software evaluation which lay in the background of the legislation may be drawn from the *International Standard* for Software Ergonomics ISO 9241-10 "Dialogue Principles", as in Figure n. 2.

ISO 9241_10 Dialogue principles

- adequacy to actual tasks performed by end-users;
- adequacy to end-users preferences;
- adequacy to end-users expectations;
- full recoverability from errors;
- self-descriptiveness of dialogue modalities;
- support and help to end-users**;**

Figure 2.

Another possible set of applicable principles are based on the *Draft International Standard* ISO 9241-11 "Guidance for Usability":

ISO 9241-11 Guidance for Usability

- Usability as Quality in Use = "the overall perceived quality of the system by realistic end-users, in specified contexts of use and based on the accomplishment of realistic work tasks".

  - *user-system efficiency/productivity*
  - *user-system effectiveness*
  - *user satisfaction;*

Figure 3.

While the ISO 9241-10 introduces good design recommendations for human-system interaction, with specific but not exclusive reference to computer systems, the ISO 9241-11 introduces a set of requirements to be adopted in order to evaluate the actual goal of global ergonomic quality for any interactive system, i.e. quality in use. In fact, by applying good design principles we may only indirectly foresee the complete ergonomic quality and it is only in realistic work contexts with realistic users that we may assess how the user-system interaction is efficient, effective and satisfactory, therefore of ergonomic quality (Giannetti and Bagnara, 1996).

In fact, prior to development of a custom system, a purchasing organisation can use the information in ISO 9241-11 as a framework for specifying the quality in use requirements which the system must meet and against which acceptance testing may be carried out (BevanandAzuma, 1997). Specific contexts in which quality in use is to be measured should be identified, measures of effectiveness, efficiency and satisfaction selected, and acceptance criteria based on these measures established.

3 Conformance Assessment

Since requirements for the VDU equipped workplace includes both hardware and software, conformance to the ISO 9241 may also be required, even though not specifically requested by the legislation.

It should be clear, in fact, that no CE marking is required, as much as other European Directives, such as Medical Devices or Telecommunication equipments, for assessing conformance to ergonomic norms.

The Circular of the Ministry of Labour n**.** 102/95 establishes that relevant UNI and CEI norms set the minimal level for the requirements of the legislation and that no Conformance declaration or CE marking is required by independent and certified third parties.

Generally speaking, Italian legislation and many Circulars clarify that conformance of workplace equipment (both hardware and software) should be based on the conformance to relevant UNI and CEI norms. European norms at ISO/CEN level may also be needed for conformance assessment since different European countries may have delays in producing national standards.

According UNI CEI EN 45014 “Criteria for supplier‘s conformance declarations”, the suppliers of VDU equipment (both hardware and software) should provide, on request, official conformity declarations (for instance, to ISO 9241) and be certified ISO 9000 so as to provide detailed description of all activities which have an impact on product quality. The ISO 9000 certification is also considered useful to guarantee that the products will maintain quality during time and use.

3.1 The ISO/UNI standards

Application of technical norms and standards therefore is the key for fulfilling ergonomic as well as health and safety requirements as stated in the current legislation (Bevan, 1995), (CUBE, 1996). These standards, even if they contain an internationally agreed body of Ergonomics best practices and are close to publication, are far less known and accepted than one might assume.

The Italian Standardisation Body (UNI), and specifically, the Ergonomics Technical Committee, is currently working for updating Italian technical norms and standards and integrating European norms so as to better fulfil the requirements of the new legislation, in a close co-operation with other UNI Technical Committees, such as Safety, Furniture, Lighting, Advanced Production Technology, Transport, etc.

During the last year, an ISO/CEN Parallel Enquiry have been launched to speed up the process of standardisation of ISO 9241 and this has greatly contributed to the development of ergonomic principles and fundamentals.

The more relevant UNI norms on Ergonomics and related topics are, amongst others:

- *UNI 8459 (83)* “Ergonomics of Work Systems: Terminology and Basic Principles”;
- *UNI ENV 26385 (90)* “Ergonomic Principles in Work Systems Design”;
- *UNI EN 614_1* “Ergonomic Principles for Machinery Safety: Terminology and Basic Principles”;
- *ISO/CEN 10075 (91)* “Ergonomics Principles for Cognitive workload”;
- *UNI EN 29241_1 (93)* “Ergonomic Principles for office work with VDU: General Introduction”;
- *UNI EN 29241_2 (93)* “Ergonomic Principles for office work with VDU: Guidance on Task requirements”;
- *UNI EN 29241_3 (93)* “Ergonomic Principles for office work with VDU: Visual Display requirements”;
- *UNI EN ISO 9241_10 (97)* “Ergonomic principles for office work with VDU: Dialogue Principles”.

ISO 9241 structure
a. Visual Requirements
• Part 7: Display requirements with reflections
• Part 8: Requirements for displayed colours
b. Workplace and Environmental Requirements
• Part 4: Keyboard requirements
• Part 5: Workstation and postural requirements
• Part 6: Environmental requirements
• Part 9: Requirements for non-keyboard input devices
c. Software Ergonomics and Man-Machine Dialogue
• **Part 10: Dialogue Principles**
• Part 11: Guidance to Usability
• Part 12: Presentation of Information
• Part 13: User Guidance
• Part 14: Menu Dialogues
• Part 15: Command Dialogues
• Part 16: Direct Manipulation Dialogues
• Part 17: Form-filling Dialogues.

Figure 4.

The complete norm *ISO 9241* is still under development and consists of *17* parts (including Part *1,2,3,10* which have already been introduced in Italy), as in Figure 4. Software ergonomics standards may fall into four major categories:

- *process oriented*: these specify requirements for the supplier‘s process of developing ergonomic software and identify the steps of the processes where ergonomic considerations are most needed;
- *performance oriented*: these describe the users, tasks, and context of use and assess the relevance of specific software for the end-users, therefore taking into account the actual user-system performance in terms of efficiency, effectiveness and Satisfaction of the interaction;
- *product oriented*: these specify required attributes of the user interface, such as typology of dialogues, menu structures, graphical objects layout, therefore taking into account internal features of the interface which may bear on the final ergonomic quality of the system.

3.2 Process oriented standards

ISO DIS 13407 “Human Centred Design Processes for Interactive Systems” provides guidance on achieving ergonomic quality and quality in use by incorporating user centred design activities throughout the life cycle of interactive computer-based systems.

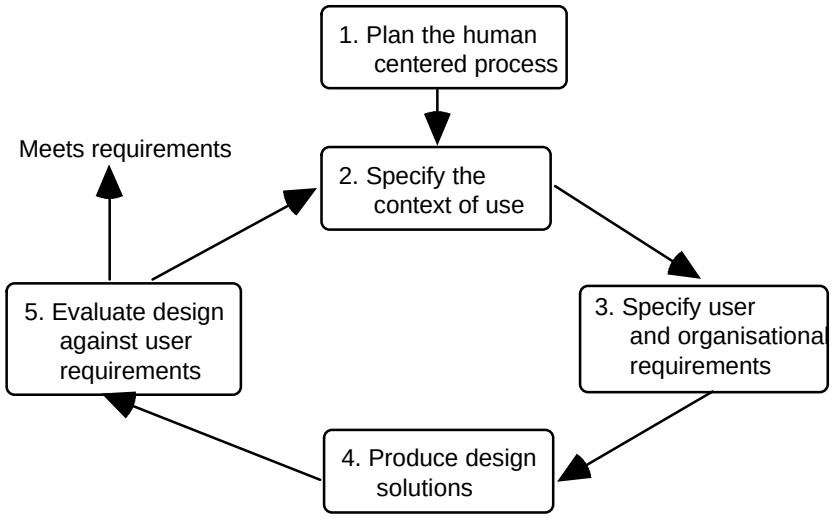

Figure 5.

It describes user centred design as a multi-disciplinary activity, which incorporates human factors and ergonomics knowledge and techniques with the objective of enhancing effectiveness and efficiency, improving human working conditions, and counteracting the possible adverse effects of use on human health, safety and performance. The iterative nature of these activities is illustrated in *Figure 5*. The process involves iterating until the objectives are satisfied.

3.3 Performance oriented standards

ISO 9241-2 : 1992 *Guidance on task requirements* - deals with the design of tasks and jobs involving work with visual display terminals.

ISO /DIS 9241-11: 1997 *Guidance on Usability* - provides the definition of usability as the extent to which a product can be used by specified users to achieve specified goals with

effectiveness, *efficiency* and *satisfaction* in a specified context of use. It explains how to identify the information which it is necessary to take into account when analysing or evaluating usability in terms of measures of user-system performance and satisfaction. Guidance is given (as in Figure n.6) on how to describe the context of use of the product (hardware, software or service) and the required measures of usability in an explicit way. It includes an explanation of how the usability of a product can be specified and evaluated as part of a quality system, for example one which conforms to *ISO 9001*. It also explains how measures of user performance and satisfaction can be used to measure how any component of a work system affects the quality of the whole work system in use.

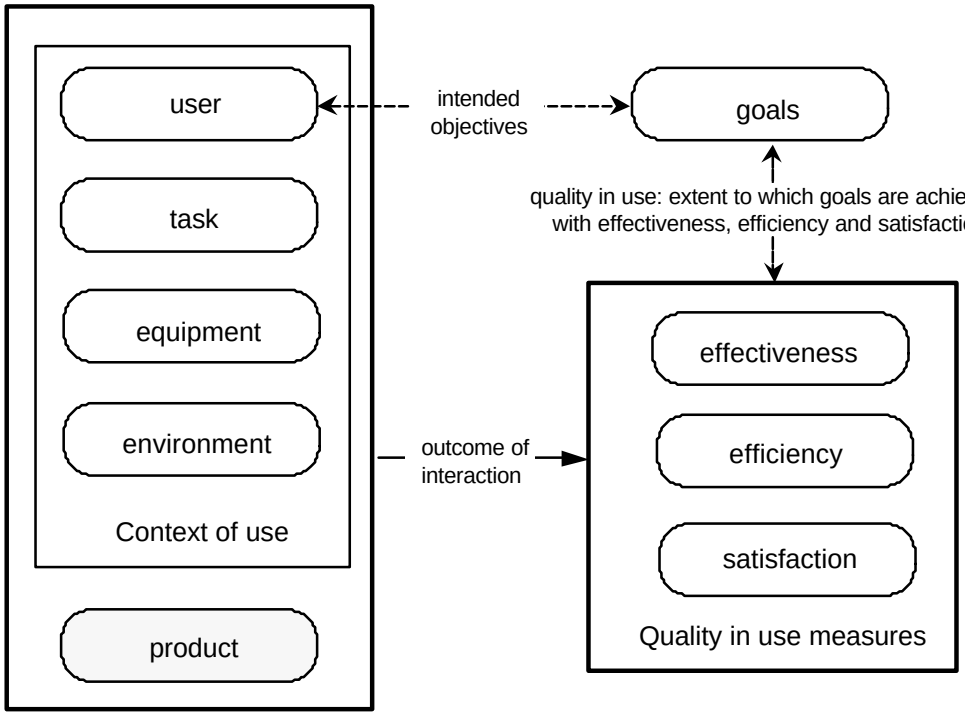

Figure 6.

The MUSiC methods and support tools (Thomas and Bevan, 1995), (Thomas and Curson, 1995), (Macleod and Rengger, 1993), (Zijlstra, 1993), (NASA, 1986), (Kirakowski, Porteous and Corbett, 1992), (Kirakowski, 1996), (Bevan and Macleod, 1994) (Macleod, 1994) were developed by the European MUSiC (Measuring the Usability of Systems in Context) project to provide valid and reliable means for specifying and measuring quality in use, while also giving diagnostic feedback which enables the design to be modified to improve quality in use. MUSiC includes tools and techniques which implement the principles of ISO 9241-11 for specifying the context of use and measuring user performance and satisfaction. Another European project, called MAPI (MUSiC Assisted Process Improvement) have experimented these methods in large and complex industrial environment as that of SOGEI SpA , Italy, actually proving the viability and cost-effectiveness of such methods and support tools (Giannetti *et. al.*, 1996) (Giannetti and Mignosi, 1997) (Natale, 1995).

These standards may be used to support the following activities:

- specification of ergonomics requirements and evaluation against these requirements (ISO/DIS 9241-11 and ISO/IEC/DIS 14598-1).
- incorporation of usability into a quality system (ISO/DIS 9241-11).

3.4 Product oriented standards

In the product-oriented view, usability is seen as one relatively independent contribution to ergonomic quality, and is defined in this way in *ISO/IEC 9126 : 1991* : Information technology - Software product evaluation - Quality characteristics and guidelines for their use, as ‚a set of attributes of software which bear on the effort needed for use and on the individual assessment of such use by a stated or implied set of users'.

Generally speaking, *ISO 9241* provides requirements and recommendations relating to the attributes of the hardware, software and environment which contribute to usability, and the ergonomic principles underlying them.

Parts *3* to *9* contain hardware design requirements and guidance which can have implications for software.

The following parts of ISO 9241 and other standards deal specifically with attributes of the software:

- *ISO 9241-10: 1996* Dialogue principles

This part of ISO 9241 deals with general ergonomic principles which apply to the design of dialogues between humans and information systems: suitability for the task, suitability for learning, suitability for individualisation, conformity with user expectations, self descriptiveness, controllability, and error tolerance

- *ISO/CD 9241-12*: Presentation of information

This part of ISO 9241 contains specific recommendations for presenting and representing information on visual displays. It includes guidance on ways of representing complex information using alphanumeric and graphical/symbolic codes, screen layout, and design as well as the use of windows.

- *ISO/DIS 9241-13*: User guidance

This part provides recommendations for the design and evaluation of user guidance attributes of software user interfaces including Prompts, Feedback, Status, On-line Help and Error Management.

- *ISO/DIS 9241-14*: Menu dialogues

This part provides recommendations for the ergonomic design of menus used in user-computer dialogues. The recommendations cover menu structure, navigation, option selection and execution, and menu presentation (by various techniques including windowing, panels, buttons, fields, etc.). Part 14 is intended to be used by both designers and evaluators of menus (however, its focus is primarily towards the designer).

- *ISO/DIS 9241-15*: Command language dialogues

This part provides recommendations for the ergonomic design of command languages used in user-computer dialogues. The recommendations cover command language structure and syntax, command representations, input and output considerations, and feedback and help. Part 15 is intended to be used by both designers and evaluators of command dialogues, but the focus is primarily towards the designer.

- *ISO/DIS 9241-16*: Direct manipulation dialogues

This part provides recommendations for the ergonomic design of direct manipulation dialogues, and includes the manipulation of objects, and the design of metaphors, objects and attributes. It covers those aspects of ‚Graphical User Interfaces' which are directly manipulated, and not covered by other parts of ISO 9241. Part 16 is intended to be used by both designers and evaluators of command dialogues, but the focus is primarily towards the designer.

- *ISO/DIS 9241-17*: Form-filling dialogues

This part provides recommendations for the ergonomic design of form filling dialogues. The recommendations cover form structure and output considerations, input considerations, and form navigation. Part 17 is intended to be used by both designers and evaluators of command dialogues, but the focus is primarily towards the designer.

- *ISO/IEC 10741-1* Dialogue interaction - Cursor control for text editing

This International Standard specifies how the cursor should move on the screen in response to the use of cursor control keys.

- *ISO/IEC DIS 11581-1* : Icon symbols and functions - Part 1: Icons - general

This part contains a framework for the development and design of icons, including general requirements and recommendations applicable to all icons.

- *ISO/IEC DIS 11581 - 2* : Icon symbols and functions - Part 2: Object icons

This part contains requirements and recommendations for icons that represent functions by association with an object, and that can be moved and opened. It also contains specifications for the function and appearance of approximately 20 icons.

These standards can be used in the following ways:

- To specify details of the appearance and behaviour of the user interface;
- To provide detailed guidance on the design of user interfaces;
- To provide criteria for the evaluation of user interfaces.

However the attributes which a product requires for usability depend on the nature of the user, task and environment (Shneiderman, 1992). A product has no intrinsic usability, only a capability to be used in a particular context. ISO/DIS 9241-11 can be used to help understand the context in which particular attributes can be required.

4 Conclusions

Italian legislation based on *European Directive 90/270/EEC* introduces ergonomic considerations in VDU work, overcoming some of the out-dated requirements which were still in force, as in the *DPR 303/1956*, therefore bridging a legislation gap with respect to modern technologies and this has been extremely valuable for Italy‘s modernisation.

ISO standards represent a valuable source of principles and criteria for creating guidelines on risk identification and assessment. Evaluation frameworks, as well as Design frameworks for User-System Interfaces, based on ISO norms, should also be developed so as to get to a comprehensive, integrated and harmonised European framework.

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

Italy: VDU and Health – Technical and Medical Aspects Concerning the Application of the EU Directive

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1 Introduction

The EEC Directive 90/270 gave rise to many contrasting reactions in Italy: businessmen and employers (artisans, professionals, traders, etc.) thought it imposed excessive constraint on work organisation while its complexity and high cost make its application difficult.

Workers and their Trade Unions, on the other hand, consider these legislative provisions to be a long overdue step towards rectifying the deplorable lack in labour legislation for the protection of workers‘ health in Italy. Unlike the two above mentioned categories, the experts, both medical and technical, have maintained a more balanced position. Their approach in fact, even though with some minor differences, was derived from a more pragmatic analysis of the facts and in agreement with the most relevant scientific evidence.

In fact, apart from what is established by the law, this problem had already been clearly studied in the literature since the early 90‘s. Two major conferences entitled “Work with Display Units” had already been held on this matter: the first in Stockholm in 1986 (Work with Display Units-86) and the second in Montreal in 1989 (Work with Display Units-89). Many topics in the medical and environmental field were widely debated.

Some important starting points emerged indicating the necessity of a more in depth analysis of the issues related to possible effects on the operator‘s health. The significance of these conclusions was confirmed and supported by two authoritative documents:

“Update on Visual Display Terminals and Workers Health” published in 1990 by W.H.O (WHO, 1990) and “Work with Display Units” published in 1989 by I.L.O. (Working with Visual Display Units, 1989) Both these documents support the theory that inappropriate work station design plays an important role in causing operator discomfort. They also acknowledged that the visual and muscular skeletal apparatuses are the two systems most seriously affected by problems of inadequate design.

This is also demonstrated by the high frequency of discomfort complaints regarding this type of work. The WWDU congresses that followed, Berlin 1992 (Work with Display Units-92) and Milan 1994 (Work with Display Units-94), reconfirmed the problems already

brought to light by the literature of the early 90‘s. The latter represented for Italy not only a useful opportunity to circulate the Directive contents, but also a favourable occasion to clarify and go into further detail about scientific issues and their applicability. This may well have helped to attenuate the above mentioned contrasting positions taken up by the various social groups involved when the Directive was initially issued, mainly due to insufficient medical and technical knowledge.

Moreover, at the Milan Conference, the numerous scientific contributions presented gave rise to a wide debate about this matter in Italy. In any case this surely favoured an exchange of information between those who put the law into practice and those who benefit from it, with many positive effects.

Perhaps it wasn‘t by chance then, that the Directive was transposed into the italian legislation (Law 626/94 tit. VI) exactly in this period (Sept. 1994), almost 5 years after it was published by the U.E.. When the Directive became part of the Italian legislation, it contained however some deficiencies. In particular three noteworthy limitations were brought into the Italian transposition of the original community text.

The first limitation consisted in exempting the Armed Forces, Police and Universities from the application of the law. It is absolutely obvious that a VDU operator belonging to these institutions encounters the same working situations and consequently the same risks as in any other working sector. Considering that there is no evidence that people in these institutions are “made differently” from others, this decision has to be considered unjustified.

The second limitation regards the definition of “VDU operator: “any worker who habitually and systematically uses a VDU for at least 4 hours consecutively for the whole working week, excluding rest breaks”. It is quite evident that according to this definition there are only a few VDU operators in Italy. In fact a worker who is employed at the VDU for 40 hrs. per week, but on Friday works 7 hrs divided into two 3 hour shifts, is not considered as a VDU operator: there is no doubt, however, that s/he is an exposed subject!

The third limitation is that the minimum requirement reported in the annex (where, by the way, parts 2 and 3 have been missed out), are considered not applicable to workstations assigned to “non exposed” workers. Consequently the awful effect of this definition of “VDU worker” is that the obligations reported in the annex were mostly not applicable even in the case of heavy exposure and of very obsolete and inadequate workstations. Regardless of this rather “machiavellian” interpretation of the Directive, many employers, particularly those involved in large public and private businesses, spontaneously opted to follow the national and international scientific orientations.

A large number of companies have therefore started to improve their VDU workstations and implement health surveillance programmes for operators assigned to VDU work over 20 hrs per week. Therefore, it seems that among the various social components involved (businessmen and their associations, workers and their unions, legislators and magistrates, occupational physicians and safety officers), there is a growing awareness that the Directive could be effective for both workers‘ health and work efficiency. These groups are progressively more convinced that the problem of VDU work is not unfounded nor is it a whim of the Community legislator. It is the result of a huge amount of information collected from all around the world, with a consistent scientific background. Consequently the EU, whose member countries are among those most technologically advanced, could not in good faith disregard it.

As a result of this change in the political climate, some important legislative nets and standards were established facilitating the application of the indications given in the Directive. To begin with, a new law (242/96) which completed the previous provision by adding parts 1 and 2 of the annex previously missed out (environment and operator/computer interface) and also by rationalising the original text in relation to other national laws concerning the Health and Safety regulation at work. A detailed text to assist in interpretation and application of the Directive has been produced by the “Co-ordination of the Autonomous Provinces and Regions” in collaboration with some Central

State Institutions (I.S.P.E.S.L. and ISS) (Coordinamento delle Regioni e delle Province Autonome, 1996).

2 The Implementation of the Directive in Italy

2.1 Generals

Diffusion of VDU‘s in Italy is rapidly increasing in all work fields, with the exception of agriculture.

The 1995 estimates are that VDUs in use were over 5 millions (4.800.000 PC, 74.000 VDT, 216.000 Minisystems, 4.200 Mainframes) (Rapporto Assinform sull‘informatica e le telecomunicazioni, 1996) while the 1996 estimates are that VDUs in use were over 5.6 millions (5.300.000 PC 84.000 VDT, 224.000 Minisystems, 4.150 Mainframes) (Rapporto Assinform sull‘informatica e le telecomunicazioni, 1997).

In this context it should be pointed out that while the diffusion of computers and technical work processes over the last 20 years has demanded a lot from the adaptation and professional abilities of the operators involved, as well as financial resources from companies, the consequent and necessary measures of redesign and modification of workplaces has been neither congruent nor satisfactory in this country.

This is probably the most important cause for numerous ailments and discomforts reported by workers.

As regards this point, the literature provides some statements (Bergqvist, 1989), which formed the basic reference for the application of the Directive in Italy.

They are the following:

a) there is a clear epidemiologically proven connection between ocular and visual alterations and the characteristics of the VDU system, the environment and the task performed;

b) there is a connection, supported by good epidemiological evidence, between musculo-skeletal disorders and overloading in the neck-shoulder region produced by prolonged use of keyboard and mouse;

c) there are no epidemiological data clearly supporting a link between skin problems and stress-related disorders for VDU work, even though a high frequency of these disorders has been confirmed by some studies;

d) short term irreversible ocular and visual damage are excluded, while long term consequences have not been sufficiently investigated;

e) adverse effects on pregnancy are excluded.

Based on these well-documented and widely agreed upon statements reported in the literature, as well as some suggestions and integrations proposed by international institutions (Stewart et al., 1995), some specific guidelines were developed for practical application of the Directive in Italy (Coordinamento delle Regioni e delle Province Autonome, 1996).

2.2 Current practical application model

2.2.1 Risk assessment.

At present in Italy the Directive applies to all public and private workers with the exception of those belonging to some institutions, namely Armed Forces, Police and Universities and others, which are however awaiting for a specific legislative measure.

For operators considered “exposed” employers are specifically requested to check their workstations with particular attention to:

a) ocular and visual risk;

b) musculo-skeletal problems (related to posture);

c) workstation characteristics and environmental conditions.

The guidelines previously mentioned (Coordinamento delle Regioni e delle Province Autonome, 1996) describe a specific procedure to analyse and evaluate all the different issues.

The “step by step” approach is the following:

a) check-list for the analysis of tasks and environment and comparison with the annex;

b) implementation, where necessary, of the simply and most evident ergonomic rationalisation measures (in compliance with the annex or with specific national standards);

c) activation of more in depth analysis for specific cases (described below).

The check-list mentioned in point a) contains:

I. general description of the ambient (n°. of operators, lay-out, heating/cooling system, working space, etc.);

II. basic data of the workstation (VDU characteristics, illumination, desk, chair, etc.);

III. analytical task description (time, task duration, kind of task, observation distance, etc.);

IV. operators‘ subjective evaluation (interview) mainly dealing with microclimate, illumination, air quality, working space, etc.).

Points I and II are up to the personnel of the company (safety officer and associated staff) while point III implies the involved workers‘ collaboration.

The procedure is aimed at promoting the analysis of all VDU workstations and their modification to comply with the requisites of the annex which, being “minimum requirements”, may not be sufficient to eliminate all discomforts. This is quite common when the operator is constantly and heavily engaged throughout the week (>30 hrs) with monotonous tasks and/or slightly varying (such as data entry, word processing, etc.), and/or where there are environmental problems.

The guideline also proposes the use of more in-depth evaluation than that of the check-list, in three cases:

a) when it is impossible to put into practice the annex requirements because of building impedements, lay-out limitations, work process necessities, etc.;

b) when an excessive prevalence of ocular/visual disturbances (VDU worker asthenopia) is found over an average of 20 % (Krueger, 1991)(Scullica and Rechichi, 1989);

c) when large scale modifications of the workplaces are performed, concerning either furniture and/or equipment.

Moreover the guideline proposes some precise indications particularly when lighting measurements are needed. This photometric methodology has been elaborated in

agreement with national scientific publications (Piccoli et al., 1988) (Piccoli et al., 1995) as well as a specific technical standard set out by the Italian Standards Association (UNI-Principi di ergonomia della visione, 1997).

Finally, the training and education of workers, for which employers are responsible according to specific articles of law, are normally carried out by technical and medical personnel and two chapters of the Guideline are dedicated to this subject.

2.2.2. Health surveillance

Health surveillance is mainly concerned with monitoring the two “targeted” apparatuses of VDU work and precisely:

a) the visual apparatus

b) the musculo-skeletal apparatus.

As to the visual apparatus, the risk of discomfort and/or long term effects are mainly connected with visual effort (observation distance and exposure time) and with some specific environmental conditions (illumination, chemical agents, hardware and software characteristics, microclimate).

It is also believed that unsatisfactory work situations can increase the frequency and/or intensity of asthenopia in VDU workers, if affected by some specific ophthalmological disorders, namely not well corrected ametropia and eterophoria (hyper susceptible subjects).

As regards the musculo-skeletal apparatus it is believed that the risks are mainly associated with prolonged seated posture (morpho/functional alterations of the spine) and an intense use of keyboard and mouse (alterations of the joints and of the myotendine and nervous components of the upper limbs).

The aim of health surveillance in this area is to pin-point cases where the existence of symptomatological, functional and/or clinical work-related variations, could be predictive of more intense disturbances or development of alterations.

Practically, for each exposed subject, two types of medical checks should be planned:

a) ergophthalmological check-ups;

b) clinical/functional assessment of the spine and upper limbs.

The first, jointly carried out by an ophthalmologist and an occupational physicians, include:

- detailed medical history with particular reference to the relationship between symptomatology and exposure;
- refraction and, if necessary, correction;
- ocular motility examination;
- colour perception;
- clinical examination (anterior and posterior segment).

The second is aimed at revealing the presence of any anatomical or clinical marked alteration and the existence of symptoms related to functional disturbances (S.A.P). The latter are investigated by means of medical history evaluations. Only if necessary, more specific investigations are carried out usually in collaboration with physiatrists. Check-ups frequency varies according to the clinical and functional picture of the subject and the work situation. Consequently, more frequent check-ups can be performed on subjects suspected of having a rapid (months) negative evolution, in order to implement the necessary primary and secondary preventative actions.

2.2.3 Job fitness evaluation.

Every exposed worker must be declared “fit” to be employed as a VDU worker. A worker can be declared fit following an evaluation of the ocular-visual and musculo/skeletal conditions in relation to his/her specific task and the work situation. In the event of severe discomfort or functional deterioration or possible damage related to the specific task is found, the worker is declared “unfit” and cannot be assigned to that task. The “unfitness” may be:

a) partial (able to work with VDUs only for part of the working time);

b) total (unable to work with VDUs);

c) reversible (unfit for a limited time);

d)irreversible (permanently unfit).

Examples are shown in Table 1.

Table 1. Examples of unfitness for VDU workers.

Pathologies with severe reduction of visual acuity
• Severe congenital ocular pathologies (advanced retinitis pigmentosa, congenital malformations of the optic nerve)
• Bilateral advanced keratoconus
• Bilateral advanced cataracts
• Maculopathies (myopic, senile, dysmetabolic)
• Severe pathologies of the optic nerve (glaucomatous optic atrophy, optic neuritis)
Severe alterations of binocular function
• Myogenic paralyses (exophthalmic ophthalmoplegia, myastenia, acute exophtalmic myositis)
• Neurogenic paralyses (isolated paralysis of the oculomotor nerve, of the trochlear nerve, of the abducens nerve)
• Heterophorias in severe decompensation
Deterioration of previous alterations (evidence from surveillance)
• Progressive worsening of myopia in subjects >35 years
• Progressive increase of heterophoria
• Decrease of fusional amplitude
• Progressive worsening of the eye surface pathologies or disorders

Fitness can be restored, in accordance with the occupational physician‘s indications. For example, specific optical corrections like multifocal lenses, orthoptic exercises, workstation accessories (special seats and keyboards, supports for upper lower limbs, etc.) or improved environmental conditions (lighting, microclimate, etc.), if able “to fit the man to the job”, can reinstate the operator to his work.

In most cases in fact, it is not the worker but the job that should be declared “unfit” since it does not meet the human psychophysiological needs. Therefore workstations and working procedures must be modified and improved using the latest technological findings. Hence, the occupational physician in charge is greatly involved, both for monitoring purposes and collaboration with other experts (risk assessment). For this reason the Italian legislator issuing this law decided it was necessary to assign by law all the preventative medical aspects solely to a “competent physician”. This professional, already mandatory in industrial activities if lead, noise and asbestos risks are present

(Law 277/91), must be a specialised (i.e. a four-year university postgraduate course) occupational physician.

The legislator assigns to this specialist not only the sole responsibility of health surveillance and job fitness of the exposed workers but also the responsability of collaborating with the technical and administrative staff of the company when suitability and comfort of the workplace are involved. In this regard the “competent doctor” can be penally responsible for any negligence or incompetence which might cause alterations in the workers‘ health.

3 Conclusions

Application of Directive 90/270/EEC in Italy, transposed into the italian legislation by the Law 626/94 and 242/96, produced many positive effects. Above all it has favoured an increased collaboration between occupational physicians and other experts (industrial hygienists, lighting engineers, safety officers, etc.) This is certainly positive, not only in terms of better health surveillance programmes but even more for activation of more specific primary preventative actions. The latter can now be more easily designed and applied by interdisciplinary working groups where bio-medical knowledge is integrated with technology and is an essential reference for design and rationalisation of work-stations.

Finally, the increased awareness of employers and workers on issues concerning occupational health in the office, favours the development of new design proposals and solutions aimed at respecting the worker‘ physical and psychological integrity. Therefore a more comfortable working life and corresponding increase in quality and quantity of productivity are a most likely outcome for the near future.

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Appendix

Italian Version of the EU Directive 90/270/EEC

DIRETTIVA DEL CONSIGLIO

del 29 maggio 1990

relativa alle prescrizioni minime in materia di sicurezza e di salute per le attività lavorative svolte su attrezzature munite di videoterminali (quinta direttiva particolare al sensi dell'articolo 16, paragrafo 1 della direttiva 89/391/CEE)

(90/270/CEE)

IL CONSIGLIO DELLE COMUNITA EUROPEE,

visto il trattato che istituisce la Comunità economica europea, in particolare l'articolo 118 A,

vista la proposta della Commissione, presentata previa consultazione del comitato consultivo per la sicurezza, l'igiene e la tutela della salute sul luogo di lavoro (1),

in cooperazione con il Parlamento europeo (2),

visto il parere del Comitato economico e sociale (3),

considerando che l'articolo 118 A del trattato prevede che il Consiglio adotti, mediante direttiva, prescrizioni minime per promuovere il miglioramento in particolare dell'ambiente di lavoro, per garantire un più elevato livello di protezione della sicurezza e della salute del lavoratori;

considerando che, a norma dell'articolo precitato**,** le direttive evitano di imporre vincoli amministrativi, finanziari e giuridici di natura tale da ostacolare la creazione e lo sviluppo di piccole e medie imprese;

considerando che la comunicazione della Commissione sul suo programma nel settore della sicurezza, dell'igiene e della salute sul lungo di lavoro (4) prevede l'adozione di misure relative alle nuove tecnologie e che il Consiglio, nella sua risoluzione del 21 dicembre 1987 concernente la sicurezza, l'igiene e la salute sul luogo di lavoro (5) ne ha preso atto;

considerando che il rispetto delle prescrizioni minime atte a garantire un migliore livello di sicurezza dei posti di lavoro dotati di videoterminali costituisce un imperativo per garantire la sicurezza e la salute del lavoratori;

considerando che la presente direttiva è una direttiva particolare al sensi dell'articolo 16, paragrafo 1 della direttiva 89/391/CEE del Consiglio, del 12 giugno 1989, concernente l'attuazione di misure volte a promuovere il miglioramento

della sicurezza e della salute dei lavoratori durante il lavoro (6); che di conseguenza le disposizioni di quest'ultima direttiva si applicano pienamente al settore dell'utilizzazione,

da parte dei lavoratori, di attrezzature munite di videoterminali, fatte salve le disposizioni pi vincolanti e/o specifiche contenute nella presente direttiva;

considerando che i datori di lavoro sono tenuti ad informarsi circa i progressi tecnici e le conoscenze scientifiche in materia di concezione dei posti di lavoro, al fine di procedere agli eventuali adattamenti resisi necessari, in modo da garantire una maggiore protezione della sicurezza e della salute dei lavoratori;

considerando che per i posti di lavoro con videoterminali gli aspetti ergonomici rivestono particolare importanza;

considerando che la presente direttiva costituisce un elemento concreto nell'ambito della realizzazione della dimensione sociale del mercato interno;

considerando che, a norma della decisione 74/325/CEE ([7]), la Commissione consulta il comitato consultivo per la sicurezza, l'igiene e la tutela della salute sul luogo di lavoro al fine dell'elaborazione di proposte in questo settore,

HA ADOTTATO LA PRESENTE DIRETTIVA:

SEZIONE I

DISPOSIZIONI GENERALI

Articolo 1: Oggetto

1. La presente direttiva, che è la quinta direttiva particolare al sensi dell'articolo 16, paragrafo 1 della direttiva 89/391/CEE, stabilisce prescrizioni minime di sicurezza e di salute per le attività lavorative svolte su attrezzature munite di videoterminali quali sono definite all'articolo 2.
2. Le disposizioni della direttiva 89/391/CEE si applicano interamente a tutto il settore di cui al paragrafo 1, fatte salve le disposizioni più vincolanti e/o specifiche contenute nella presente direttiva.
3. La presente direttiva non si applica:

a) ai posti di guida di veicoli o macchine;

b) ai sistemi informatici montati a bordo di un mezzo di trasporto;

c) ai sistemi informatici destinati in modo prioritario all‘utilizzazione da parte del pubblico;

d) ai sistemi denominati «portatili» ove non siano oggetto d‘utilizzazione prolungata in un posto di lavoro;

e) alle macchine calcolatrici, ai registratori di cassa e a tutte le attrezzature munite di un piccolo dispositivo di visualizzazione di dati o delle misure necessarie all‘uso diretto di tale attrezzatura;

f) alle macchine per scrivere classiche, denominate «macchine a finestra».

Articolo 2: Definizioni

Ai sensi della presente direttiva si intende per:

a) videoterminale, uno schermo alfanumerico o grafico a prescindere dal procedimento di visualizzazione utilizzato;

b) posto di lavoro, l'insieme che comprende le attrezzature munite di un videoterminale, eventualmente con tastiera o altro sistema di immissione dati, e/o software per l'interfaccia uomo/macchina, gli accessori opzionali, le apparecchiature connesse comprendenti l'unità a dischi, il telefono, il modem, la stampante, il supporto per documenti, il sedile e il piano di lavoro, nonché l'ambiente di lavoro immediatamente circostante;

c) lavoratore, qualunque lavoratore ai sensi dell'articolo 3, lettera a) della direttiva 89/391/CEE che utilizzi regolarmente, durante un periodo significativo del suo lavoro normale, un'attrezzatura munita di videoterminale.

SEZIONE II

OBBLIGHI DEI DATORI DI LAVORO

Articolo 3: Analisi dei posti di lavoro

1. I datori di lavoro sono tenuti a compiere un'analisi dei posti di lavoro per determinarne le condizioni di sicurezza e salute per i lavoratori, in particolare per quanto riguarda i rischi eventuali per la vista e i problemi di affaticamento fisico e mentale.

2. I datori di lavoro devono prendere le misure appropriate per ovviare ai rischi così riscontrati, in base alla valutazione di cui al paragrafo 1, tenendo conto della somma e/o della combinazione delle incidenze dei rischi riscontrati.

Articolo 4: Posti di lavoro messi in servizio per la prima volta

I datori di lavoro devono prendere le misure appropriate affinché i posti di lavoro messi in servizio per la prima volta dopo il 31 dicembre 1992 soddisfino alle prescrizioni minime di cui all'allegato.

Articolo 5: Posti di lavoro già messi in servizio

I datori di lavoro devono prendere le misure appropriate affinché i posti di lavoro già messi in servizio entro il 31 dicembre 1992 siano adattati per soddisfare alle prescrizioni minime di cui all'allegato entro quattro anni al massimo a decorrere da tale data.

Articolo 6: Informazione e formazione dei lavoratori

I. Fatto salvo l'articolo 10 della direttiva 89/391/CEE, i lavoratori devono ricevere informazioni su tutto ciò che riguarda la salute e la sicurezza in relazione al loro posto di lavoro, in particolare le informazioni sulle misure applicabili al posto di lavoro attuate a norma dell'articolo 3 e degli articoli 7 e 9.

In tutti i casi i lavoratori o i loro rappresentanti sono informati su tutte le misure in materia di sicurezza e salute prese in applicazione della presente direttiva.

2. Fatto salvo l'articolo 12 della direttiva 89/391/CEE, ogni lavoratore deve ricevere inoltre una formazione per quanto riguarda le modalità d'impiego, prima di iniziare questo tipo di lavoro ed ogniqualvolta l'organizzazione del posto di lavoro è modificata in modo sostanziale.

Articolo 7: Svolgimento quotidiano del lavoro

Il datore di lavoro è tenuto a concepire l'attività del lavoratore in modo che il lavoro quotidiano su videoterminale sia periodicamente interrotto con pause o cambiamenti di attività, in modo da ridurre l'onere del lavoro su videoterminale.

Articolo 8: Consultazione e partecipazione dei lavoratori

La consultazione e la partecipazione dei lavoratori e/o dei loro rappresentanti si svolge conformemente all'articolo 11 della direttiva 89/391/ CEE per tutte le materie disciplinate dalla presente direttiva, compreso il suo allegato.

Articolo 9: Protezione degli occhi e della vista dei lavoratori

1. I 1avoratori beneficiano di un adeguato esame degli occhi e della vista, effettuato da una persona che abbia le competenze necessarie:
   - prima di iniziare l'attività su videoterminale,
   - periodicamente, in seguito, e
   - allorché subentrino disturbi visivi attribuibili al lavoro
   - su videoterminale.
2. I 1avoratori beneficiano di un esame oculistico, qualora l'esito dell'esame di cui al paragrafo 1 ne evidenzi la necessità .
3. I 1avoratori devono ricevere dispositivi speciali di correzione in funzione dell'attività svolta, qualora i risultati dell'esame di cui al paragrafo 1 o dell'esame di cui al paragrafo 2 ne evidenzino la necessità e non sia possibile utilizzare dispositivi di correzione normali.
4. Le misure prese in applicazione del presente articolo non devono assolutamente comportare oneri finanziari supplementari a carico dei lavoratori.
5. La protezione degli occhi e della vista dei lavoratori può far parte d'un sistema sanitario nazionale.

SEZIONE III

DISPOSIZIONI VARIE

Articolo 10: Adeguamenti dell'allegato

Gli adattamenti di carattere prettamente tecnico dell'allegato in funzione del progresso tecnico, dell'evoluzione delle normative o specifiche intenazionali oppure delle conoscenze nel settore delle attrezzature dotate di videoterminali sono adottate secondo la procedura prevista all'articolo 17 della direttiva 89/391/CEE.

Articolo 11: Disposizioni finali

1. Gli Stati membri mettono in vigore le disposizioni legislative, regolamentari ed amministrative necessarie per conformarsi alla presente direttiva al più tardi il 31 dicembre 1992.

Essi ne informano immediatamente la Commissione.

2. Gli Stati membri comunicano alla Commissione il testo delle disposizioni di diritto interno che hanno già adottato o che adottano nel settore disciplinato dalla presente direttiva.

3. Ogni quattro anni gli Stati membri presentano alla Commissione una relazione sull'attuazione pratica delle disposizioni della presente direttiva, indicando i punti di vista delle parti sociali.

La Commissione ne informa il Parlamento europeo, il Consiglio, il Comitato economico e sociale e il comitato consultivo per la sicurezza, l'igiene e la tutela della salute sul luogo di lavoro.

4. La Commissione presenta periodicamente al Parlamento europeo, al Consiglio ed al Comitato economico e sociale una relazione sull'attuazione della presente direttiva, tenendo conto dei paragrafi 1, 2 e 3.

Articolo 12

Gli Stati membri sono destinatari della presente direttiva.

Fatto a Bruxelles, addì 29 maggio 1990.

Per il Consiglio

Il Presidente

B. AHERN

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(1) GU n. C 113 del 29.4.1988, pag. 7, e
GU n. C 130 del 26.5.1989, pag. 5.

(2) GU n. C 12 del 16.1.1989, pag. 92, e
GU n. C 113 del 7.5.1990.

(3) GU n. C 318 del 12.12. 1988, pag. 32.

(4) GU n. C 28 del 3.2.1988, pag. 3.

(5) GU n. C 28 del 3.2.1988, pag. 1.

(6) GU n. L 183 del 29. 6.1989, pag. 1.

(7) GU n. L 185 del 9. 7. 1974, pag. 15.

ALLEGATO

PRESCRIZIONI MINIME

(Articoli 4 e 5)

Osservazione preliminare

Gli obblighi previsti dal presente allegato si applicano al fine di realizzare gli obiettivi della presente direttiva e qualora gli elementi considerati esistano sul posto di lavoro e non contrastino con le esigenze o caratteristiche intrinseche della mansione.

1. ATTREZZATURE

a) **Osservazione generale**

L'utilizzazione in sé dell'attrezzatura non deve essere fonte di rischio per i lavoratori.

b) **Schermo**

I caratteri sullo schermo devono avere una buona definizione e una forma chiara, una grandezza sufficiente e vi deve essere uno spazio adeguato tra i caratteri e le linee.

L'immagine sullo schermo deve essere stabile, esente da sfarfallamento da altre forme d'instabilità.

La brillanza e/o il contrasto tra i caratteri e lo sfondo dello schermo devono essere facilmente regolabili da parte dell'utilizzatore del videoterminale e facilmente adattabili alle condizioni ambientali.

Lo schermo dev'essere orientabile ed inclinabile liberamente e facilmente per adeguarsi alle esigenze dell'utilizzatore.

E' possibile utilizzare un sostegno separato per lo schermo o un piano regolabile.

Lo schermo non deve avere riflessi e riverberi che possano causare molestia all'utilizzatore.

c) **Tastiera**

La tastiera dev'essere inclinabile e dissociata dallo schermo per consentire al lavoratore di assumere una posizione confortevole e tale da non provocare l'affaticamento delle braccia o delle mani.

Lo spazio davanti alla tastiera dev'essere sufficiente onde consentire un appoggio per le mani e le braccia dell'utilizzatore.

La tastiera deve avere una superficie opaca onde evitare i riflessi.

La disposizione della tastiera e le caratteristiche dei tasti devono tendere ad agevolare l'uso della tastiera stessa.

I simboli dei tasti devono presentare sufficiente contrasto ed essere leggibili dalla normale posizione di lavoro.

d) **Piano di lavoro**

Il piano di lavoro deve avere una superficie poco riflettente, essere di dimensioni sufficienti e permettere una disposizione flessibile dello schermo, della tastiera, dei documenti e del materiale accessorio.

Il supporto per i documenti deve essere stabile e regolabile e deve essere collocato in modo tale da ridurre al massimo i movimenti fastidiosi della testa e degli occhi.

È necessario uno spazio sufficiente che permetta ai lavoratori una posizione comoda.

e) **Sedile di lavoro**

Il sedile di lavoro dev'essere stabile, permettere all'utilizzatore una certa libertà di movimento ed una posizione comoda.

I sedili debbono avere altezza regolabile.

Il loro schienale deve essere regolabile in altezza e in inclinazione

Un poggiapiedi sarà messo a disposizione di coloro che lo desiderino

2. AMBIENTE

a) **Spazio**

Il posto di lavoro deve essere ben dimensionato e allestito in modo che vi sia spazio sufficiente per permettere cambiamenti di posizione e di movimenti operativi

b) **Illuminazione**

L'illuminazione generale e/o l'illuminazione specifica (lampade di lavoro) devono garantire un'illuminazione sufficiente ed un contrasto appropriato tra lo schermo e l'ambiente, tenuto conto delle caratteristiche del lavoro e delle esigenze visive dell'utilizzatore.

Fastidiosi abbagliamenti e riflessi sullo schermo o su altre attrrezzature devono essere evitati strutturando l'arredamento del locale e del posto di lavoro in funzione dell'ubicazione delle fonti di luce artificiale e delle loro caratteristiche tecniche.

c) **Riflessi e abbagliamenti**

I posti di lavoro devono essere sistemati in modo che le fonti luminose quali le finestre e le altre aperture, le pareti trasparenti o traslucide, nonché le attrezzature e le pareti di colore chiaro non producano riflessi fastidiosi sullo schermo.

Le finestre devono essere munite di un opportuno dispositivo di copertura regolabile per attenuare la luce diurna che illumina il posto di lavoro.

d) **Rumore**

Il rumore emesso dalle attrezzature appartenenti al / ai posto / i di lavoro deve essere preso in considerazione al momento della sistemazione del posto di lavoro in particolare al fine di non perturbare l'attenzione e la comunicazione verbale.

e) **Calore**

Le attrezzature appartenenti al / ai posto / i di lavoro, non devono produrre un eccesso di calore che possa essere fonte di disturbo per i lavoratori.

f) **Radiazioni**

Tutte le radiazioni, eccezion fatta per la parte visibile dello spettro elettrromagnetico, devono essere ridotte a livelli trascurabili dal punto di vista della tutela della sicurezza e della salute dei lavoratori

g) **Umidità**

Si deve far in modo di ottenere e mantenere un'umidità soddisfacente

3. INTERFACCIA ELABORATORE/UOMO

All'atto dell'elaborazione, della scelta, dell'acquisto del software o allorché questo viene modificato, come anche nel definire le mansioni che implicano l'utilizzazione di unità videoterminali, il datore di lavoro terrà conto dei seguenti fattori:

a) il software deve essere adeguato alla mansione da svolgere;

b) il software deve essere di facile uso e, se del caso, adattabile al livello di conoscenze e di esperienza dell'utilizzatore; nessun dispositivo di controllo quantitativo o qualitativo può essere utilizzato all'insaputa dei lavoratori;

c) i sistemi debbono fornire ai lavoratori delle indicazioni sul loro svolgimento;

d) i sistemi devono fornire l‘informazione in un formato e ad un ritmo adeguato agli operatori;

e) i principi dell‘ergonomia devono essere applicati in particolare all‘elaborazione dell‘informazione da parte dell‘uomo.