

PROJECT FOR THE MODERN EDUCATIONAL TOOL IN MEASUREMENT AND METROLOGY

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Abstract: *Multimedia represent an integrated system, enabling contact with users, taking their attention and offering the possibility for informing them. They utilise technical means for simultaneous acting through visual tools, enabling easy and intuitive control through user friendly graphical interface. Key elements of the multimedia include static and animated graphics, sound and text, video sequences. Paper describes introduction of modern information and communication technologies (ICT) in education. Description of the international project COMET, granted by EU, focused on development of the multimedia tool for education in measurement and metrology, is presented as well.*

Keywords: *education in measurement, multimedia, information and communication technology*

1 INTRODUCTION

Information and communication technology (ICT) opens a completely new world for utilisation of the latest progress in education. Hardware and software developments enable obtaining of a good result in relatively favorable costs. Therefore proper attention must be paid to such possibilities, encouraging teachers and students take advantages of ICT, overwhelming apprehensions and skepticism. It does not definitely mean that the educational classicism is forgotten. ICT just brings new ways how to transform information in a new form.

2 EU POLICY AND ICT IN EDUCATION

The policy of the European Union concerning the use of ICT services (Internet especially) by educational institutions, enterprises and individuals, has been declared at the summits in Lisboa (March 2000) and Stockholm (March 2001). The summits have stressed the importance of ICT for the creation of a so called *society of knowledge*, for higher quality of education and subsequently for the economical growth; for removing barriers of employment among individual states, etc. In particular, the vision of EU training policy includes:

- development of human skills necessary for living and work in the information society;
- the use of modern information and communication technologies in the training (multimedia, internet, WEB);
- the diversity of the training possibilities (tutored education, semi-autonomous learning, open and distance learning, autonomous learning);
- contribution to higher quality and effectiveness of education;
- improvement of the access to the education for all people including disabled people.

3 ICT POSSIBILITIES IN EDUCATION

The use of ICT offers the following innovative features:

- high *illustrativeness*,
- *knowledge concentration* in one product which can be directly used for training,
- high *flexibility* and *adaptability* in preparation of training courses for individual target groups with different training needs,
- *facilitated access* to the training – use in different types and levels of the education.

All above-mentioned points, concerning use of ICT in educational process, stress increased *effi-*

Totally 10 institutions from 7 European countries take part at the project. Two of them belong to the Vienna University of Technology (VUT), project promoter.

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ciency of the training that has a real economical impact.

4 WHY TO USE ICT IN EDUCATION OF METROLOGY AND MEASUREMENT

Metrology and measurement have a key position in the areas of science, research, production, testing and certification. While metrology is more a research science for highly specialised experts, its results together with the appropriate measurement equipment are widely used in the practical life. In modern industries, the costs of measurements represent up to 10-15% of the production costs. In Europe of today we measure and weight a cost equivalent to 6% of the combined gross national product.

Increasing precision of the measurement, more sophisticated methods and means, continuing research as well as the considerable amount of newly adopted EU normative documents lay high requirements on the qualification and skills of persons working in this area. Knowledge in metrology and measurement is necessary also for managers especially of small and medium size enterprises (SMEs) which don't employ their own metrologists. These managers should consider metrology and measurement in their technological decisions and innovation policy. This resulted in an increased demand for training in the area of metrology and measurement. A needs analysis showed that the potential of the traditional approaches to vocational training in metrology and measurement has reached its limit performance and can not fully satisfy the actual and future requirements. The traditional

vocational training system in the area of measurement and metrology provides face-to-face training courses consisting of lectures, exercises and laboratory training. The teaching materials are in printed form, the use of information and communication technologies (ICT) in the training is rather low.

5 COMET PROJECT

As everybody can imagine, multimedia development is long-lasting and expansive matter. Therefore consortium of 10 institution has submitted a proposal for the international project

entitled *Computer Aided Training in Measurement and Metrology* (COMET) within the Leonardo da Vinci framework. The acceptance of the project was confirmed in summer 2001 and the official starting date was November 1, 2001. Project lasting is planned for 36 months, finishing in November 2004.

The specific aim of the project is to develop and disseminate a *multimedia training package for vocational training in the area of metrology and measurement*. The purpose of this multimedia package is to improve the quality and efficiency of the vocational training in the above mentioned area, to facilitate the access to this training as well as to contribute to wider use of information and communication technologies in vocational training.

The complete product will consist of:

- *multimedia courseware* including lectures, exercises, tests, and supporting modules (calculation tools, dictionary), all in hypertext form, supported by graphics (including full-color static figures, two- and three-dimensional computer animations, video sequences). This multimedia courseware will be available on WEB-site as well as on CD-ROM,
- *supporting teaching materials* in printed form (including textbook, working sheets for lectures and exercises, tables, tests, dictionary, etc.);

The package developed should be used in different types and levels of education – in face-to-face education, open and distance learning,

Content is divided into 31 modules arranged in 10 WPs.

Work package		Module	
1	General introduction	1	history of metrology and meas.
		2	quantities and units
		3	measuring principles
		4	measuring instruments
2	Meas. instr. and devices	5	physical principles of meas.
		6	design and man. of meas. instr.
		7	image and signal processing
3	Measurement I	8	temperature
		9	pressure
		10	flow and flow rate
4	Measurement II	11	material level
		12	length, position, dimension
5	Measurement III	13	roughness
		14	geometrical properties
6	Measurement IV	15	angle
		16	frequency of rotation
		17	humidity
7	Measurement V	18	force
		19	mass
		20	torque
		21	power
8	Measurement VI	22	voltage
		23	current
		24	resistance
9	Utilis. of measured data	25	experiment design
		26	models of measurement
		27	uncertainty in measurement
		28	measurement process control
10	Legislative aspects	29	international organisations
		30	metrological systems
		31	accreditation and certification

WEB-based learning, individual learning. This will create very good conditions also for the training of disabled people, and of course, ensures equal chances of women for the vocational training.

In order to ensure a wide use of the multimedia training package, it will cover the most frequent topics of metrology and measurement. Wide use of the developed multimedia training package will be supported by its modular structure providing information in three levels (basic, advanced, expert) as well as by its development in 4 languages - German, French, English and Slovak. As the multimedia training package should

be a unique product in the area of metrology and measurement, a big interest of the market is expected.

The primary target group of the project includes staff working in the metrological laboratories of industrial enterprises, calibration and testing laboratories. In addition, it is expected that the developed multimedia training package will be widely used also for the training of managers especially of SMEs, testing and calibration laboratories as well of students in the initial vocational training. The development of the multimedia training package in English, German, French and Slovak versions will enable its direct use in local languages of many European countries.

Area of metrology and measurement is very wide and rich. Therefore only certain tasks have been selected. The whole content is organised and developed in modules. Modules are arranged in work packages for sake of clarity. Totally 31 modules should be developed, organised in 10 work packages.

The development of the multimedia training package runs in three basic parallel lines: development of multimedia shell, development of expert content including supporting

teaching materials (exercises, electronic tests, etc.) and development of relevant graphical elements.

The quality management of the project is based on three main principles:

- involvement of leading experts in the project,
- efficient management,
- continuous evaluation, testing, and corrective actions.

The project consortium has been formed with respect to the different types of tasks to be performed within the project. Therefore, the con-

sortium includes experts in the area of measurement and metrology, in the area of professional training (incl. university education, continuing education, open and distance learning), in the area of the development of WEB-based applications and multimedia, as well as in the area of project management.

The operational management structure proposed for the project should ensure transparency in the roles and responsibilities of the individual project partners.

Testing and evaluation of the developed modules as well as subsequent correcting represent the third element of the quality assurance system. The consortium members will test the individual modules, work packages and finally the complete product as well by external users.

The developed product dissemination strategy must follow three objectives:

- to get the product into the awareness of the potential users and create a good image for it,
- to acquire enough users for testing and evaluation of the product preliminary versions,
- to ensure a broad use of the final product.

The professional background of the project partners forms a good basis for a successful accomplishment of the foreseen dissemination and marketing strategies. All partners will use their

The screenshot shows a web page titled 'Radian' and 'Steradian' from the 'Metromedia' website. The page is structured with a sidebar on the left containing navigation links such as 'Home page', 'Animations', 'Video', 'Exercises', 'Quiz', 'Calculators', 'List of sources of information', 'Index', 'Search', 'Help / FAQ', and 'Your questions and comments'. The main content area is divided into sections for 'Derived unit of plane angle' and 'Derived unit of a solid angle'. The 'Radian' section defines it as the angle between two radii of a circle where the arc length equals the radius, and notes that there are 2π radians in a complete circle. The 'Steradian' section defines it as the solid angle that subtends an area on a sphere equal to the square of the radius, and notes that there are 4π steradians in a complete sphere. Two diagrams are included: Fig. 2.6 shows a circle with radius r and arc length s equal to r , defining one radian. Fig. 2.7 shows a sphere with radius r and a solid angle Ω subtending an area A on the sphere's surface, where $A = r^2 \Omega$. At the bottom of the main content area, there are buttons for 'Exercise 3', 'Exercise 4', and 'Back to contents'. The browser's address bar shows 'Internet'.

Example of the educational text, providing text information, figures, animations, exercises and self-tests

numerous professional contacts to support the dissemination of the multimedia training package. As dissemination forms an important part of the project activities, the information on the project, its progress as well as the outputs will be disseminated in several lines, as stated above.

CONCLUSION

Development of the above described multimedia training tool for the education in measurement and metrology, can be observed at the free project web site www.metromedia-online.com. Everybody is welcomed to visit this site, all inputs and suggestions are cordially appreciated.

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