MULTIMEDIA TOOLS FOR EDUCATION 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. Main attention is paid to journey from classical textbook to multimedia educational package. Description of the international project proposal, focused on development of the multi-level, multilingual multimedia tool, intended for education in measurement and metrology, represents main part of the paper.

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

1 ICT IN EDUCATION

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 scepticism. It does not definitely mean that the educational classicism is forgotten. ICT just brings new ways how to transform information in a new form.

1.1 EU policy and use of the 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.

EU creates also technological possibilities for fulfilling such aim. Ministers of EU countries, responsible for telecommunications, supported the proposal to ensure the possibility of Internet access for each household. According to the proposal, telecommunication operators must guarantee the functioning Internet access also in distant areas of individual countries where such service is not profitable. Each citizen of the EU has the right for access to telephone, fax and Internet. This means that utilisation of modern educational technologies is not restricted only to rich and attractive areas and countries.

1.2 Conventional training methods versus ICT possibilities

Comparison of conventional training methods and materials with those based on the use of ICT brings following results:

The main disadvantages of the traditional training approach and materials are represented namely by:

- low visual level (illustrativeness) of teaching materials,
- limitation of the laboratory training to the equipment available at the training centres,
- low adaptability of the training courses to the different needs of different target groups,
- restricted access to the training.

On the other hand, the use of ICT offers the following innovative features:

- high *illustrativeness* is a big advantage of new information and communication technologies. While the traditional teaching materials offer only so called *static information* consisting of text and pictures, the multimedia package stresses the expert content by its dynamical graphics (video sequences, graphical animation). The efficiency of the teaching and learning process is also considerably improved by the use of hypertext structure and incorporating other interactive supporting modules (like indexes, registers, calculations, dictionary);
- *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. ICT educational products usually have a modular structure enabling the selection of the appropriate modules for the given training course. The multilevel structure (typically basic, advanced and expert level) of the information contained in the package enables to satisfy the needs of the users with different pre-qualifications. Use of IT technologies enables fast updating of the training materials so that they can reflect the latest knowledge in the respective field,
- *facilitated access* to the training - ICT can be used in different types and levels of the education (face-to-face education, open and distance learning, WEB-based learning, individual learning, continuing education, university education. Namely Internet offers the best possibilities for individual vocational training.

All above-mentioned points, concerning use of ICT in educational process, stress increased *efficiency* of the training that has a real economical impact.

1.3 From classical textbook to multimedia educational tool

The possibilities for use of ICT in education are very wide, therefore also journey from classical textbook to the multimedia tool includes several stages. Let's mention some of them.

Publishing the classical publication on data medium

Using data medium instead of classical textbooks represents the simplest way for the ICT utilisation. By data medium are thereby meant recordable CDs as well as storing data on server accessible via Internet. In the most simple case text created for publishing by classical way is transformed into an electronic format, suitable for browsing and possible printing of interesting parts. Widespread format is *.pdf that can be viewed by free browser Adobe Acrobat Reader™ and that is most likely the most popular standard in this field. As almost everybody prepares the textbooks by computer (figures can be scanned or drawn by proper graphic editor) this way of publishing does not bring almost any additional effort comparing to the classical textbooks publishing.

As such use of ICT seems to be very marginal and not being worth any attention, it brings several advantages:

- price - CD (or server) contains undoubtedly more content for less money. Expenditures connected with publishing, namely with printing, can be neglected. Costs of data mediums (even in the case of servers) are much lower, especially when several textbooks are stored at one CD,
- good accessibility, especially in the case of Internet access.

As use of data mediums instead of classical printing is rather new possibility, several questions should be solved:

- author rights - protection of copyright, while illegal electronic copies have the same quality as original. This is very difficult problem and its satisfactory solution is not observable yet (remember Napster™ court),
- official recognition of such publication (not being printed classically) - International System of Books Number (ISBN) is connected with printed materials and there are problems (in Slovak Republic at least) with official classification of electronic publications,
- advertising and marketing - brand new ways for advertising and marketing, in most cases via Internet, comparing to the printed materials being sold in book stores.

Textbook Measurement in Technology *has been transformed described way in the *.pdf form. Besides the textbook, CD contains also the working sheets, intended for remarks during the lecture. The same version is located at the web site* silly.vm.stuba.sk *; access is free.*
Interest of the student is rather high. They can borrow CD version from the faculty library, download it from Internet or buy in the bookstore.

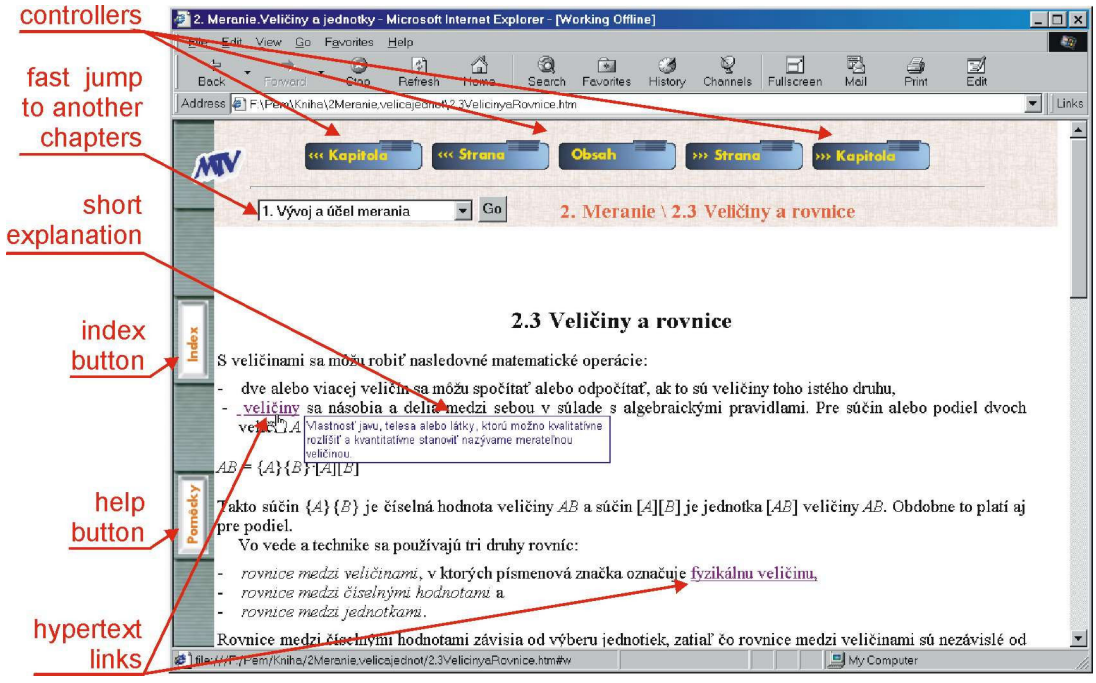
(original textbook - Chudý, Palenčár, Kureková, Halaj: Measurement in Technology, published by Vydavateľstvo STU, 1st edition, 688 pp., ISBN 80-446-5826, in Slovak)

Modification of the classical publication and its publishing on data medium

Let us consider again the CD and Internet. Task is a little bit more complex now. While in the previous case only material prepared for publication by classical way has been utilised, another possibilities occur now:

- preparation of the color version of used graphical elements (figures, charts, schemes),
- preparation of the hypertext version of the study material,
- addition of links to further information sources on Internet. If such references are to be utilised in CD version of the textbook, access to Internet must be provided.

One can observe introduction of so called *interactivity* feature. User (not more the classical reader!) can select the way of information reception - the journey how he (or she) will continue in learning.



Textbook Measurement in Technology *has been transformed also to the hypertext form. Comparing to the *.pdf version, offers much higher comfort for user, enabling fast searching for required information. Besides links (functioning by clicking on the highlighted word) includes also short explanation of selected terms, appearing after simple moving cursor over the highlighted word.*

Such modification brings following advantages:
- fast searching for required information due to hypertext utilisation. Cross-references enable easy finding of explanations when studying respective part of the text,
- higher information value of graphical elements - color makes wonder, improving considerably way of information receipt,
- references to the information sources considerably expand amount of presented information and they can solve the requirement of user to get very detailed information in the respective field.

A lot of software tools for hypertext preparation are commonly available. Internet browsers are usually utilised for browsing of such educational work.

Movement introduction

Let us continue in the journey from classical textbook to multimedia and introduce more complex product having certain features of multimedia educational tool. Movement introduction means presentation of the graphical elements in dynamic form of animations. More easily form of dynamic actions offer different presentation packages, e.g. Microsoft Power Point™.
Static figuration of certain phenomena (physical and technological principles, complex drawings) could be very difficult even after a long preparation and careful design. User observes only leading or final stage of the phenomena, respectively several transient elements in the best case. On the other hand, dynamics of the presented information means further improvement of the education quality.

Introduction of new elements, different from classical textbook

ICT offers incorporating of new features into educational tool. Besides text and graphical elements, having the character of the knowledge presentation, another possibilities for development of the user skills can be introduced:
- *calculation programs* - even simple calculation programs, like conversions among different units, improve practical utilisation of presented knowledge,
- *simulation examples* - wide variety of simulation programs are available (e.g. Matlab™). Proper simulation examples can describe also very difficult tasks (e.g. uncertainty evaluation) and thereby fix presented knowledge,
- *virtual tools and laboratories* - very popular and growing area, enabling practicing of theoretical knowledge. Expansive laboratory equipment (not available many times, or requiring special safety precautions) is not necessary. Certain danger can be seen in their virtual nature, when students do not obtain real practical skills in work with real equipment,
- *electronic exercises and tests* - very important feature namely for open and distance learning.

All these elements support receipt of knowledge, presented in explanatory part. They can properly supplement

Multimedia

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 as well. Fast development, caused by improved SW and HW elements, did not avoid also multimedia creation.
Multimedia support motivated receipt of information that is assumption for their wide use in education. Therefore methodical, by the multimedia form given information, can supplement or replace textbooks or the tutor-led lectures. In distance education forms multimedia represent potentially main information source for learned subject. As stated before, in multimedia offer number of advantages in this function:
- hypertext (hypermedial) approach enables fast search of required information and their receipt in different context,
- presentation dynamics, based on large scale of visualisation elements (animation, video sequences, narration, original sounds).

One must consider that multimedia educational programs find the best application in individual study, often without contact with teacher. Therefore big attention must be paid to the pedagogical aspects of the multimedia tool creation. Structure and way of presentation must be adapted to the learning subject. Information flood can disorient the student and thereby damp the motivation and interest for obtaining further knowledge. This is observable very much when using Internet information sources. Dangerous can be passivity of the student, getting the information in the easy way, not being forced to

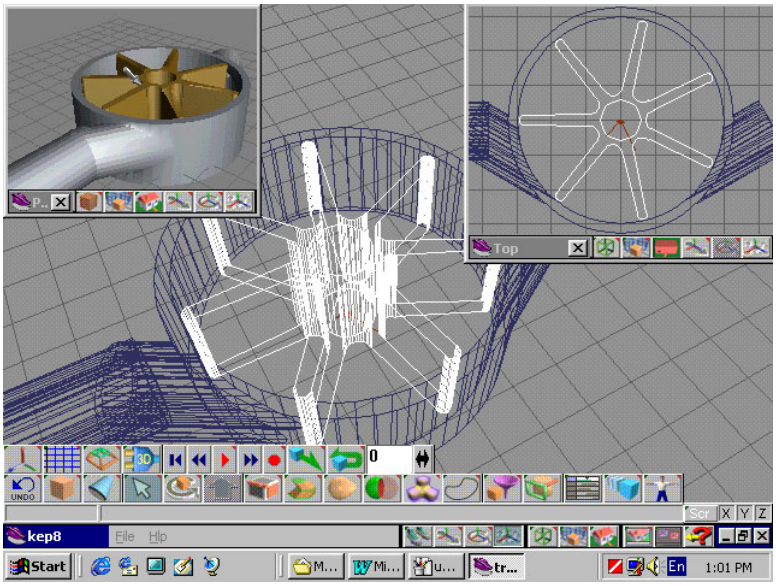
think about it so much. Even excessive use of different virtual instruments, simulation programs, etc. can suppress practical skills and thereby embarrass utilisation of obtained knowledge.

1.4 ICT and educational institutions

Use of modern ICT in education brings a lot of problems that should be solved to obtain satisfactory result. Both parties must cooperate in this process - educational institutes and teachers as well.
Consider teacher first. Few years ago there were just limited possibilities for presentation of lectures or preparation of the study material. Use of transparencies for overhead projector (mostly black and white), maybe frames for normal projector, later on video (occasionally) - those were usual possibilities for knowledge presentation. Preparation of the classical textbooks has been done using typewriter, later by computer. Teacher had to be expert in the field, not having many possibilities (and not being asked) to think on formal aspects of the knowledge presentation. But growing expansion of the ICT increased also demands put on teacher - how to attract students attention, how to present the knowledge as effectively as possible? So that teacher, still being expert in the field, should be able to utilise also new possibilities given by ICT. Either by himself, or formulate his ideas for computer experts at least. The first case is ideal, but rare. The second one is easier, but much more expansive. And the result sometimes must not meet expectations from both sides.
On the other hand, educational institutions should:

- theoretically solve and practically verify pedagogical aspects of multimedia utilisation. As this is rather new technology, its pedagogical appropriateness must be ensured,
- support use of new modern teaching methods (multimedia included) in educational institutes. Many times one can find the opinion - everything new is difficult, old approaches has been proved and verified. Therefore organisation must encourage people find and use new possibilities, creating proper technical and human conditions.

Wide variety of graphical editors, animation software, hypertext preparation tools is available on the market. Their proper utilisation for intended purpose requires certain skills and is not so evident for most teachers. The ever-continuing development offers new possibilities, on the other hand requires more and more specialised operators.



Example of the animation preparatory phase. Three dimensional wireframe model is prepared first (upper right window). Then surface properties are added (upper left window). Animation of the full-color model is designed in the last phase. Shown is animation of the flow meter, performed in Caligari TrueSpace™ animation software.

As stated before, supporting of ICT use in the educational process is both technical task as well as organising task. Technical aspect could be solved relatively easily - I mean technically, not economically. If you consider a price for computers, presentation tools, software packages - you get very high expenditures. On the other hand - when you create a good educational product, interesting for the market, you can get part of the expenditures back. Good possibilities for marketing and sale of such product brought Internet (see following part *Dissemination* later in the paper). Small prices for product download from Internet (maybe students can have free access) can result thoroughly in very

interesting amount. Even more if some companies could be attract to add links to their products. All that could help by ICT use. Best possibilities have products developed also in some of the world languages

Organising tasks cover support of the teacher by ICT experts. Due to a complex character of the multimedia, it is not liable that single person could prepare proper text, graphical elements (static and dynamic), video (maybe with original sound), supporting modules (programs, tests). Therefore a team (center) should be created, offering support to the expert in the field. Most likely, the economical aspects are the most often reason for not doing it. Finances from sold products can somehow overwhelm them. Another financial source is represented by grants, either local or international. Programs like Leonardo da Vinci, Socrates, maybe the 5th framework, could represent available frameworks for financing the educational activities.

Utilisation of ICT in education is not easy. But one cannot stop the human progress. ICT will go more and more into our everyday lives. And is better to be prepared.

2 COMET

As described in previous text, 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. Although the decision on the project financing has not been announced yet (it should be known in November 2001), presented information can describe complexity and difficulties of the multimedia development process.

2.1 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. Metrology and measurement have a big importance for standardisation, interchangeable manufacturing and thus also for the development of the global European economy. Measurement and metrology play an important role in quality assurance of products, goods and services. Type approvals, conformity assessment of individual items, their verification and testing – all these tasks are based on measurements. 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.

The above mentioned facts result 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 laid on the vocational training in this area. 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. This was the main impulse for the submitting of such project proposal.

2.2 General information

Project lasting is planned for 36 months. Proposed total budget represents approximately 540.000 EUR with EU contribution planned for 397.000 EUR.

Totally 10 institutions take part at the project, resident in 7 European countries. Two institutions belong to the Vienna University of Technology, promoter of the project.

Country	Institution	Contact person
A	Vienna University of Technology, University Extension Centre	Franz Reichl
A	Vienna University of Technology, Institute of Production Technology	Peter-Herbert Osanna
A	Austrian Standards Institute	Alexander Budasch
D	Steinbeis Transfer Centre	Dietrich Hofmann
EL	Western Greece and Epirus U.E.T.P.	Maria Ikarioti
F	Institut Méditerranéen de la Qualité	Christine Angelini
NL	University of Twente	Paul Regtien
SK	Slovak University of Technology	Martin Halaj
SK	Mega & Loman	Ján Miklášik
UK	Whitestone Business Communications	Jackie Grove

2.3 Project aim

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 sfacilitate 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-colour 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. The WEB-site and the CD-ROM will include also “ready-for-print” supporting teaching materials,
- *supporting teaching materials* in printed form (including textbook, working sheets for lectures and exercises, tables, tests, dictionary, etc.);

The package will be used in different types and levels of education – in face-to-face education, open and distance learning, 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 project addresses the respective objectives of the Leonardo da Vinci program as well the call priority:

- by the use of latest information and communication technologies and training methodologies, it will increase the *quality of the vocational training*, and thus *improve the skills and competencies* of students and specialists undertaking vocational training;
- the developed multimedia training package will be disseminated/distributed via Internet and on CD-ROM that will ensure its high availability. The package will be suitable for the initial training, all types of continuing education (from tutored learning up to distance and open learning) as well as for individual learning. Thus, the *access to vocational training* of all target groups including disabled people and women will be improved;

- *employability*: better skills and competencies gained during the initial training will increase the chances of young people to find a job. Good access to continuing education will enable the staff working in the respective areas to *improve continuously their skills and competencies* in accordance with the requirements laid on their actual or future working positions.

2.4 Target groups

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. The developed multimedia training package can be used in many different sectors – mechanical engineering industry, chemical industry, electrical engineering industry, paper and pulp industry, environmental protection, testing and certification of products, services and goods, etc. It will be possible to use the package use in different types of education. The main users should be continuing education centres offering continuing education, open and distance learning, WEB-based courses, higher education institutions offering different types of education as well as companies and laboratories for the internal training of their staff.

2.5 Project impact

Wide European impact of the project is expected, based especially on the following facts:

- the multimedia package will be developed in 3 most used European languages (G, F and E), as well as in one local language (SK). This creates a strong basis for its wide use in Europe,
- the multimedia package will be used in many different sectors – mechanical engineering industry, chemical industry, electrical engineering industry, paper and pulp industry, environmental protection, testing and certification of products, services and goods, etc. Thus, the target group includes a big number of potential users,
- the innovative features of the multimedia package should motivate both the providers of vocational training and students to its use.

Due to the innovative aspects of the multimedia package as well as to the obligated competence testing of the staff working in testing and certification laboratories, following short-term impact of the project is expected:

- the number of specialised (tailor-made) courses reflecting the actual needs of individual target groups will be increased,
- the number of students undertaking a form of continuing vocational training in metrology and measurement (face-to-face training, distance learning, WEB-based learning, individual training, etc.) will be increased,
- as the developed multimedia training package will be suitable for open and distance learning as well as for individual learning, the number of disabled people (especially people with disabilities of motoric functions) in training can be increased,
- the efficiency of the training will be increased, that means the relevant knowledge will be gained in shorter time and with higher flexibility.

The long-term impact of the project in the area of vocational training should be apparent in *stimulation* and *support* of the global implementation of ICT into vocational training. The *stimulation* will be based on the expected fact that the successful multimedia package will serve as a model for the preparation of similar products in other areas of vocational training. The *support* will be based on the transferability of the developed multimedia package to other training fields. Transferable will be especially the open software structure of the multimedia courseware and the methodology of the training package development. Thus this project will contribute to the development of the information society.

Project should have also a long-term impact. The multimedia package will serve as a gate to the area of metrology and measurement for managers especially of SMEs. Their better knowledge in this area will be reflected in their innovation and technological policy towards generally accepted European standards what will have a positive influence on the European cooperation and economy.

2.6 Expert content

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

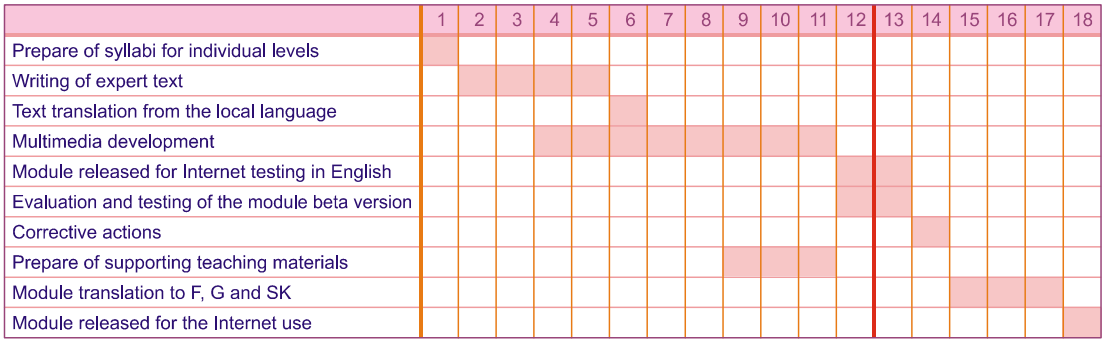
packages for sake of clarity. Totally 31 modules should be developed, organised in 10 work packages. For details see following table.

Multimedia tool content is divided into 31 modules arranged in 10 work packages.

Working package		Module	
1	General introduction	1	history of metrology and measurement
		2	quantities and units
		3	measuring principles
		4	measuring instruments
2	Measuring instruments and devices	5	physical principles of measurement
		6	design and manufacturing of measuring instruments
		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	Utilisation 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

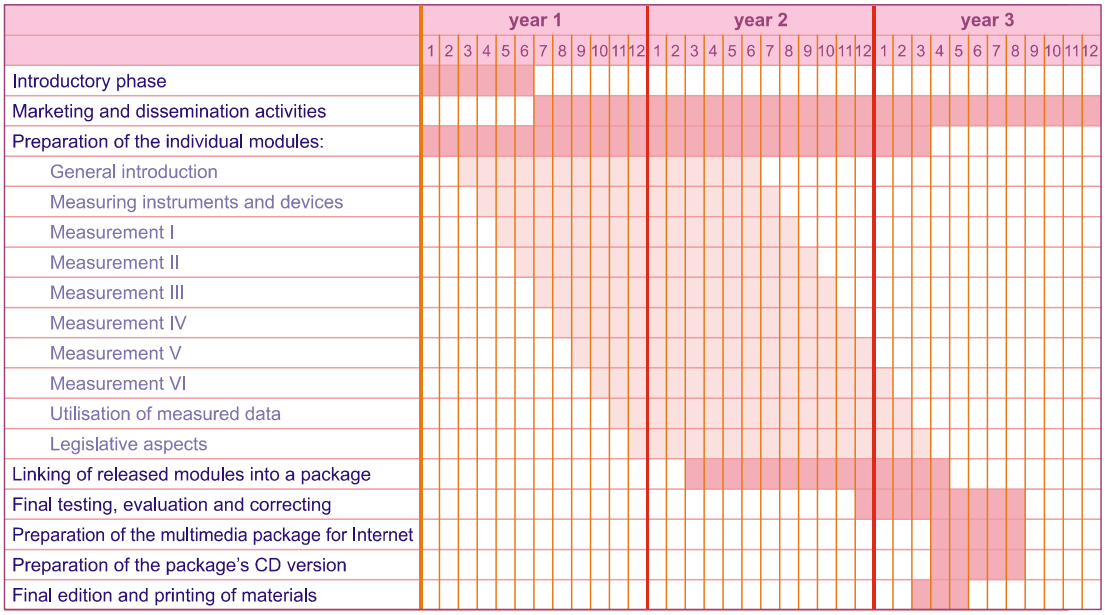
2.7 Stages of the development process

The development of the multimedia training package will run in 3 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 modularised and open structure of the product will enable its step-by-step development and addition of new modules. It is expected that the first modules of the multimedia training package including the graphical tools and supporting teaching materials will be released for the web utilisation and testing at the beginning of the second project year. Subsequently, other modules will be continuously released in small time intervals. The full version of product will be released for the final testing and improvement about 5 months before the end of the project and the final version of the package will be available on WEB and on CD-ROMs about 2 month before the end of the project.
Please find an example of the development cycle of one individual expert module on following figure.



Example of the development cycle for one module. Preparation of the module lasts for 18 months, module is released for Internet testing after 13 months.

Brief timetable for the development of the whole multimedia training package is shown on following figure.



Development cycle for the whole multimedia package. Development of the whole package is calculated for 36 months.

2.8 Quality Assurance

The quality management of the project will be based on the following 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 consortium 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.

- *testing and evaluation performed by consortium members*. Each developed module will tested by the project partners. After successful testing, the respective module / work packages will be released for public use on the project WEB-site,
- *testing and evaluation performed by external users*. For external testing and evaluation, a questionnaire will be developed. It will be possible to complete the questionnaire interactively on the project WEB-site. The data will be used for eventual corrective actions. The external testing and evaluation will be performed by two main groups of users:
- *ad hoc users:* it is expected that the project WEB-site will be visited by a number of students and experts in the area of measurement. All these visitors will be asked to complete the above mentioned questionnaire.
- *students in training:* the modules and work packages should be used in training courses organised during the project (regular study, continuing education courses, etc.). The respective modules / packages will be available on the project WEB-site or, if required by the course organiser, they will be delivered on CD-ROM. All course participants as well the teachers will be asked to complete the questionnaire.

2.9 Product dissemination

The 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 concrete main steps to be undertaken include:
- creation of an own project web site with the developed multimedia training package. The access to this site will be free during the project and it will serve also for the evaluation and testing of the package,
- publishing of information on the project and on the multimedia training package in journals, press and maybe also in other media,
- presentations during expert conferences, seminars, fairs,
- mailing the information materials to institutions providing vocational training, to professional organisations, enterprises, etc.,
- practical use of the multimedia package during training courses organised by the project partners and other training institutions.

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 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.

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