

# Results and experience from the application of a common methodology for Users Requirements Specification in Distance Education using Telematics<sup>1</sup>

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## Abstract

*The cooperation of the Information and Communications Technologies (ICT) and the Educational communities, is recognised as a necessity that must result in the adaptation and tuning of the education processes in terms of pedagogical methodologies, school infrastructure, human resources development and organisational restructuring, in order to efficiently absorb and utilize technological developments. The ICT community has to realize the significance of the users' needs, the difficulties of the intervention to an old and traditional process. And the need to view their technology applications not only as a technical exercise. The initial phases of the TRENDS project, which are described in this paper, resulted in an agreed common methodology for carrying out the necessary investigation of the user needs in secondary education. This methodology, which was followed more or less in all participating countries, produced answers to questions concerning the role of the educators and their basic training, their familiarity with technology, education policies from a trans-European perspective, the content, forms and aims of further training, the distance training of teachers in the use of new technologies, the motives, incentives and organisational schemes for enhancing re-education, the needs of the educational environment and technology-based training, the needs of the educators in practical didactic methods, etc.*

Nowadays it is more than evident that the rapid evolution of Information and Communication Technologies (ICT) during the last decade, along with the need for widespread distribution of knowledge, have necessitated the development of pioneering distance education services for the assistance of the didactic process. The collaboration of these two distinct worlds - Computer Science and Education - will result in the creation of a universal Education Society.

Distance education services are expected to find major fields of applications in the didactic process (Veen, Collis, de Vries, & Vogelgang, 1994), since they attempt to exploit the benefits that ICT offers in education, rather than make the educators and the trainees experts on ICT. The co-operation of these two communities is not yet straightforward. Experts from both worlds will have to participate in joint projects which will consider the needs and the trends of both sides and will end up with a distance education environment. The TRENDS project is one example of just such a joint project.

## The TRENDS project

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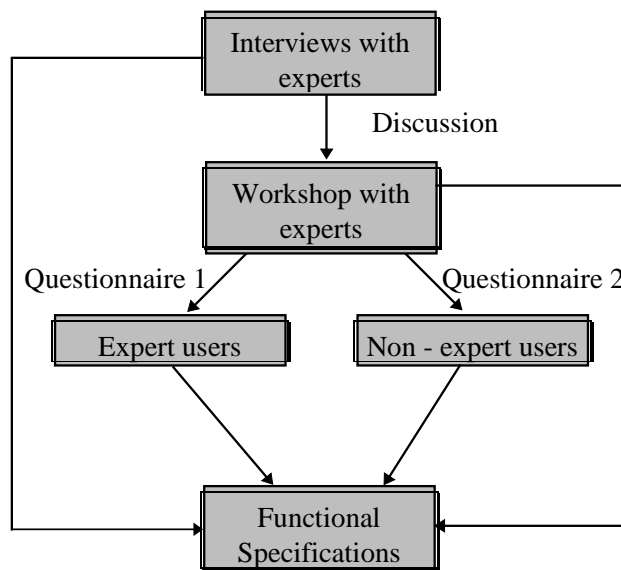
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The TRaining Educators through Networks and Distributed Systems (TRENDS) Project (Bouras, Kapoulas, Kastis, & Spirakis, 1996) aims at the in-service distance training of 2,400 school teachers in Secondary Education, on the “*use of Information Technology and Telematics in the learning process*”, from six countries (400 per country) - France, Greece, Italy, Portugal, Spain and United Kingdom. The training process will be implemented by flexible and distance learning methods, through:

- The development and the use of an in-service, school-based training session, based on multimedia telematics and existing, mature network technologies.
- The establishment and operation of a European Teachers' Training Network (ETTN), consisting of six interconnected “National Sites” (a Training Centre, clients in the schools and teachers in each country) and providing distance training services, by using multimedia telematics, to teachers and teacher trainers.

During the TRENDS project 120 teachers - one from each of the 120 participating schools - will be trained in the early validation phase and will play the role of the trainers of the rest of the 2,400 teachers afterwards, in the project demonstration phase.

The evolution of a promising and ambitious experiment, such as the TRENDS project, strongly depends on the strategy and the “Usage Scenario” that will be adopted. Thus it is of great importance to specify the user requirements effectively, covering the needs of both the direct users (educators who will participate in the project) and the indirect users (policy makers in the education system of each country, ICT experts, etc.).



**Fig. 1: Description of methodology**

## Methodology for the User Requirements Specification

The target group of the TRENDS project is trans-European and consists of educators who will be trained to use Information Communication Technology (ICT) in the classroom. Some of the possible techniques that could be used for the establishment of the User Requirements of a trans-European project, according to a widely accepted methodology (the Usability Guide, accepted by the European Commission (Smith, Mayes, 1996), are the following (see Fig.1):

**Personal interviews with the end users.** This technique offers a useful way to investigate and determine their needs in real life. The main problem of this technique is the enormous number of

the end users, which might lead to prohibitive costs. A careful selection of a representative group of the initial target group of the project might be more practical and still effective.

**Questionnaires.** In order to keep the cost down, the use of custom designed questionnaires and surveys may prove a more practical option. The key point of this technique is the construction of the questionnaires, so as for them to be representative and to reflect all the possible user requests. The construction of efficient questionnaires that will lead to the specification of the User Requirements of a project is a very serious and complex task. A team that will construct the questionnaires must include specialists on the scientific areas that the project deals with, experts on technological issues, as well as representatives of the potential target group.

**Organisation of discussion panels for brainstorming and feedback.** In these panels, representatives from all sides of the project should participate, for a more objective view of the situation. This might be useful as a final stage, for verification of the User Needs as they were described by some other technique.

After some co-ordination and tuning among the partners of the TRENDS project, some common points emerged in the methodologies proposed for the specification of the User Needs. These common points were agreed upon:

1. Interviewing a number of representatives or key persons of the target groups and experts in each country, for a first impression before constructing the custom designed questionnaires.
2. Development of workshops for key persons on topics related to the project's strategic plan.
3. Construction (according to the information provided by the interviews and the basic axes that were discussed in the workshops) of questionnaires, and distribution to the potential end users (teachers of schools). These users were categorised in two major groups:
  - Users with experience in using ICT for educational purposes from a limited number of schools. This group will provide some evidence of real cases of in-service technology-based training.
  - Users with no experience in the use of ICT. Their opinion will play an important role on the specification of the expectations on applying telematics to teaching.

## **Presentation of Results**

The determination of the needs of the end-users of the TRENDS Project is the attempt to detect inefficiencies in the basic education and training mechanisms of the teachers. It is particularly important to survey their training needs in the use of new technologies in education, i.e. lack of skills/expertise in using and integrating multimedia information and communication technologies in their daily work (as a tool to enhance the learning process in various subjects). The survey completed during the TRENDS project, in order to succeed in this attempt, aims to detect the user needs so as to provide the project with clear ideas for the skills/expertise the teachers must acquire. Another goal of this survey is to lead safely to the determination of the "Functional Specifications of the Network".

According to the adopted methodology, a number of workshops/round table discussions and interviews were organized first, to give a starting point and provide a global view of the user needs before constructing the questionnaires that were eventually distributed to the potential end-users of the project. In some countries two kinds of questionnaires were distributed, one for the experienced and one for the inexperienced users (Bouras, Kapoulas, Kastis, & Spirakis, 1996; C.T.I., 1996).

The kind of participants in the workshops/round table discussions and the interviews differed among the national sites. The participants included in-service educators of various disciplines, university

professors, key persons in policy making for education and training, national experts in the fields of information technology and open distance learning (ODL), teachers experienced in the use of telematics in secondary education, representatives of professional and scientific associations, directors of regional training centres, and educationalists responsible for initial teacher education and continuing professional development training. Also, in some cases, a group of direct users (secondary teachers with or without experience in teacher training, telematics, and open and distance learning) was interviewed. At some national sites a common questionnaire was used for the interviews.

The participants of the workshops/round tables focused on key issues related to the teachers' job profile, their initial and in-service training, the "new role" of the teacher implied by the introduction of new technologies, their needs for support, and also access, cost, management and suitability of the new technologies. The results extracted from the interviews, concern educational policies, the content, forms and aims of further training, and also, the functional scheme of distance teachers' training in the use of new technologies.

It was concluded, that it is crucial to work towards: 1) creating better conditions to promote the involvement of the educators in TRENDS, and 2) answering the training needs indicated by the teachers.

Concerning the first issue above, emphasis was placed on:

- giving schools better conditions for the kind of activities involved in TRENDS (provision of appropriate classrooms, enhancement of the existing infrastructures, access to Internet, technical education of teachers, keeping in touch with the teachers);
- motivating school teachers (i.e. by providing courses focusing on their interests);
- creating or adopting interfaces and user-friendly services (to access information on Internet, to exchange information, to construct WWW pages, to collaborate when working); and
- creating a group of users specially prepared to promote the use of the telecommunications services. Suitable criteria should be used to select among them.

In order to satisfy the training needs indicated by the teachers, it was suggested that it is important to develop courses or other initiatives that focus on the following:

- educational methodologies for specific subject areas
- pedagogical issues
- management and implementation of educational projects
- scientific knowledge on particular subject matter
- application of information and communication technologies
- integration of information and communication technologies into the curriculum
- provision of essential know-how on using basic telecommunication services such as e-mail, news, bulletin board systems
- development of basic skills on the use of co-operation tools over network infrastructure
- development of basic skills on constructing WWW pages (e.g. HTML editors)
- educational potential created by the use of telematics services, either privately or in the classroom.

In order to upgrade the educational system, the need for further education and the use of new technologies should be highlighted. The primary goal of an embracing educational policy is to provide multifaceted forms of further education such as school-based teacher's training programmes, long distance training methods, and interdisciplinary university programmes. There are also some cultural obstacles which can inhibit change of the educational system. These obstacles can be overcome by means of a gradual introduction of didactic innovations, by providing teachers with the suitable tools to understand the meaning, and the use of learning technologies. Also, the teachers should become better acquainted with research methods and not only skilled in using learning technologies in order to bridge the gap between the degree of technological complexity and the real didactic innovation. The most appropriate way to accomplish this is via small groups or on an individual basis.

Educators should also learn to familiarize themselves with new educational methods. Different forms of teaching should be applied and co-exist, e.g. seminar type, distance training, schools-based, at home. The duration of the training should reflect the needs of the instructor and the gaps that have to be bridged. First, the training scheme needs to be horizontal to the different teaching disciplines, by involving teachers from different domains. Second, the focus needs to be on didactics, in order to guarantee a good integration with the teaching activity. The majority of teachers believe that long distance training should be accompanied by some form of personal communication and contact with other teachers. The vast majority of teachers said they prefer the combination of training with the use of computers and the distribution of related literature.

The experienced users said that their current personal usage of Information and Communication Technology (ICT) was high, indicating that they used ICT to produce learning resources and for administrative purposes. There was less classroom use with students. At school the greatest use was in a departmental room, and this usage was spread throughout the day, including before and after school.

Training at school should provide the student with the opportunity to "construct" the new knowledge within an appropriate technological and learning environment. The contact between the trainer and the trainee should make use of all the capabilities offered by modern technology (on-line, video conferencing, etc.). Another important issue is the development of courses aiming at helping teachers cater to those students whose performances are not satisfactory.

While in fact there is a prevailing use of off-line technologies, the demand is oriented toward on/off-line technology (in the educational and teacher training environments). Among the on-line technologies the prevailing interest is for E-mail and WWW servers, while among the off-line options the prevailing interest is for teaching software and applications.

Nearly all teachers would like to collaborate with colleagues from other countries, and receive information on European educational programs, especially aspects related to the subject taught. The majority of the teachers affirm that they frequently share experiences and projects with their own school colleagues, and they claim that this exchange of experiences should be extended to the international level.

The general attitude of the inexperienced users towards the use of new technologies is quite positive. Most of them said they are particularly interested in initiatives regarding modalities of using new audio-visual and multimedia learning tools. The application of computers for didactic purposes should not be limited to the preparation of learning material or reports. The software applications used should not be text editors only. Most teachers prefer to be trained through examples of real applications, or through a combination of theoretical presentations, empirical applications, and suggestions on existing literature on the subject.

The attention to telematics applications in education is generally very high: the interviewees seemed to be particularly interested in the professional updating of teachers and in the use of electronic encyclopaedias, atlases, dictionaries, and reference books. They prefer to attend re-education programs using the new technologies, with groups of colleagues with similar interests.

## **Comparative Analysis of Results**

### **Introduction of ICT to the Educational Process**

First of all, with their all-encompassing approach regarding the specific needs of educators, the countries participating in the project illustrate the principle that training in the use of information technology is not the project's main purpose. The main aim is the familiarisation of educators with the use of Information and Communication Technology (ICT) as a supporting tool for the educational process.

Within the same context is the realisation that the further education of teachers in the field of ICT will improve their professional skills, change their teaching habits and give them a more positive profile which will contribute to the improvement of the quality and efficiency of their work.

Since the educational background of teachers in the use of the new technologies is deemed inadequate, it is necessary to provide an initial basic training course on ICT and its capabilities as a teaching tool. In most countries - Spain, Portugal, Greece, France - these needs revolve around certain facets of ICT such as:

- learning to employ the new technologies for educational use, mainly through an ODL environment;
- providing further efficiency in the teaching of particular subject matter; and
- learning how to acquire multimedia information and to achieve personal contact through telematics infrastructure.

Certain countries like France and England lay special emphasis on learning about, and taking advantage of, the possibilities of having access to available information resources. These include the Internet and databases which provide widely known and accepted documentation centres, as well as specific information provided through specialised networks and multimedia.

### **Application of ICT to Didactics**

Nearly all countries, with only slight variations, exhibited the need for additional knowledge pertaining to particular subject matter. This knowledge ought to either fill in ascertained gaps in the initial training of educators or contribute to the updating of the educators on the subjects they teach (Italy, Portugal, Spain).

The fulfillment of this need presupposes that the training program should cover all the subject matter taught at school and take into consideration the particular content/ didactic needs of the educators. This need can also be satisfied by the provision of additional supervisory bibliographies and supplementary didactic material.

Certain countries (Italy and Portugal) have proposed the introduction of parallel training programs for an interdisciplinary approach to the lesson being taught. The aim is to diffuse knowledge among

the users of the TRENDS network. For this purpose the training model must be as open as possible and satisfy wider pedagogical, subject matters and social needs. Within the same framework are:

- The need for further education and updating of educators on the new didactic methodologies for each subject matter is deemed imperative. The aim is to familiarise educators with these methodologies so they may apply them in the classroom. Special emphasis will be placed on the ones which help solve special problems teachers face in the classroom;
- The need to learn ways and methods to readjust the didactic methodology used by educators in the wake of their new knowledge and new skills derived from the use of new applications within the context of ICT (England);
- The need for the provision of additional knowledge regarding pedagogical theories that can be applied in real everyday school situations (Portugal); and
- The need to update and educate the students in the new evaluation methods (Greece).

The fulfillment of the above mentioned needs will provide educators with the capability to evaluate and reassess the contribution the new technologies will have to the learning process.

### **Needs of End Users for the adopted Training Model**

The development of an environment favorable to communication for TRENDS users, but also to the entire education community, has been deemed necessary for educators. This conclusion has emerged from the research carried out in many countries (Portugal, Spain, Italy, France). This need can be fulfilled through the educator's familiarisation with the use of ICT.

Educators need to communicate on matters regarding:

- information about the innovations in education,
- update on the organisation and application of educational procedures aiming at the dissemination of better teaching attitudes, and
- exchange of information between the users of the system.

Research carried out in Greece revealed that there is a need for information on the organisation and functioning of other education systems. This includes the capability to exchange educational material and experiences on the use of ICT. The proposal that students should also be given access to this information is noteworthy. The establishment of these terms of communication will promote, among other things, a European dimension in education (Italy, Spain).

The open distance training method that TRENDS has proposed is acceptable to the majority of the members of the target-groups of each participating country. This applies to the direct and indirect users. More specifically:

- In certain countries educators prefer to be trained within the framework of the school system rather than through on-line communication with the trainer (Spain, Italy), without however rejecting it.
- On-line communication with the instructor (and with colleagues on a national and international level) is generally viewed as a necessary prerequisite. The occasional direct (live) communication between the educator and the trainer is equally important.
- The integration of multiple formats of information (text, audio, video) is generally desired by all target groups.

- Several countries, including Italy and Spain, lay stress in the participation of the entire school community (students, teachers etc.) in the TRENDS network. Other countries (Greece) favour both the individual and the group procedure. It has been proposed that groups should comprise people sharing common interests (e.g. groups of educators with the same specialisation).

According to conclusions made in Italy, educators with a different background can only be grouped together if the sole purpose is to learn the general uses of technology as opposed to using it as a teaching aid for specific lessons.

- Several countries (England, France, Portugal etc.) place importance on the selection of the educators undergoing further training who will in turn train their colleagues. It is generally believed that these educators should have some form of knowledge and experience on ICT, good relations with their colleagues, a positive attitude to ICT, and strong motivation.
- England, for its part, has proposed that an evaluation has to be made on the contribution that information technologies will make to the learning/didactic procedure in schools.
- Greece and Portugal refer to the lack of, and the need for, appropriate space within schools. Greece, Spain and Portugal also refer to lack of school equipment. In Spain however it is believed that this may be overcome.
- On the contrary, as far as Italy is concerned, experts and those from the target group who are experienced in the use of ICT prefer to be linked up from their homes. Others, less experienced in the use of ICT, have expressed an interest in working both from home and school on the basis of a flexible time schedule.
- England, Italy, and Greece have stressed the need to schedule time. Italian experts say that the time educators dedicate for their training should, in some way, be estimated. Greek educators want their training to be incorporated into a time schedule so that they won't be pressured by their regular school schedule.
- The majority of Spanish educators on the contrary, say they are willing to dedicate ample time for their training in Information Technology. It seems, finally, that there is a general demand from educators for a flexible training program with respect to the dimension of time.
- The provision of sufficient incentives for educators participating in the TRENDS project constitutes one of the more critical aspects for its success. One category of incentives referred to by educators and experts of all participating countries concerns "educational" incentives. This is interpreted as the provision of substantial help to educators to carry out their work. This help should be specifically aimed at aiding them in teaching a particular subject in the classroom.
- It also entails an interest in the potential of the new technology and the opportunity to work with colleagues and students beyond the confines of regional limitations. Additionally, these incentives entail access to information sources, the opportunity to develop common projects, and initiatives with other educators and bodies outside the field of education. Finally, educators must be able to take advantage of the benefits provided by long distance training (flexibility, speed) and fulfill their professional ambitions. These incentives by themselves are not viewed as sufficient. For this reason, in the opinion of many officials and educators, additional incentives should be provided.
- The certification of this training and its contribution to the educator's career (Greece, Portugal, France, Italy). Italy has proposed the consolidated certification system of ODL.

## Conclusions



The synthesis which has been attempted in order to illustrate the basic common needs of educators in the TRENDS project, led to the following conclusions:

- The use of the pioneering Information and Communication Technologies in the teaching process seems to be promising and beneficial. Yet, the provision of basic and applied knowledge should also be emphasized.
- The programme should not only furnish supplementary knowledge on the subject taught, but also provide guidelines for interdisciplinary approaches on common matters.
- Information should be provided on the use and opportunities provided by access to educational databases, documentation centres, electronic libraries, etc.
- Communication and information should be provided concerning analytical programmes, didactic methodology, education programmes, innovative educational applications and new didactic methods and approaches.
- Open long distance training is a method accepted by the majority of the members of the target-groups of each country.
- On-line communication between the educators and their trainers and colleagues is generally viewed as an elementary tool and essential precondition.
- The combination of vision, text, sound, video, etc. is generally considered necessary, as is the use of WWW servers, e-mail, news, video-conferencing etc., especially when referring to users with no expertise on ICT. Printed literature adjusted to the special needs of each country for further education/training is also considered useful.
- It is considered advisable that the TRENDS network take advantage of the existing communication technologies (Internet, Euro-ISDN, etc.).
- Schools are generally accepted as the training grounds. In certain countries though, this presupposes that infrastructure problems are solved. Many educators, however, have expressed their interest (or preference) to undergo, when feasible, training at home.
- As far as incentives to participate in the programme are concerned, it is advisable, apart from strictly educational considerations (continuous information, self-improvement), to examine others such as training certification, accommodations with respect to the work schedule at school, financial benefits, etc.

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