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Abstract

The aim of this article is to focus on the main elements that characterise online course design, a process usually comprising two strictly related macro-phases: the course plan itself and the communication architecture for the development and running of the proposed learning activities.

The article addresses the impossibility of designing an online course on the basis of criteria typical of onsite education, and emphasizes the importance of adopting methods and strategies that are compatible with the technological medium and the communication dynamics to which it gives rise.

The suggestions that will be made are not intended to represent a codified formula for the design of online courses, but rather to provide discussion points on key issues within the process.

INTRODUCTION

A wide spectrum of possibilities exist for the educational use of ICT (Information and Communication Technologies). These run from using the Web as an online tool for seeking out and distributing learning material up to the organization and management of virtual classes using the online education approach. These can be grouped under three separate headings:

1. *Educational processes based on onsite teaching*, where the Net is used to gain remote access to learning material, with the possible addition of online counselling from tutors.
2. *Mixed educational processes (online/onsite)*, which combine characteristics of onsite education (lectures, group work, etc) and of online education (discussion, remotely guided exercises, etc), and where activities of either kind complement those of the other.
3. *Wholly online educational processes*, that include no onsite activities at all, being based on distance interaction between the actors in the process (students, tutors,

experts, etc) carried out using both asynchronous communication (e-mail, computer conferencing, etc) and synchronous communication (chatting, audio/video conferencing, etc).

This paper will concentrate on the design of courses that fall into this last category and that adopt approaches identified with so-called *third-generation distance education*, otherwise known as *online education* (Harasim, 1990; Nipper, 1989).

THIRD-GENERATION DISTANCE EDUCATION

In the field of distance learning, systems defined as third-generation are those based on intense interaction between all the players in the process with the purpose of forming a collaborative learning community, albeit a virtual one.

In traditional distance courses (those known as *first* and *second-generation* courses, or, alternatively, *correspondence* and *multimedia* courses) the emphasis is less on the communication element than on individual exploitation of learning material. By contrast, in online education it is the collaboration among participants that stimulates and fosters learning.

Communicating at a distance, participants discuss the course content and/or engage in practical activities like producing reports, designing projects, and so on. The attendees swap ideas on the course subject; and in this way, the whole group can share and benefit from the experience of each participant, thus gaining fresh insight into the particular course content (Kaye, 1991). This is done with the assistance of tutors, who support participant-participant and participant-content interaction (Berge, 1995).

Courses based on this model are run by staff with expertise in three different areas: contents, online course methodology, and technological aspects. In some cases, these areas are handled separately by different staff members; while in others, they are covered by the same person.

The tutors' work is complemented by one or more content experts, who are mainly involved in the phase of course design but may also be accessible online while the course is in progress (though this is not normally the case). Accordingly, there is a need for the roles of all the players in the learning process to be clearly defined (Trentin & Scimeca, 1999). The experts usually look after course content and its structuring, outline

activities, and sometimes suggest the most suitable educational strategies for achieving learning goals.

Once the content structure has been defined and the type of learning activities decided, the tutor has the task of reshaping the course plan devised by the experts, drawing upon online education strategies in order to make the course work on the net.

Let's now take a look at the main phases involved in the design of an online course.

DESIGNING AN ONLINE COURSE

When dealing with online education, it is necessary to rethink the methodologies, criteria, and approaches normally adopted for conventional educational design/planning. Account must be made for the positive and negative influence of ICT use, which can be attributed to a number of specific factors such as the particular type of communication (chiefly text-based, but also video communication); the shift in the teacher's role within the class; and, last but not least, problems involved in managing student access to network resources.

The design of an online course may be divided into two strictly correlated and interconnected macro-phases: the *course plan* itself and the *communication architecture* for the development and management of the learning activities that the course envisages.

ONLINE EDUCATION: THE COURSE PLAN

There are a host of different approaches for designing online courses: We shall propose just one of these, that adopted in the design of the Polaris courses (Trentin, 1997a) for in-service teacher training.

The various steps in the design process (see Appendix A) will be listed in order, although each may actually have a retroactive effect on the one that precedes it.

Design Constraints

At the outset, it is advisable to define the constraints and limits within which the course is to operate. These may concern:

1. Economic aspects.
2. The context of reference (higher education, pre/in-service training, etc.).

3. The profile of the participants and the conditions surrounding their participation.
4. The type of technology to be used.
5. The type of support that the course provider can offer students.
6. The period in which the course will be held.
7. The availability of experts for online consultation.
8. The feasibility of producing ad hoc learning material.

In a way, the constraints delimit the area in which the subsequent design phases will develop.

Analysis and Definition of Learning Needs

A distance course can either be pre-packaged and offered to a given population or produced on commission (tailor made courses). In any case, its aims and objectives cannot be defined without first carrying out a detailed study of the users' learning needs and then setting them out in detail.

The design of pre-packaged courses begins with a study of the learning needs of a specific user group, and this provides the basis for putting together the package. In the case of tailor-made courses, the users themselves express their learning needs to the course designers.

Definition of Aims

The aims are usually defined in terms of the hopes expressed by those who propose or commission the course*: "the students will learn how to . . . they will realize that . . . they will get used to . . . they will be able to . . . they will distinguish between . . ."*, etc. So the objectives need to be formulated in terms of *"gaining awareness of . . . learning to use tools to . . . analyzing and comparing . . ."*, etc. Essentially, the transition from defining aims to setting objectives centers on identifying learning activities that allow measurement of the degree to which aims/objectives have been reached (Rowntree, 1981).

Defining and Structuring Objectives

Proper definition of objectives has a strong impact on the subsequent design phases and especially on the mechanism used to evaluate both the course as a whole and learning in particular. In most cases, it is worth operating at two different levels, namely the definition of final and intermediate objectives. The former case normally sees the simultaneous involvement of tutors (those who coordinate the project and act as moderators among the course commissioners, experts, students, etc.) and experts (those who provide the content expertise). By contrast, in the definition of intermediate objectives the leading role is played by content experts, with the aid of tutors, who have ultimate responsibility for guiding the students toward the pre-set goals.

Structuring of objectives may be carried out in a variety of manners, including arrangement in a taxonomy (Bloom, 1956) or in a hierarchy of main and subordinate objectives (Gagné, 1970). Figure 1 shows an example of a hierarchy.

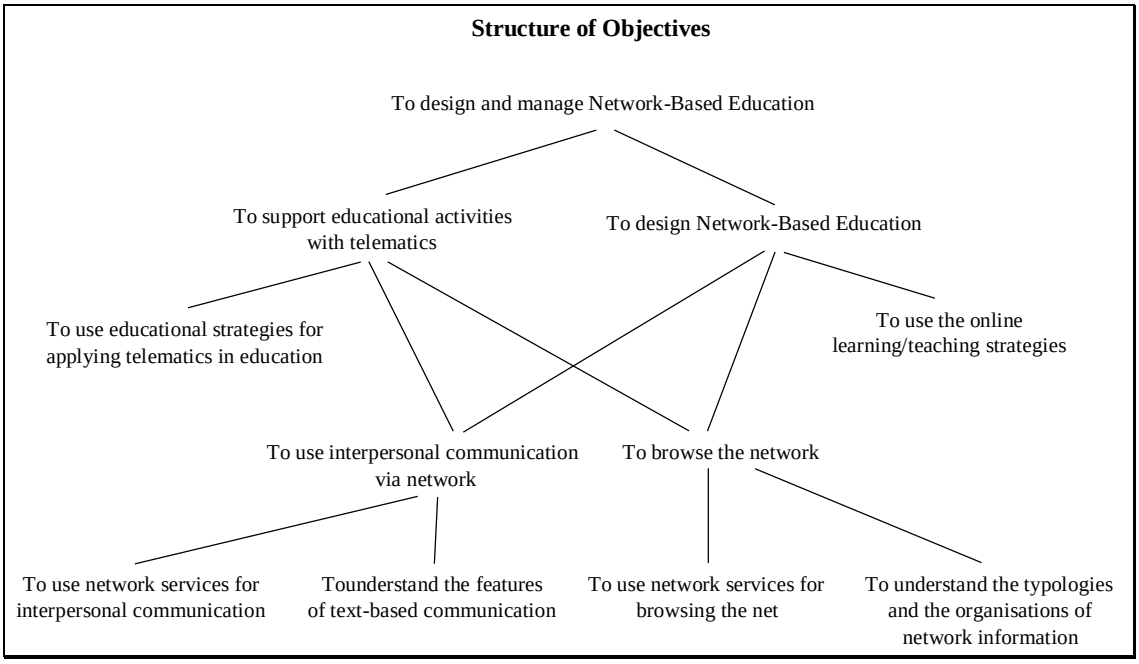

Figure 1. Structure of objectives in a course on the use of ICT in education

It is often advisable to try to draft the intermediate and final evaluation tests for the course immediately following initial definition of objectives; in other words, before proceeding with the subsequent phases of course design. This is a very effective way of

gaining feedback about the consistency of the structure of the objectives (Trentin, 1997b).

Course Prerequisites

At this point, before passing on to defining and structuring course content, it is necessary to identify the knowledge and basic skills that students will need in order to participate in course activities.

At the university level these relate to current year, course of study, and the student's effective knowledge both of the content and the technology to be used, elements which can easily be gauged through an entrance exam.

When it comes to distance education, however, the problem is far more complex, given the certain non-homogeneity of the student group. The need therefore arises for fully fledged pre-testing in order to define an average profile of the virtual class that is to be constructed. When forming student groups, it is always important to seek the most homogeneous level possible of pre-knowledge and skills, all the more so when dealing with an online course.

Defining the prerequisites is therefore a crucial step for course designers, as it helps them to establish a kind of substratum of subordinate knowledge, the foundations for the scaffolding that will support knowledge acquisition during the course. What's more, defining the prerequisites is also important for setting the course entry conditions.

But how can these prerequisites be defined? The course designers (experts and tutors) can define them in terms of the course objectives, or they can be gleaned from a preliminary study of the population of potential course beneficiaries.

Content Structuring

The sound structuring of online course content into main and subordinate topics is strongly advised, given the close connection this structure has with the structure of the Web-based environment that is to host the learning activities and manage communication flow. If sound prior structuring of objectives is done upstream (using the hierarchy approach, for example), then the corresponding content structure will result almost automatically.

Online courses are usually divided into stages, each of which is further divided into a series of modules. The course topic is consequently subdivided into general

sections, some of which are necessary introductions to other sections, while others are optional or designed for supplementary study.

In this phase, too, the teaming up of content experts and tutors plays a key role. Thanks to their knowledge of the subject area, the content experts are able to define a structure suitable for the pursuit of the learning objectives. On the other hand, the tutors bring their know-how in designing and running online courses and are aware of how a given content structure can be adapted to network use. There is a possibility (indeed a high likelihood) that the experts involved will be unacquainted with the concept of online education; and, as a result, they are likely to produce a content structure based on a traditional teaching approach.

Referring back to Figure 1, at this point each node of the hierarchy ought to be associated to content that will lead toward the achievement of the related learning objective. The outcome is shown in Figure 2.

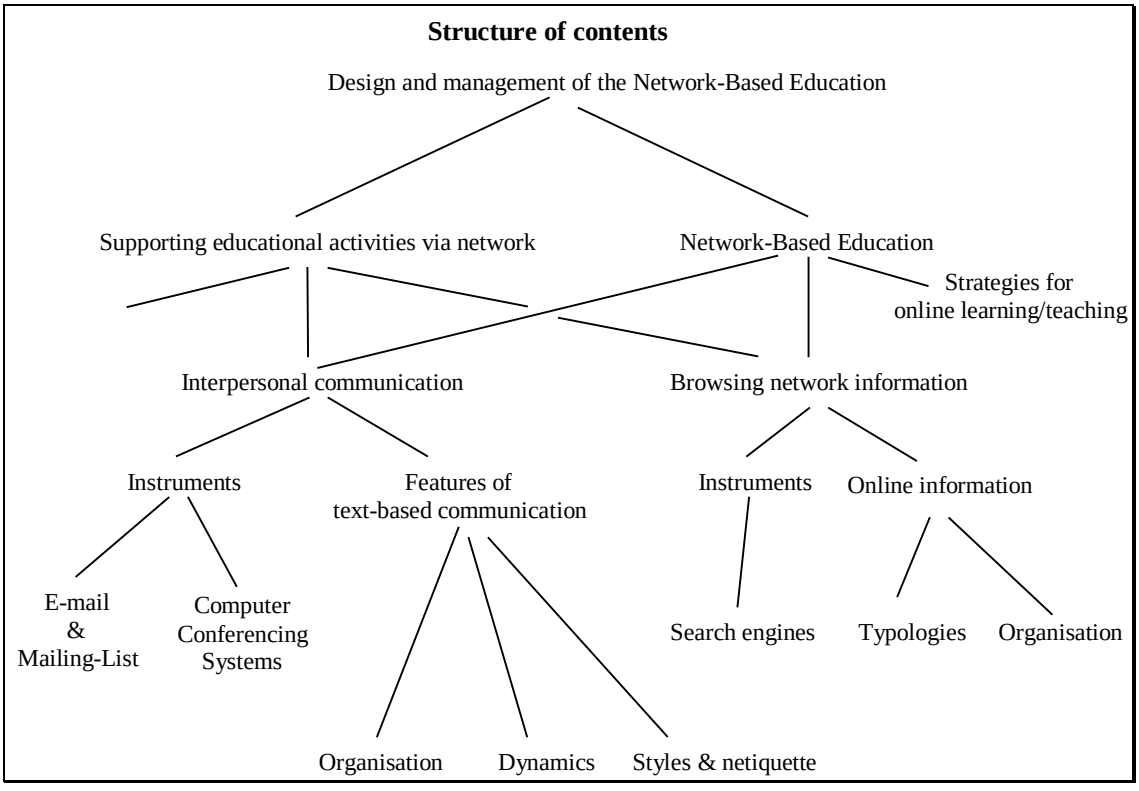

Figure 2. The content structure in a course on the use of ICT in education

Course Flexibility

Online courses, especially those based on collaborative strategies, must take proper account of participants' specific needs. Course flexibility is called for in response to a variety of factors: differences in equipment levels, differences in the amount of free time available to dedicate to the course, differences in the level of know-how in the technology to be used, and so on.

A solution that has proved effective here is to draw on the dual-track concept and provide a mainstream channel together with alternative pathways for supplementary study. To put it briefly, an online course should comprise:

1. A main path to be followed by all participants that leads towards the achievement of a pre-established minimum number of learning objectives.
2. A series of optional paths, some of which are outlined in the design phase, while others are devised to meet needs that arise as the course unfolds-always bearing in mind the ultimate aims of the course. Clearly, these optional paths are recommended for those participants (or groups thereof) who get through the main path activities before the others, either because they had more time to dedicate to the tasks or had a stronger grasp of the subject from the outset. These supplementary paths are also useful for participants who wish to form virtual subgroups in order to investigate topics that fall outside the original course plan.

In this respect it is vital to define clearly these optional activities and to decide under what conditions they are to be proposed. In any case, they are not to be considered as substitutes for sections of the main path.

Choice of Educational Strategies

Having defined the educational objectives, we need to identify the learning strategies to be adopted for their pursuit. These may include instructional training (in the use of tools and services), exercises, discussion, collaborative work, simulation, role playing or tutorials, to name but a few.

It is important to identify the most effective methodology for employing each of these strategies. For instance, there are a number of options available for employing collaborative learning, including strategies like reciprocal teaching (Palincsar & Brown, 1984) and the jigsaw method (Aroson, 1978).

In any case, the identification of educational strategies calls for a modicum of awareness of what network interaction involves, of the dynamics of computer mediated communication, and thus of the various degrees of effectiveness that those strategies may have at different moments in online activity. This means that the classroom experience that a teacher/trainer has gained over the years provides no guarantee of success when working in online education, especially the first time out.

Defining Evaluation Criteria

The complicated matter of defining evaluation criteria is still the subject of research. Evaluating an online course raises a number of problems at different levels. Two in particular are of special significance:

1. Evaluation of learning.
2. Evaluation of student participation levels in terms of activity carried out online.

Evaluation of learning. Without going into detail about the modes normally used for evaluating learning in an online course, it should nevertheless be stressed that their definition must go hand in hand with the definition of educational objectives and of the educational strategies employed for pursuing those objectives. What this means is that the learning strategy itself often suggests the mode of evaluation. For instance, a strategy that features online discussion calls for evaluation based on qualitative-quantitative analysis of the messages produced by the participants (Henri, 1992; Thorpe, 1998).

Evaluation of participation levels. We need to distinguish here between two different ways of organizing participants; namely, virtual classes or learning circles (Riel, 1992). Virtual classes bring together individual participants who are scattered over a geographical area and therefore remote from one another. Learning circles, on the other hand, are locally based groups (e.g., students at the same university) who use ICT to communicate with other such groups situated in other geographical areas.

Evaluation of participation levels within virtual classes may be performed by analyzing the messages produced and by examining the log files to gauge the level of online “presence” (Log files are files in which the computer conferencing system automatically records each individual action that participants perform online: reading/writing messages, chatting activity, connection times, etc.). Evaluating the

performance of members belonging to a learning circle is a far more difficult task, as online output generally reflects the activity of the group as a whole. A possible solution in such cases is (on at least one occasion during the course) to split up local groups and create new virtual groups made up of members from the various original groups, who will thus be forced to communicate exclusively online. This represents a fairly effective way of singling out the members of local groups.

Furthermore, with both virtual and local groups it is important to define monitoring modes that will reveal to the tutors whether and to what extent the participants are focusing on the key issues as identified by the content experts. What's more, during the course the tutors should also be in a position to judge whether collaborative activity is actually taking place. As to the focus on key issues, a possible answer may be to agree with the content expert on a sort of checklist of key issues that participants must cover in their messages, and also to decide what level of detail ought to be reached. Ascertaining collaborative activity, on the other hand, can be done by using a simple double-entry grid (sender/receiver) to see whether there is cross-referenced communication among participants (quotes, questions and answers, etc).

Defining Course Activities and Related Resources

Having chosen the educational strategies and methodologies, we can now go on and define course activities for putting these into action. We need to distinguish here between activities based on individual action and those that envisage collaborative learning, as well as between activities designed for use by virtual classes or by learning circles.

In addition, we need to indicate the resources required for each activity. These include learning and support material, course guides, available experts, the roles of the tutor (counselor, discussion moderator, facilitator for exercise activities or collaborative production, etc), management modes for group activities, the network services to be used, etc.

On the question of material, it is useful to distinguish between what is already available (material used in previous courses or contained in books, articles, Web pages, courseware, etc.) and what needs to be produced especially for the course. In the latter case, attention needs to be paid to how one produces learning material for online

courses, especially Web-based ones, but we will bypass this matter as it falls outside the scope of this paper.

Mode of Operation

When organizing network activities, it is crucial to decide how many participants are to be involved and how their interaction is to be organized (Webb, 1982; Riel & Levin, 1990). Accordingly, careful attention must be paid to setting the size of the virtual class in response to the activities proposed during the course and the role to be played by experts and each member of the tutoring staff while the course is underway.

Setting the Size of Online Study Groups

The considerations made below refer in a general manner to a situation in which there is a single entity at the other end of the telephone line, without distinguishing for the moment whether that entity is an individual course participant or a group of participants organized in a learning circle. In fact, from the viewpoint of network interaction, the local group is seen at a general level as a single entity that communicates with other entities (other local groups), all of whom are organized in learning circles.

This is an important consideration when defining the tutor-to-participant ratio, which, ideally, should range from about one-to-ten to one-to-fifteen. This ratio, however, is a purely indicative one, given that the tutor's capacity to interact with a certain number of participants depends on the type of activity that he/she is called upon to run (discussion, exercises, role play, collaborative production, etc.). For the same reason, the size of the groups into which the participant population is divided is determined by the need to make their distance work efficient. For instance, if the students are to engage in collaborative production, they ought to be divided into small groups: Mediating online, especially via asynchronous communication, is never an easy task, as the longer discussion and decision-making goes on, the more complex and time-consuming the collaboration will be.

Now let's look at the relationship between the type of activity and the size of the learning group. For simplicity's sake, we shall examine the cases of collaborative production and topic-based discussion.

Production Groups

The first point to make here is that collaborative production calls for a limited number of participants while discussion does not (remembering that it is best not to involve too many participants in any online activity). The reason is fairly clear. Production activities involve continuous mediation between those working on the creation of a product: The more ideas are put forward, the harder the joint decision-making process becomes. What's more, when participants communicate in an asynchronous mode, the whole process slows down and this often undermines collaboration.

A reasonable number of participants might be somewhere around five to six units, remembering that a unit may represent a single individual interacting remotely with others or a local learning circle.

The size of virtual groups also depends on the type of collaborative strategy we intend to set in motion, as well as on the participants' specific situation regarding logistics and equipment. We need to decide whether to adopt a parallel strategy, whereby each group member works independently on a specific part of the overall product, or a reciprocal strategy, whereby each person contributes to each part of the overall product (Diaper & Sanger, 1993).

So the size of the groups into which participants are divided is governed by the need to maximize the efficiency of the distance work.

Discussion Groups

In the case of discussion groups, the situation is somewhat different: The more participants there are, the easier it is for ideas, observations, opinions and so on to circulate. When organizing online discussions, we often refer to the so-called "critical mass" (i.e., the minimum number of participants needed for a lively exchange).

But care needs to be taken here as well, because if the number of what we might call "active" participants exceeds a certain threshold, there is a risk of creating online "noise" that could damage the whole system. We might set the minimum number of dialoguing entities needed to guarantee a lively online discussion at about 10 to 12 units.

That said, those who frequent topical mailing lists and newsgroups may well object that this number is far too low. However, it has to be recognized that we are not talking about open discussions that anyone can join, take part in, and leave as they wish

(as is the case with the aforementioned Internet services). Rather, we are dealing with groups that are aware they belong to a learning community that has set rules, planned and scheduled activities, and clearly defined procedures.

Defining Staff Members' Roles

Harmonization of staff members' roles is a key factor in the success of an online course. It helps to avoid overlap in the tutors' actions (which is often disorienting for the participants) to prevent clashes in the replies given by different tutors, to delineate the respective fields of action of the tutors and experts, to establish decision-making procedures, and so on.

One way of organizing the tutoring staff is as follows:

1. Assign each participant a *personal tutor* who will follow the student from close range throughout the whole course, giving advice, offering support when difficulties arise, etc.
2. Appoint a *head tutor* (sometimes called an *area tutor*) for each module of the course, someone who is to coordinate all the activities within his/her module, keep activities on schedule, support interaction between participants and the area expert (using different strategies according to whether that expert is available online or not), etc. In other words, this person acts as a reference tutor for that particular segment of the course.
3. Appoint a *head of staff*, a kind of course director, who is to supervise course activities, set the schedule, act as staff spokesperson when participants require explanation of course contents or methods, take the final decision on any eventuality arising during the course, etc.

Structure and Schedule of the Online Course

Online courses require careful prior structuring, given that once they are underway it becomes extremely hard to make substantial alterations. The same meticulous planning must also go into the scheduling of each individual activity, be it at the stage or the module level.

Outlining the schedule for the whole course is no easy task. No matter how much care and effort are put into estimating the time necessary for the various activities, the need invariably arises for constant calibration, ever greater flexibility, and response to

needs that come up throughout the course. All of this is inevitable given the asynchronous nature of communication between the participants and the freedom of the individual (or local group) to decide when to dedicate time to the course.

Nevertheless, there is a clear need, at least at the activity planning level, for general scheduling guidelines (i.e., words markers for measuring the progress of the various activities and for deciding whether to readjust the timetable – which is almost always the case).

Organizing the course into main and sub-activities is often useful on this count.

ONLINE EDUCATION: THE COMMUNICATION ARCHITECTURE

Once the course design has been completed and the activities for the various players (students, tutors, experts, specialists, etc.) have been defined, the next step is the so-called logical structuring of the communication between the participants, (i.e., outlining the system that is to guarantee proper flow of information and interpersonal exchange within the learning community). There are the three main steps involved.

1. Identifying Communication Requirements

Online courses generally feature three main types of communication flow: between tutors (coordination and decision making); between tutors and experts (consultation and support) and within the various learning activities envisaged (among tutors, students and experts).

Each of these flow types includes not only interpersonal communication, but also the exchange of documents and more generally of any material in electronic format.

In the first two cases, the communication requirements are fairly clear-cut and in a way quite easy to define. The last case is more complicated, in that the communication needs strictly depend on factors like the type of activity envisioned for the students, the educational strategy and methodology for their development, the breakdown of students into groups and subgroups, and so on. Consequently, for each activity proposed, the mode of interaction between all the players needs to be carefully examined.

2. Choosing the most Suitable Network Services

Once the communication requirements have been defined, the next step is to choose the most suitable network service for running the course. This means assessing

not just the performance of the chosen service but also the cost it entails: Cost differences exist between services of the same type (e.g., interpersonal communication, information access and sharing, etc.).

If the need is to organize, say, a discussion, the choice lies between a mailinglist, which is virtually cost free, or a conference area within a computer conferencing system, where the technological and man-hour costs are undoubtedly greater. Similarly, document and material sharing can be handled either in a very rudimentary manner using file attachments on e-mail messages, or in a neater, more refined way by setting up a Web site.

3. Designing a Logical Communication Structure

Once the most suitable and affordable network services have been identified, the next step is designing the logical communication structure (i.e., organizing the interaction flows between the participants and arranging the shared information space) (Trentin, 1997c).

A number of issues will need to be tackled here. For example, how should the computer conferencing environments be divided into areas and sub-areas in accordance with the various learning activities (discussions, collaborative work, exercises, etc)? If we opt to use mailing lists only, what lists should be organized and for which interpersonal communication activities? How can we go about arranging the course materials and the workgroups' in-progress products and displaying them on "electronic bookshelves"?

Furthermore, it is advisable, where possible, to provide areas outside those strictly dedicated to course activities. These may include: so-called "cafés" where the participants can chat freely among themselves; an area for exchanging materials not strictly related to the course; a bulletin board for notices of different kinds and a technical support area.

Clearly, using environments that can easily be tailored to communication requirements will make participation by the various players in the learning process all the more pleasant and straightforward.

It is worth examining the effects that may sometimes be obtained by prior subdivision of a communication environment into conferences and sub-conferences, and

by the remodeling of that structure on the part of the course managers (tutors, teachers, etc.) while the course is underway (Trentin, 1998).

To get a clearer idea of this matter, let's imagine a book, or rather its contents page. By dividing the text into chapters and paragraphs and arranging them in a particular order, the author communicates to the reader his/her individual view of the topic structure at hand, and suggests a way of exploring it. In the same way, dividing an online learning environment into areas and sub-areas helps to channel the communication within the structure itself. In other words, it gives a glimpse of the vision that the course author has of the topic being dealt with.

It is therefore plain to see just how important it is for the online course manager to be skilled in designing the logical communication structure, especially in view of the dynamics that this structure will tend to instill as the course progresses (unforeseen supplementary study, organization of subgroups, etc).

Let's take an example. Let's suppose that the participants in an online course (or some of them, at least) manifest particular interest in a subtopic of the main discussion theme and that, accordingly, the course manager opens a specific forum (a sub-conference in the computer conferencing system) for developing that subtopic. The participants often interpret such a move as a go-ahead, if not outright encouragement, to explore that subtopic, which may not have been foreseen during course designing.

DESIGN EVALUATION

The lifecycle of a learning process can be broken down into three macro-phases - *design*, *execution* and *validation* - where the later phases are often affected by the preceding ones. For instance, execution and validation often provide useful hints for improving or even redesigning the course.

The aim of this paper has been to analyze the design phase; and, therefore in conclusion, it is worth considering on what basis we might evaluate the success of that process. The most immediate answer would appear to be the extent to which the course goals have been reached (e.g., learning of given contents).

However, the achievement of educational objectives does not in itself mean that the course design is valid, even though it is a necessary condition for declaring that a course has been successfully designed. This is because any design faults that become

apparent while the course is underway may be patched up by the tutors. Thus, the direct monitoring of course activities becomes one of the main tools for evaluating the soundness of design decisions, not to mention the efficacy of the tutors' and experts' performance. Accordingly, monitoring should be orchestrated in such a way as to give feedback on all of the elements considered during the design phase.

Table 1 shows a possible checklist compiled on the basis of the preceding discussion.

Online Course Design
1. Has sufficient consideration been given to project constraints?
2. Have the prerequisites for course participation been defined properly?
3. Have the stated objectives been reached? If not, why not?
4. Has the structure of the contents helped in reaching objectives?
5. Has flexibility helped to tailor the course to the participants' real learning needs?
6. Have the learning strategies and methodologies helped in reaching educational goals?
7. Have the activities proposed to the participants helped in applying the learning strategies?
8. Were the virtual groups of a suitable size for the proposed activities?
9. Did the learning materials and technologies prove effective and easy to use?
10. Were the course activities scheduled properly?
11. Did the tutoring staff offer satisfactory support?
12. Did the experts perform effectively?
13. Were there any interaction problems between the tutoring staff and the experts?
14. Did the modes for evaluating the participants prove effective for measuring learning and participation levels?
Design of the Communication Architecture
1. Were the communication flows for carrying out course activities correctly foreseen?
2. Were the most suitable network services chosen?
3. Did the logical communication structure respond properly to the participants' needs for interaction and exchange of material?

Table 1. Checklist for Designing an Online Course and Communication Architecture

CONCLUSIONS

This article has repeatedly stressed the point that it is impossible to design an online course on the basis of criteria typical of onsite education and that it is necessary to adopt a series of methods and strategies that into take account the medium and the communication dynamics it triggers. Accordingly, the fundamental points in online education are:

1. Employing the most suitable ICT tools and methods to meet the requirements for interaction and exchange between all the players in the learning process.
2. Being aware of the (positive and negative) influence that the use of ICT can have on a range of factors like the particular type of communication (text-based or audio/videocommunication), the change in the teacher's role within the class, and, last but not least, the problems involved in managing student access to network resources.

This awareness forms the basis for planning the design phases of an online course. Some of these have been examined in this paper, grouped under two general headings: *online course design* and the *communication architecture* for carrying out the course. Appendix A sets out and summarizes the relationships between the various elements that make up an online education project.

The structuring of the communication environment can influence the development of an online course, and, as a result, it is important for the course designer to be fully versed not only in the technology to be used but also in the learning methodology.

Finally, on the basis of the so-called categorization of project elements, a possible checklist has been provided to help in the evaluation of the design process of an online course.

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APPENDIX A - ONLINE EDUCATION: PROJECT ELEMENTS