

# **The NETTUNO Model –Network for the University Everywhere- Towards an Integrated and Open Distance Teaching-Learning Process**

by  
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## **New Social Contexts and New Training Needs**

Telecommunication and satellite technologies have made many training courses available. These courses make way for learning and acquiring new skills even outside traditional educational and training facilities; everyone can learn thorough the Internet and television media. Within the information society, the development of an open and extended educational system presents both possibility and risks.

Institutions in charge of education and training can not ignore today's new setting. They can not remain indifferent to the issues it has raised up nor to the need to bring teaching and learning into this new context. They can not ignore that the most important fact today is the "innovation-development-growth-occupation" dynamic that has come into difficulties and that determines the need for continuing education. Today, people need to be prepared to be able to constructively fit into a constantly evolving society. It is no longer enough to just brush-up on one's own skills, but rather, one needs to take on new skills and to become qualified in new professions. Therefore, education must:

- reach everyone
- be diversified and adapted to people of all ages
- constantly innovate what disciplines and study programs cover
- create new guidelines for those professions most in demand on

the job market –one that's marked by strong dynamism.

For years the university has been able to satisfy the needs of higher education. But, in this new context, if the university wants to be able to play a key role in political, economic, cultural and social development, it must single out new solutions and take on effective strategies in order to respond successfully to education's new needs.

Therefore, universities must:

- be able to redefine their functions
- fit into the new context and setting of the information society
- acquire the ability to adapt to new demands
- take parallel or separate initiatives into account
- modify the professional role of the teacher.

I believe a valid response to new training needs may be given by a new distance University model that has its mainstay within traditional universities. A model that allows traditional universities to take on a leadership role again in the innovation society process by offering new contents, diversified training systems, and new knowledge communication models based on new technologies. A distance university model, from a training point of view, is based on the founding of consortia of universities and technological firms. From methodological and didactic point of

view, this model is based on the use of new telecommunication technologies for teaching and learning.

## **CONSORTIA**

Consortia, in the new model, let places where knowledge is augmented by research and teaching maintain their key leading roles. Bringing host universities together offers not only a high-quality pool of human resources but also a know-how from which to choose. It's then possible to make excellent choices from such a rich selection over a wide range of departments. Having businesses be part of the consortium offers the opportunity to narrow the gap between the world of education and the world of production by linking tutors and users and answering human resources' new needs in continuing education. Telecommunication and satellite technologies have eliminated the distances between countries, this model can be, therefore, extended to the European and international level. This can thereby enlarge the pool of knowledge and skills, overcome national boundaries and recreate the model of university that gave way for the birth of European culture: the medieval university.

## **TECHNOLOGIES**

New technologies offer great potential for carrying out innovations in the teaching/learning process; they even have potential for traditional avenues. The variety of tools and mechanisms offered by new technologies allows for the creation of a learning environment that's very different from the traditional one. Telecommunication puts an end to a one-way transfer of knowledge; it opens up a new line of communication which allows the student access to the contents of dynamic knowledge. It can enrich the student and communicate to others. In such a way, distance learning sparks new modes of communication between students and professors certainly no longer one-way like they were in the first distance teaching models, they are now two-way. Although one can not replace the emotional aspect that comes out of different interpersonal human relationships, distance interactivity learning does introduce an essential aspect of the traditional teaching/learning relationship.

Telecommunication and computer networks allow lessons, multimedia products, data banks, and self-grading systems to be brought directly from the universities to the user's desk. Today's new technological capabilities allow traditional university systems to prepare methodologies that bring innovation -methodologies similar in depth and breadth to those adopted by a business when they introduce new technologies. Introducing new technology to businesses radically changes the processes of industrial production. Rigid organization gives way to flexibility. Facilities and professions change similarly as well. Models of industrial production evolved into new flexible models as a consequence of implementing new technologies. A similar evolution has happened in training systems. New technologies, in fact, allow for the rejection of rigid subdivisions of educational avenues and clear the way for an open and flexible instructional system. These reflections are at the foundation of the distance teaching model proposed by **NETTUNO –Network for the University Everywhere**.

## **NETTUNO –NETWORK FOR THE UNIVERSITY EVERYWHERE.**

The model developed in Italy for distance learning at a university level has its mainstay within the traditional university. From an institutional point of view, it's based on the emergence of a partnership between universities and businesses in technology. From the methodological and didactic point of view, it's based on the use of new communication technologies for teaching and learning.

The partnership structure has allowed these universities to take on a leadership role in the innovation of products, processes, facilities, product flexibility and adaptability, greater student autonomy, a modified teacher's role, and evolution of facilities that are all effective for both face to face and distance learning.

Instruction entails quality teaching by the best professors from traditional universities. They themselves are fully responsible for the distance teaching/learning process. Students of distance learning sign-up for the same courses and take the same exams as matriculated university students following courses on-campus do. Distance learning students also receive university degrees that have the same legal standing as those received through traditionally run courses. Teachers carry out the same functions prescribed for in-class students as for distance learning students. Moreover, teachers add other details for distance teaching which are coordinated not by only one university, but by all universities of that group. And here lies the most innovative element: only professors who are the most open-minded to innovation and who are the best in a joint didactic project get involved.

From an organizational point of view, the Consortium is made up of a National Center, supplying Universities, Technological Poles, at-home workstations for students, and University Technological Centers. The NETTUNO Network is thus made up of different outlets that allow teaching and learning to happen inside as well as outside traditional universities, the student's home, or businesses. Among these sites, the Technological Poles play a fundamental role; they are open structures where technologies have been installed (such as video-libraries, computers, modems, fax machines, telecommunication links, satellite television, Internet, ISDN lines, virtual laboratories). These allow the didactic process to be carried out at a distance. A Technological Pole inserted in a business allows employees to enroll in one of NETTUNO courses. They can get further professional training or earn a University diploma or degree.

The University Technological Poles have become breeding grounds for innovation within traditional universities. These Technological Poles are even attended by students and teachers who follow traditional on-campus courses.

Technological Poles at home allow students to consult multimedia data bases, ask teachers and tutors questions by phone or other forms of telecommunication, reserve, receive, and store didactic material from video-lessons into virtual laboratories (these can be administrative materials as well as didactic).

This has allowed a real, live network to be created - a network that can easily be extended to a European level. It has allowed a distance institution to be set up using technology in a specific and particular way. When information is transferred it becomes a real and actual lesson or didactic seminar and not only distribution of basic materials.

Using the Network for these proposals, the transfer of knowledge is possible from one institution (a supplying university) to an audience of students situated in different geographic areas, and also from different institutions (Technological Poles) to individual learners or organizations.

The advantages for learners include the availability of a wide range of courses, combined with flexibility of time and space for learning. Universities, business firms, or professional organizations that are part of the network benefit because each limited effort made by every partner all adds up to a huge global offering. Also, sliding budgets make the development and distribution of learning materials synergically profitable.

## **MIXED DIDACTIC MODEL**

As has been mentioned beforehand, the start-up of an organizational and structural model has allowed a new pedagogic model to be created that fulfills the requirement of flexibility and that manages to avoid the isolation of the student. This is a mixed model that empowers traditional systems by using a way of teaching unencumbered by spatial-temporal limits, but still maintains direct interaction. The model of distance teaching proposed by NETTUNO considers the distance arrangement that includes activities out of which the student studies alone and activities that use new technologies and activities that make the student interact with other people –either in person or at a distance. With this model, one is able to attain "that difficult synthesis between interaction and independence" (Garito, 1996). The two models are described below:

### **Traditional Method**

- direct interaction with teacher and tutor.
- seminars and practical assignments carried out in the presence of the tutor or teacher.
- meetings for tutors and groups of students held at the Technological Poles.

### **Distance Method**

- teacher's lessons (40 academic hours broadcast over television).
- practice exercises (over the Internet, multimedia software, video and computer conferencing).
- distance tutoring (over the telephone, by video, audio, and computer conferencing, by fax, e-mail, computer forums and chat rooms).

### **Satellite Television**

Satellite television and the Internet are fundamental among the technologies used by NETTUNO. All of the teacher's courses are broadcast on RAI channel 2 and are aired 24 hours a day on channel RAI NETTUNO SAT, which the RAI beams from the EUTELSAT HOT BIRD 2 satellite. There are 240 courses produced by the NETTUNO network for a total of 1200 hours of university video-lessons. Besides the video-lectures, there are didactic books, workbooks, multimedia software and products, and didactic Internet web sites linked to the video-lesson that are used for the distance learning courses.

### **Distance Didactic Model**

#### **- Traditional Didactic Methods**

By planning different distance teaching and learning activities it was taken into account that distance teaching, through mass media (even allowing for the use of interactive processes) does not solve many students and users' problems with their difficulty in relating to a far, remote, and impersonal structure.

Therefore, in order to prevent such from happening, time and places have been given so the student can take the initiative and take advantage of such direct meetings. In particular, the traditional method provides face-to-face meetings for direct interaction between student and teacher or tutor. Traditional tutoring undoubtedly has the advantage of allowing shortcomings to be dealt with on-the-spot through the relationships teachers and students have established in NETTUNO's University Technological Poles during the course of the lessons. The possibility, on the teacher's

part, to ultimately motivate the student by creating a positive and open climate is surely one important element of direct contact. At the same time, the face-to-face method breaks up the student's isolation and permits him or her to "socialize within a group". It also creates opportunities for collaboration, exchange, discussion, and debate with other students.

## **Distance Learning Didactic Methods**

Today, modern technology can bring about "presence at a distance" (through video-conferencing, chat rooms...). NETTUNO puts forth a didactic with a method of teaching/learning that is synchronous (teaching and learning happening at the same time, but not in the same place) and diachronic (training and educational processes that are no longer tied to the same time and place).

### **Diachronic Method**

Above all, it's necessary to underline how this method offers the maximum degree of flexibility. The lack of spatial-temporal limitations allows the student to learn at his/her own rate and at the times that are convenient. The lack of limits of space also allows the student to use didactic materials in every possible context: at home, at work, at the study centers –all based on his or her needs. Therefore, optimal learning is fostered.

Different aspects of learning are included in the diachronic method:

- symbolic-reconstructed learning
- learning by doing
- collaborative learning mediated from written work through supportive

### **technologies**

In the first two methods, man and machine interact: the student uses a VCR, satellite television, computer, telecommunication networks, and virtual laboratories. In collaborative learning, interaction takes place not only between person and technology, but also between students and/or teachers. Interaction is carried out through the use of technologies that are based on *writing*: fax, electronic mail, and discussion groups or forums on the Internet. Overcoming the limits of time and space, these instruments create the conditions for creating a "virtual community" and for equipping collaborative learning processes over a network which then foster new methods of socialization. The possibility to form relationships at the end of studies is essential because it allows the discussion and clearing up of the many doubts that haven't always been taken fully into account by the teachers and tutors.

### **Synchronous Method**

In the synchronous method, the development of new technologies has brought with it a particularly significant innovation. Telecommunication has made it possible to initiate interaction in real time without needing the participants to be present in the same place. Time unfolds simultaneously for all, but place is no longer a necessary condition. Just like in the case of collaborative learning mediated through writing, interaction happens not only with technology, but also occurs between groups of students, groups of instructors, and between students and instructors. The synchronous method, therefore, allows collaborative learning to be carried out through video-conferencing, conference calls, and Internet chat rooms.

## **New Teaching Models**

The new proposed models imply there's been a change in the traditional standing of university professors; they are no longer privileged providers of knowledge. Professors have had to learn, in fact, to give lessons on television, to plan and complete multimedia products and virtual laboratories; they've had to learn to teach with video-conferencing and to create didactic web sites on the Internet. Professors have had to guide students in the process of learning by one-self using non-traditional tools, methods, and technologies. They have had to create new types of books. These professors have the dual function of teaching on television, but at the same time, supporting learning through telecommunication networks and technologies.

Using a medium like television has brought change in traditional didactic communication. In the new didactic model, professors have been forced to find new ways to explain, sum up, and present their knowledge to a virtual student in such a way that the process of learning becomes critical and reflective. The video-lecture requires special preparation and, in order to take full advantage of the medium's power; the teacher has to work together with technicians and experts in visual language. Every video hour requires from 20 to 30 hours of preparation. The teacher has thus naturally developed new communication skills and has learned how to use new languages for memorizing his/her own research results and for teaching regular, traditional academic courses.

Besides teaching on television, professors have learned to create new kinds of books, multimedia software, and virtual labs linked to the video-lessons. These multimedia products are organized in such a way that they cover the bases of knowledge in different departmental disciplines. They cover methodologies of interactive programs, ways of deepening learning processes, systems for self-grading and systems for comparative evaluations.

Many professors have learned to communicate with students and colleagues live through audio and video conferencing, or in real time through Internet's forums and chat rooms. Practical exercises are worked out from these systems. Also, users can discuss the video-course's contents and talk things out if results are unclear. They can develop collaborative learning, help solve problems and also help overcome those difficulties that distance learning students often run into: difficulties tied to the isolation of self-study and learning. In the televised programs, the teacher teaches interactively; he/she asks the students questions, the students answer, they interact with the instructor and with each other. The collaborative learning they develop is similar to what comes out of working in groups (what normally results from in-class, face-to-face teaching).

In NETTUNO's didactic system, technology is not inserted passively into the university's didactic activities –as if it were any other type of tool. Rather, technology is an active subject; it has become the teacher's new working tool. Without a doubt, this experience has created much reflection over the ways knowledge is communicated and therefore over the university's didactic. Professors are exposed not only to their students' judgment, but now even more so to the judgment of their colleagues and those who chose to follow their televised lessons and connect to NETTUNO's didactic web sites (the sites where all distance learning course materials are found and where there are forums for discussion of various subjects).

## **New Learning Methods**

In the open spaces of learning, students can freely choose to go from theoretical instruction to practical training. They can navigate the large multimedia data -bases in real time, and strike up two-way and interactive communication even at a distance. They themselves can be at the center of the teaching and learning process.

Teaching's open and flexible telecommunication settings allow the NETTUNO model to integrate different languages, to open up new lines of communication, and to permit students to activate the process of active and interactive learning. NETTUNO's didactic model is in constant evolution. For this reason, the Network is involved in many research projects. One in particular is the research project Hermes- Giotto (**H**igh **T**ransfer **R**ate **M**edicine and **E**ducation **S**ervices by **S**atellite). This covers the bases for modifying the directions distance learning and teaching take. Hermes Giotto has proven that today it is possible to integrate different technologies: satellite television, Internet, and video-conferencing. It has made complete learning environments on the Internet possible where different methods of communicating knowledge are used:

- digital video-lessons: here students use a linear, symbolic, reconstructed learning model (that is still tied to classic teaching methods).
- an intelligent library where methods of using hypertexts are used for studying and consulting books linked to different subjects covered in video-lessons.
- a virtual laboratory, where the student can gain familiarity and knowledge with

the method 'learning by doing'.

- video-conferencing, the student can initiate collaborative learning by having a talk on the web. He can share step-by-step the process of learning in different linguistic and social situations.

The methods are "hosted" in one "virtual" place where the learner's mind can cultivate his own personal aptitudes. He can enter into one of these four "worlds" and use as much as is made available for that didactic course. This "virtual" place is represented by an open sky without limits where one can teach and learn in one's own personalized way as well as be guided by a teacher and tutor through telecommunication.

A student being accompanied by Hermes (the winged messenger of the gods), can "surf" on the Internet into different virtual settings. With the **video-lecture** he can study the theme of Giotto (his background, his art, his works). With the **intelligent library** he can deepen his knowledge through hypertexts using books from all over the world. With the virtual laboratory, the student can choose:

- to visit the **laboratory** set up in the Convent of Assisi where expert restorers are busy piecing Giotto's frescoes back together in the Upper Basilica of Saint Francis which was damaged by an earthquake the 26<sup>th</sup> September 1997.

The student can then decide to follow the **video-lesson on restoration** in which the restoration techniques being used are explained. By doing some practical exercises the student can learn more about the art of being a restorer. The system allows one to operate virtually in a three-dimensional reconstruction, **to select the fragments**, see how damaged the fragment is, restore it, and replace the fragments to **rebuild** the frescoes of Saint Francis and Saint Claire.

Learning activities are structured in such a way to keep the student from losing track and getting confused. The activities, instead foster the transference of knowledge, skills and experience in a context that allows one to go along a guided path and move from:

- the simple to the complex
- theory to learning by doing
- individual study to interactive dialogue between teachers and students (and between teachers).
- guided exercises to research on the World Wide Web.

In this setting for open and integrated learning, the student has the possibility to personalize his entire course of study. The student can interact with different materials and can finalize a study strategy that utilizes multimedia and hypertexts. For example, he can organize his learning materials by creating folders for texts, sounds, and images. The student can pause the video-lesson in order to look up something in the virtual library's texts and data banks. He can try out practical activities in the laboratory to see if he is able to turn theoretical knowledge into practical ability. He can navigate the Internet in order to get more in-depth information from different linguistic and cultural settings. He can have a conversation with other students and experts through the Internet's discussion groups and forums.

The learning environments found on the Internet let the student exchange and compare; he can access diversified fields, enact real "virtual" encounters with teachers and students from different campuses around the world. In didactic cyberspace, students are able to create a group spirit that's universal.

Thus, the university that was once an isolated system subdivided into classes, levels, and fields of study, and where preordained knowledge was merely repeated is now transformed into an open system that's capable of updating itself and able to integrate all knowledge available online.

## **Conclusions**

The NETTUNO model has been helpful for forming a new educational community that's both actual and virtual. This model has already produced important results. It has put into debate traditional models of teaching and learning. The fact that those teachers who created distance courses no longer teach in a traditional way is very significant. Now they play out their teaching role in different ways; in fact, they use languages to communicate knowledge with instruments that are constantly more sophisticated. The new enthusiasm generated by this experiment has had a great influence upon other academic settings and has let us propose the model again on a European level.

The key to the model's success is due to the fact that it is used with the knowledge that the process is evolving and flexible. Teachers and students can start using technological innovations by and by as they become available. The model offers the university a laboratory in which it's possible to experiment with new teaching methods and to progressively use the terminology connected with technological development. The foundations have been laid that will enable universities to become aware of the new role they must play in this age of information.

By using the widely different abilities present in different universities, an interesting synergy has been created among the businesses that develop technology and the universities that develop quality programs.

In this laboratory, NETTUNO has evolved and made headway. In just a very few years it has gone from the simple use of television and computer to the use of sophisticated telecommunication and satellite technologies. The satellite television channel RAI NETTUNO SAT has let us quickly go from using different media to using one single medium: computer or an interactive television. Related to this technological advancement, NETTUNO can count on the ability and availability of an ever-growing number of professors capable of using new languages. The contextual availability of technological and human resources has let us develop notable research activities; it has also facilitated the experimentation of different distance teaching models.

In the end, this on-going research has to build a consistent body of theoretical and operative knowledge and to strike a balance between technical and engineering components – the cognitive,



cultural, and educational aspects belonging to the development of information technology. At one and the same time, this research is theoretical-experimental, pure and applied.

These research results allow us to create a concrete model of distance teaching that:

- gets people and cultures truly closer together;
- opens the way for a global system of communication of knowledge that changes our way of life and our ways of learning and thinking;
- and allows the start of a series of concrete innovations for the traditional training and educational system.

Teachers' and students' physical movement is substituted virtually by the mobility of ideas. This way, interaction between students and teachers from different universities in the world can develop. Culture and knowledge can be internationalized and a truly open and democratic university can be created –a university that moves beneath open skies and without borders, and is able to develop new awareness and also new values.