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E-mail addresses for editorial correspondence: <rfcalvo@ati.es>, <nicolet@acm.org> or <rcarniel@dgt.uniud.it>

E-mail address for advertising correspondence: <novatica@ati.es>

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e-Learning – Borderless Education

Guest Editors: **Ángel Fidalgo-Blanco and Martín Llamas-Nistal**

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E-Learning in Distance Education and in the New Cooperative Environments

Enrique Rubio-Royo, Domingo J. Gallego, and Catalina Alonso-García

This article, of informative purpose, aims to give an overview of how e-Learning is being included in training processes considered as traditional (distance and on site learning). But it will also be looking at practical cases showing the results of the application of e-Learning within the framework of what are referred to as 'entrepreneurial units', small research groups and departments set up within Universities to apply innovative techniques among teachers and learners.

Keywords: collaborative environment, corporate e-Learning, distance education, online training, organizational innovation, virtual campus.

1 Introduction

To improve the quality of teaching, to meet the new demands created by our knowledge society and to provide education in humanistic values are aims that most European universities strive to achieve. The governing bodies of many universities have put in place strategic policies and plans (both on an individual and a cooperative basis) to meet the aforementioned aims. But an important role is also being played by what are referred to as 'entrepreneurial units'; small research groups and departments which are applying innovative techniques among their teachers and learners to achieve some of those aims. They act as test beds for other teaching institutions and provide important information for the governors of our universities to bear in mind when addressing strategic policies and plans. In this article we will provide two practical cases from two different entrepreneurial units, each with a common denominator: the use of e-Learning[1] platforms.

- The first case concerns the work carried out by Domingo J. Gallego and Catalina Alonso-García on the use of e-Learning in the distance learning. The incorporation of information and communications technologies in distance learning is a 'natural' evolution toward the use of technological advances to improve a given service. The aim is to use technological innovations in an non-exclusive way; that is to say, learners who do not have the required technological infrastructure at their disposal can still receive a quality service, but those that do can benefit from more learning possibilities, other approaches and different results.
- The second case concerns CICEI (Centro de Innovación para la Sociedad de Información, <http://www.cicei.com>) of the Universidad de las Palmas de Gran Canaria, Spain. This is based on adapting certain processes normally related to on site learning to the new competitive strategies arising from the advent of the knowledge society. The aim is to promote cooperation among teachers. Given the social nature of knowledge, cooperation is one of the cornerstones of the Knowledge Society. Cooperation is present in organizational learning and innovation, informal learning, and learning in the workplace. This new cooperative aspect of

1. The e-Learning platforms employed include training systems, cooperative work and knowledge management; all processes use the Internet as their communications support.

Enrique Rubio-Royo is a full professor, working in the field of knowledge and computer science and artificial intelligence in the Dept. of Informatics and Systems of the Universidad de Las Palmas de Gran Canaria, Spain. He is the Director of the Centro de Innovación para la Sociedad de la Información (CICEI) of the same university <http://www.cicei.com/>. He is also the Coordinating Director of the doctoral programme "Information technologies and their applications" and is director of the UNITWIN-UNESCO chair of "Information Technologies for Northwest Africa", <http://www.cicei.ulpgc.es/unesco/tis/>. For more than ten years he has been analysing the role of information technologies in social and organizational environments and has designed and implemented several models of organizational innovation, e-learning, and collaborative environments in both public and private organizations. <rubio@cicei.com>.

Domingo J. Gallego has a PhD from the Universidad Complutense de Madrid, Spain, a Master in Educational Technology and Communications from Columbia University, New York, USA, and a Diploma in Cinematography from the Universidad de Valladolid, Spain. He is a professor of Didactics and Organization of the Spain's Universidad Nacional de Educación a Distancia (UNED). He lectures on Educational Technology and runs the doctoral courses "How to do educational research on the Internet" and "Knowledge and intellectual capital management". He is the technical coordinator of the postgraduate course "Master in Educational Informatics", <http://www.uned.es/infoedu>. He has extensive research experience and has directed 25 doctoral theses, all presented and defended, and many other research papers. He is the author of several research papers and publications on educational technology, distance learning and knowledge management. <dgallego@edu.uned.es>

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learning needs a new culture and a new environment of collaborative work.

2 E-Learning in Distance Education

In the 90s the UNED (Universidad Nacional de Enseñanza a Distancia, Spanish Open University, <http://www.uned.es>) was a 'paper' university. All its teaching material was centred on texts supported by radio broadcasts and audio and video material. As early as 1992 the article by Domingo J. Gallego entitled "From the paper university to the telematic university", published in the journal *A Distancia* to commemorate twenty years of the UNED, was already heralding the coming changes and technical advances.

While encouraging the use of technology, UNED is a university which is technologically non-exclusive; in other words it does not exclude learners who do not have access to the required technology (computer, Internet...) but it does encourage teachers and learners to enter and make full use of the world of the new technologies for learning. Many years ago, in the closing session of the 10th Congress of Pedagogy (Salamanca, October 1992) Miguel Angel Quintanilla said that 'technology' had become the "*modern day cultural coincidence*".

Computers have come into the field of learning bringing with them a different way of acquiring knowledge. By using computers learners should be able to develop their ideas, apply their knowledge and gain confidence in themselves as intellectuals.

Computers afford us a huge opportunity to acquire unprecedented skills and to invent and carry out highly interesting tasks, providing access to the languages and the world of computing. The results of several pieces of research seem to show that the use of the computer in support of individualized learning results in:

- The learning being more active.
- The possibility of greater sensorial and conceptual variety.
- Less fatigue.
- An approach to cognitive processes.
- An aid to abstraction.

The different ways Informatics can be used act as a catalyst by creating a new type of relationship between teachers and learners. But this will only be possible when both teachers and learners are prepared to shrug off their current hidebound roles and play the more open role required by the new methodological models, characterised by curiosity, discovery and knowledge building.

Educators should create new educational models which meet the need to generate new sources of knowledge. Teachers should foster motivation and awaken the thirst for knowledge in their learners. In this way we can give learners an in-depth education, one in which they acquire new knowledge by experimenting, exploring and innovating, learning at their own pace and in their own learning style. Informatics as a new language plays a vital role in this.

Catalina Alonso-García is a PhD in Educational Science and a graduate in Psychology from the Universidad Complutense de Madrid, Spain, and also has a Diploma in Industrial Psychology. She is a Basic Education teacher and a professor of Educational Technology in the Spain's Universidad Nacional de Educación a Distancia (UNED). She runs the doctoral courses "Teaching Styles, learning Styles" and "Educational Implications of Emotional Intelligence", and is the director of the Master, Specialist and Expert postgraduate courses on Educational Informatics. She has chaired eight UNED Educational Informatics Congresses (1996-2003). She has taught at every level of the education system, and has authored several research papers and publications on educational technology, distance learning, emotional intelligence and learning styles. <calonso@edu.uned.es>

3 Online Learning

In our electronic age, the very concept of 'distance' needs to be rethought in the light of the new resources that teachers and learners of distance learning have today.

But it is the incorporation of such modern technologies as fibre optics, communications satellites, microcomputer networks, videoconferencing, teleconferencing by computer, e-mail and the Internet which allows us, indeed obliges us, to take a fresh look at the classic approach and our usual distance learning models and open up new educational horizons.

This new series of mediational tools enable us to overcome some of the typical difficulties of distance learning, for example the distance in time and space between learner and learning centre, which led to delays in the solution of difficulties and even to changes in the way those difficulties were formulated. The Internet overcomes isolation in learning by making virtual classrooms and collaborative learning possible.

Traditionally distance learning has been described as a form of education in which learners:

1) are physically separated from their teacher,
2) are also separated from their teacher in time,
3) and learn independently of any contact with teacher or other learners.

Nowadays the classic definition of distance learning has widened its horizons to embrace the new possibilities that technology, and, in particular, telecommunications provide. Craincross claimed, a few years ago, that "*The death of distance will probably be the single most important force shaping society in the first half of the next century*". Accordingly we need to come up with a new taxonomy that takes into account other kinds of teacher-learner relationships:

Category 1: Correspondence based distance learning

1. Study by correspondence based solely on written material.
2. Study by correspondence based on written material backed up by audio and video recordings.
3. Study by correspondence based on written material backed up by radio or television programmes, but with no communication in real time.

Category 2: Telecommunications based distance learning
1. Bidirectional audio communication audio.
2. Bidirectional audiographic communication.
3. Bidirectional video communication.
4. Bidirectional communication by computer.

In the UNED there are currently a great many elements of Category 1 and Category 2 coexisting together. We can see in our university how real time bi-directional communications, achieved by means of various technological resources, enable interactivity and dialogue and enhance the quality of educational processes. We find ourselves in an exciting new situation in which communication systems are of paramount importance as decisive mediating elements in education.

Peter Drucker, the famous business and management guru once said in an interview published in Forbes magazine in June 1997 (pp. 84–92) "*Thirty years from now, big university campuses will be relics. Universities won't survive. It's as large a change as when we first got the printed book... Already we are beginning to deliver more lectures and classes off-campus via satellite or two way video at a fraction of the cost. The college won't survive as a residential institution.*"

4 Virtual Online Environments

Virtual online environments will be able to be supported by internal networks or Intranets, private networks belonging to an organization or by Extranets, external networks to communicate with 'the outside world'. The Extranet par excellence is, of course, the Internet, whose current possibilities, in its existing form, could be said to be stretched to the limit. It was designed to carry written information (text) but now sound, image and moving images have increased the informational load over channels which have become inadequate. The boom in institutional and private connections has meant that the network has reached saturation point, slowing down processes, sometimes to an exasperating degree, making the practical use of multiple audiovisual resources impossible. The launch of Internet 2 and the technological improvements this will herald means that we can look to the future with some optimism while making the best out of the present.

The design of online virtual environments will depend on at least three factors. Firstly on **culture**. If we are used to doing things in only one way, change could be very slow in coming, especially considering that a fifth of the population of the first world is over sixty five years old, and a large percentage of educators are over forty five and will find it hard to make the move into virtual environments. It may be that developing countries with younger populations and fewer preset ideas will be quicker to discover and benefit from the new technologies than the aging West.

Secondly, on **cost**. The Internet has been more successful in countries where its use is less expensive. When free Internet connection was offered to Spanish educational centres, more than six thousand centres hooked up to the Internet. Broadband connection and its associated cost are limiting factors in the use of online virtual environments.

Thirdly, on **ease of use**. When a technology is easy to use it quickly becomes popular and people snap it up. The case of mobile telephones is a good example of this. The more effort is required to get to grips with a technology, the slower and more limited will be its dissemination. An online virtual environment based on complex technological systems will have much less chance of becoming widely used than an environment using 'transparent and user friendly' technology.

When in 1993 Marc Andreessen and his colleagues at the University of Illinois designed Mosaic, the first multimedia Web browser, they opened up the way to create virtual environments with new features. The Internet became multimedia by nature – albeit slow and flawed, but multimedia nonetheless – with greater accessibility and more fun to look at. We have also seen the introduction of Hypertext, a cross-referencing tool allowing users to move straight from a selected word or phrase on the screen to related information stored on a computer in another part of the world, thereby enabling us to use related documents conjointly.

The concept of cyberspace, a term first coined by William Gibson in 1984 in his book *Neuromancer*, as a computer generated three dimensional world in which people can experience a virtual reality, is loaded with connotations of danger, isolation and anti-humanistic overtones in a world controlled by machines. However a good use of the new forms of communication may actually increase the variety and depth of interpersonal communications, enriching people's lives and opening up a gateway to a new type of social life.

5 Virtual Platforms

Since the mid 90s various platforms for the design of online courses have appeared on the scene. After the initial experiments with HTML editors, integrating e-mail and other activities developed with Java or Javascript, we now have a large number of platforms facilitating the design of online courses. However the number of platforms available may cause problems for some people, due to the lack of standardisation and the need to decide on a specific platform.

Virtual platforms normally provide three kinds of tools:
- User interface design tools.
- Tools to facilitate learning, communication and collaboration.
- Course management tools.

Obviously the first step in the design of online courses is to decide what platform to use. This is a complex decision requiring the analysis of the various tools available and how they meet the specific needs of each learning centre.

6 A Practical Case: UNED's Postgraduate Courses in Educational Informatics

In UNED's postgraduate courses in educational informatics the basic pedagogical criteria of third generation distance learning have been followed: to design plurimedia teaching materials developed specifically for the postgraduate courses; to set up some on site meetings with the learners (those unable to attend in person can follow the meeting by videoconference on the postgraduate web page and can communicate and take part in the meeting over the Internet); to promote collaborative learning and the learners' self knowledge of their learning abil-

ities by means of guided self-diagnosis of their learning style. Also included are distribution lists (as an improvement on the old BBS (Bulletin Board System) and the latest methods of teacher-learner and learner-learner interaction provided by the WEBCT platform: fora, debates, chats, file sending, etc.

The choice of WEBCT as a basic platform was made for us by the university which chose it for all its telematic activity. We have tried out other platforms and we have carried out some research into the didactic possibilities of different online educational models and available educational web pages. Some of this research is soon to be presented to the academic community in the form of doctoral theses.

Looking back at the results of UNED's postgraduate courses in educational informatics we believe that the considerable experience over the years of different ways of approaching distance learning has had a strong influence on the teaching. If today we can talk about the nearly 3,000 teachers who have passed through our postgraduate courses over the last ten years, and eight International Congresses of Educational Informatics hosted by the UNED which provide an annual snapshot of the state of educational informatics in Spain and other countries in proceedings that fill thousands of pages and CDs with demonstrations and creations educational informatics which are easy to apply in the classroom, it is because the holistic approach to distance learning has covered most learning possibilities.

There are some people who have a great enthusiasm for Informatics and Telematics and start up virtual learning, or online learning, activities and experiments without any prior review of and without any thought to the meaning of distance learning and its methodological peculiarities. They merely make a transposition of the on site class to the telematic class. We believe that experience and a proper understanding of the teaching methodology of distance learning is of paramount importance, whatever your choice of design and platform.

7 CICEI: New Context-New Reality

The current situation of transition toward the Knowledge Society (qualitative and generalized change within a networked society) is bringing about a new context, a new reality, one to which organizations and private individuals will have to adapt. In particular, changes in the nature of work (concerning the management of intangibles) require new skills, knowledge and attitudes of the new professionals (knowledge workers). In turn, the social nature of knowledge requires new collaborative work environments (knowledge based work environment) to be designed within the new emergent organizational forms (networked organization). To implement these new environments, to support the interaction and sharing of the new emergent social forms (different types of online communities), various community oriented information technologies are used, as shown diagrammatically in Figure 1.

As we have seen, the present situation facing private individuals and organizations is one of far-reaching and rapid change. This gives rise to complexity and uncertainty, and makes it impossible to predict what the future has in store. Meeting the requirements of this new reality does in turn produce changes,

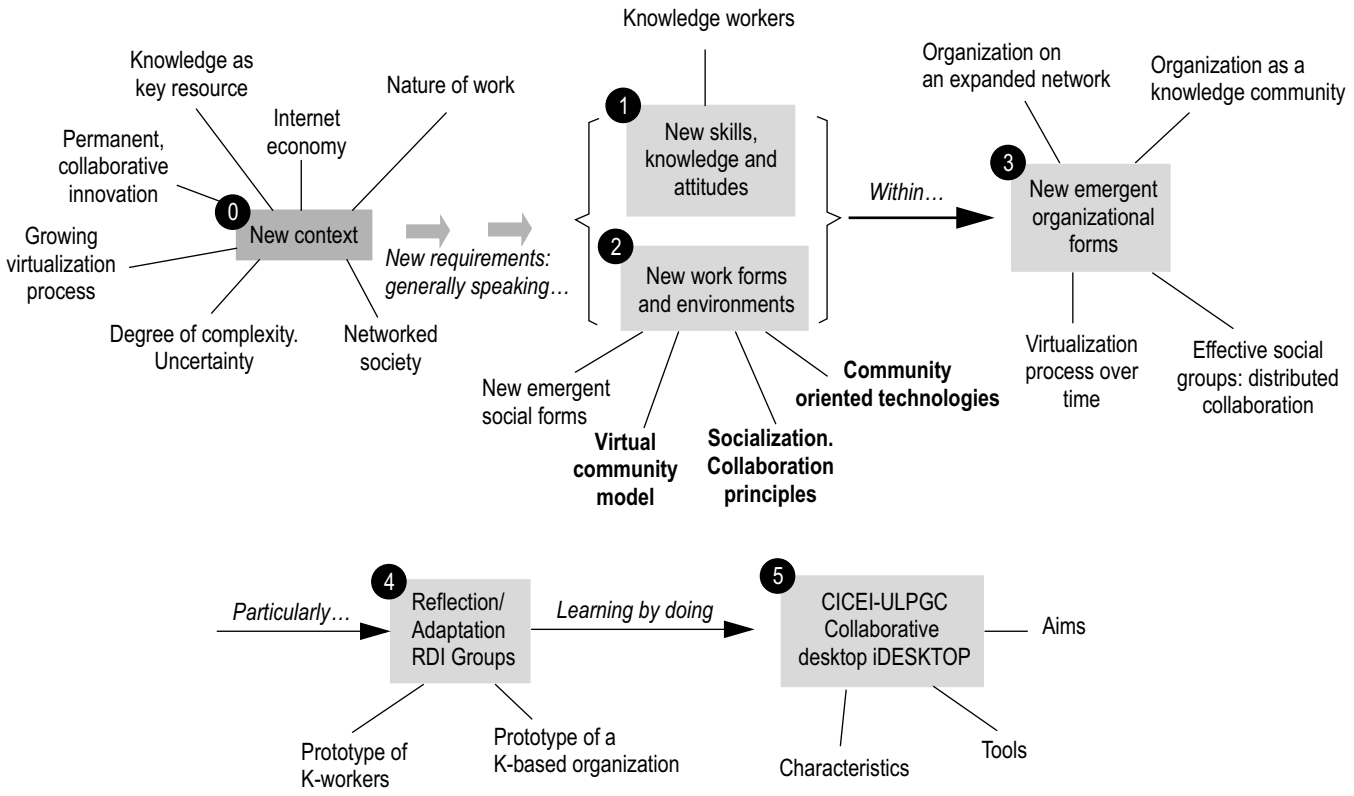

Figure 1: New Context – New Reality: the CICEI Model.

both in the nature of work and the forms and type of relationships to be found in group work, within the framework of the new emergent organizational forms.

This new context, reflecting the current transition toward a knowledge society, has set the scene in CICEI for the formalization and implementation of a socio-technical model of 'Networked Organization', known as the SURICATA model. The main features of this are, among others:

- The intensive use of ICT (Information and Communications Technologies) and particularly of Internet technologies, which brings about fundamental changes at a global level (e-Society), in organizations (e-Company), in industry (e-Economy) and in the marketplace (e-Business).
- Networking as a new organizational logic on which emerging organizational structures are based in support of the new paradigms of knowledge creation, dissemination and sharing.
- View of knowledge as the key asset to manage (main source of competitive edge).
- View of the organization as a knowledge system (social nature of knowledge).
- Innovation in knowledge management as a strategy of organizational adaptation and change. Knowledge sharing as the only direct path to sustainable innovation.
- 'Organizational' learning as a feeder for knowledge management.
- The organization as a community of communities.
- The community as a 'nucleus' upon which knowledge is created and shared (virtual communities, knowledge flows, social networks).

In the light of all the above, we see the implementation of an overall knowledge strategy within an organization – and in particular of an RDI centre – not only as a process of adaptation but also as a process of growing virtualization over time, in the context of a new reality (moving toward the knowledge economy), characterized by the following elements: people oriented (interpersonal relations); importance of ideas, innovation, coordination and technology; immersion in the age of intangibles; an unprecedented emphasis on the value of learning.

8 New Forms and Environments of Knowledge Based Work

As Peter Drucker said a few years ago "*Making knowledge workers more productive requires change in basic attitude, while making the manual workers more productive only required telling the worker how to do the job. Furthermore, making knowledge workers more productive requires changes in attitude not only on the part of the individual knowledge worker, but on the part of the whole organization*".

In response to this new scenario, organizations are designing and developing different strategies addressing, on the one hand the new knowledge, skills and attitudes of the knowledge workers, and, on the other hand, the new work forms and environments required.

8.1 The Knowledge Worker

Out of all this is emerging a new kind of 'worker' and a new way of working. It is ever more apparent that "*The only thing that gives an organization a competitive edge – the only thing that is sustainable – is what it knows, how it uses what it knows, and how fast it can know something new*" (Laurence Prusak). In order to manage and share this knowledge, organizations need knowledge management mechanisms to facilitate organizational learning and innovation. This leads to 'knowledge based work', by which is understood "*any activity that increases the knowledge a person or an organization has*" and should include any kind of reflection or research that captures, stores and uses knowledge leading to new products, services or innovative processes. This has given the term 'knowledge worker' (k-worker), coined by Peter Drucker about forty years ago, a new lease of life, although there is still a certain degree of confusion about its exact meaning,. Basically any person involved in the creation, management and dissemination of knowledge is a knowledge worker. Of course this definition covers a wide range of activities and professions. Generally speaking, k-workers tend to be academically well qualified, have a thirst for knowledge and innovation, and an intensive use of information technologies.

Given all the above we can say that for 'knowledge workers' to perform effectively in our knowledge society there must be a synergy between the capacity of technological systems to process information (ICT) and the creative and innovative capacity of the people involved ('knowledge workers'). Thus, as well as requiring new skills (computer skills, interpersonal skills, etc.), knowledge workers will also require new work environments to enable that synergy ('personalized portal for the knowledge worker'). The understanding, acceptance and efficient use by 'knowledge workers' of the working environments we have described above, will allow them to 'delegate' to technology anything that is programmable, allowing us to concentrate our time and effort on value added activities requiring creativity and innovation.

8.2 Knowledge Based Work Environment

The growing virtualization process, the presence of virtual communities and the appearance of knowledge workers all make it essential to modify our work environments. This is where the aforementioned 'personalized portal for the knowledge worker' comes in, where the dimensions of individual and collaborative work (formal and informal groups) converge, with the aim of increasing and sharing organizational knowledge and thereby generating a return for the organization.

The management models of the industrial era placed emphasis on control and top down orders, with clearly defined functions and responsibilities. The resulting hierarchical control structures are unable to respond quickly enough to the changing demands of the users, nor can they meet the needs of the workers. In this respect we can see a shift in current management methods towards biological metaphors (ecosystem) and complex systems, characterized by relationships involving interdependency and feedback.

Traditional groups	New emergent forms
Homogeneous • Groups of 'similar' people • Organizationally similar (e.g. departments)	**Heterogeneous** • Diversity of people, organizations, and specialities • Organizationally disparate
Static • Structure and participants • Little mobility (in terms of adding and deleting members)	**Dynamic** • Change forms part of the process • Membership is fluid, based on needs
Organization oriented	**Productivity oriented**
Centralized management • Connected hierarchically	**Distributed management** • May or may not be connected hierarchically
Predefined boundaries • The group is predetermined • Inflexible approach	**Self-defined, organic** • Knowledge defines the group • Adaptive to tasks
Reliant on 'technical expert' • Complex set up • Sophisticated management and maintenance	**Technologically self sufficient** • Rapid technological adoption (in principle) • Learn as you go enhancements
Fixed geographical location • Few locales	**Mobile** • Anywhere, anytime

Table 1: Traditional and Emergent Work Groups.

Traditional work groups are thus being replaced by new emergent forms. Generally speaking, there is a shift from homogeneous and static groups to heterogeneous and dynamic ones, as is shown in Table 1.

As specific examples of these new social relationships that knowledge workers form part of we could mention: formal work groups, project teams, practice communities, informal knowledge networks, etc.

8.3 Virtual communities

As we have seen, if the environment changes so must work forms, organization forms and communication forms. Virtual communities and work teams emerge as key components of knowledge management and organizational learning and innovation strategies.

In regard to this we see the field of applied research 'Virtual communities and ICT' as being of great interest, given the synergy arising from the combination of ICT's capacity for transformation on the one hand and, on the other, the capacity for innovation and creativity of people and groups. We consider that:

- Virtual communities in general, and practice communities in particular, will play an ever more central role within both organizations and society in general.
- Virtual communities as a support to the reconfiguration of learning and knowledge management processes (new paradigms) and of new emergent organizational forms.
- Different profiles of virtual communities in response to organizations current need to develop a greater intentionality and systemization with regard to knowledge management (design of a strategy)
- Relative value of virtual communities (Web based networks, with human many-to-many interactions), compared to broadcast networks (one-to-many) and transactional networks (one-to-one)
- New paradigm of networked creativity (overcoming the traditional dichotomy: 'few create, many consume').
- Socio-technical paradigm of innovation (sustainable): as a way of adapting to social, market, and technological changes, as the current main source of competitive edge and as cultural property.
- ICT as an implementation support for the different virtual community profiles.

8.4 Socialization: Principles of Collaboration

The mere existence of virtual communities and work teams is not enough; we need to give some thought to what conditions are required for such online communities to work and to be effective and productive. Generally speaking, the management of social interaction by applying principles of collaborative participation can help communities to improve their results exponentially. So, in order to achieve collaborative participation we need to adopt the appropriate principles for the creation of effective social systems.

The sociological principles behind the development of social systems provide an approach or model for the design of Web based interactive services. The principles of community collaboration which a) facilitate the organization of groups; b) enhance team collaboration; and, c) promote the exchange of knowledge, can be summed up as follows:

1. **Purpose**. Shared interest or aim: why are we here?; what do we aim to achieve together?; how do we achieve our purpose online?
2. **Identity**, of the group and personal: do we know who's who?; can members identify other members and establish a relationship with them?
3. **Reputation**. In online communities it's not who you are but what you do that is important. Reputation is achieved by our own actions (degree of participation, number and quality of contributions, value contributed to the organization).
4. **Working**. Our behaviour should be regulated according to shared or pre-established values. All group members must have it clear what they can and can not do, how to resolve conflicts, who makes the rules, etc.
5. **Communication**. We must be able to interact, share information and ideas with the other members.
6. **Groups**. Possibility of members forming smaller groups (either formal or informal) when specific tasks or interests require it.
7. **Shared environment**. Interaction takes place in a shared environment which generates synergy and helps members to achieve their personal and group aims.
8. **Boundaries**. The community is aware of who belongs and who doesn't belong to it.
9. **Trust**. Without trust a collaborative group cannot function. Trust is built over time and must be created by the group's members, promoters and facilitators. The building of trust increases the group's efficiency and makes it possible to resolve conflicts.
10. **Exchange**. The group's collaborative work requires an exchange of values, knowledge and ideas.
11. **Expression**. Expression is the community's lifeblood. It is how members know what other members are doing.
12. **History**. By keeping track of its actions the group acquires a culture and style of its own. It remembers what has happened, the way things are done, its successes and failures, etc... All this is vital for the community's development.

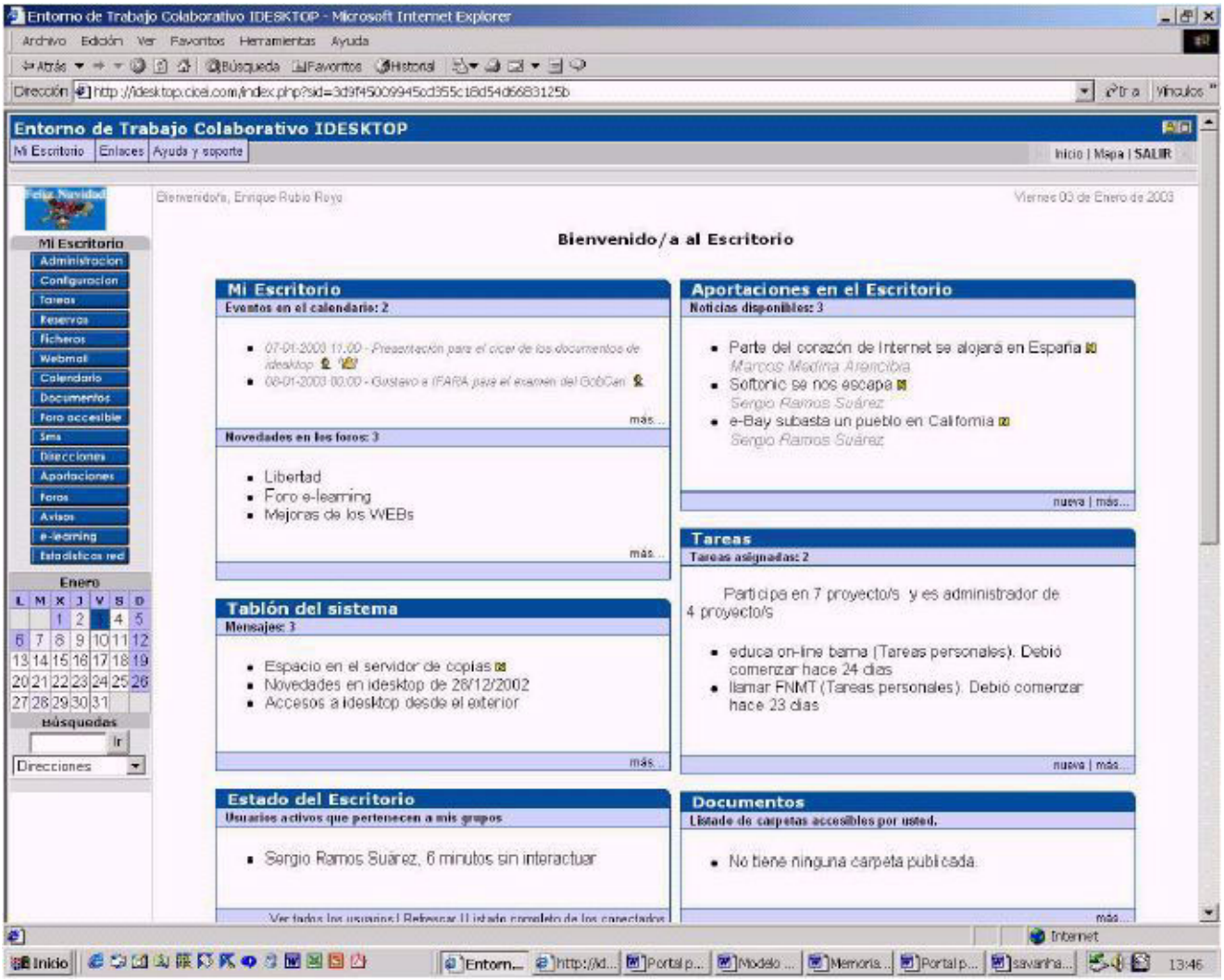

Figure 2: IDESKTOP Interface.

9 A practical Case: the Collaborative Work Desktop IDESKTOP

IDESKTOP is a Web based collaborative work environment which supports the communication, collaboration, innovation and productivity of work groups in a secure way, regardless of the physical location of its members. It is intended for collaborative work in organizations of any size, work teams and virtual communities, and uses Internet technologies. Its interface is shown below in Figure 2.

The collaborative desktop achieves its aims by means of collaboration, communication, productivity and e-Learning tools.

- **Collaboration:** collaborative work is the basic strategy for the creation and distribution of knowledge in the community and is supported by such tools as the collaborative calendar, distributed diary, directories, resource booking, polling for quick consultations, meeting management, unattended full-text searches, etc.
- **Communication:** communication between community users and outside world users is provided by applications such as alerts, instant messaging, member contributions, discussion forums, internal chat, e-mail, diary.
- **Productivity:** the management of documents, projects and tasks, and workflow are among the options provided to create the right space in which to improve individual and collective production.
- **e-Learning:** a system of external links to portals and offers of training (on several different platforms) integrates a traditional range of online training at a corporate level.

The different configurations and accesses within the environment are based on user and group profiles, with the aim of providing total flexibility when sharing information.

IDESKTOP is totally programmed in PHP v4 as a web server module, using an object oriented design throughout, which will facilitate the future integration of information from external resources. The programmed classes shield the system from the platform they reside in (Unix, Linux, Windows, Solaris, etc.) and from the database system used (Oracle 8i, MSSQL, mSQL, MySQL, Sybase, etc.). The development platform is based on Linux 2.4.3, Apache 1.3.19, PHP 4.0.6 and Oracle 8.1.7 systems. All information is processed in XML (eXtensible Markup Language) format, although at the moment everything goes through a parser to convert it to HTML (Hyper Text Markup Language) due to the poor support provided by current browsers to DTD (Document Type Definition), XML and XSL (eXtensible Stylesheet Language).

One of the most important aspects of our development is the security of accesses and contents. To this end we have defined several levels of security covering different fields. From a logical point of view we have chosen a session based explicit security model in which each user only sees the modules he or she has access to. Although a user may force access to an unpermitted module, the system will check internally whether such access is allowed for that particular user or group profile.

At the request of the administrator, any user may be required to make use of a *digital certificate* to sign in and register accesses to the system by means of a double client/server certification. Although the system can be configured to use any kind of certificate, it is currently working with the certificate issued by the Fábrica Nacional de Moneda y Timbre (the National Mint of Spain). If desired the system can issue its own certificate (in our case, CICEI's).

To send sensitive information over the Internet some modules make use of SSL technology to encrypt contents. Absolutely all processes requested are recorded by the system, with all the information necessary to enable processes and accesses to be audited.

Translation by Steve Turpin

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