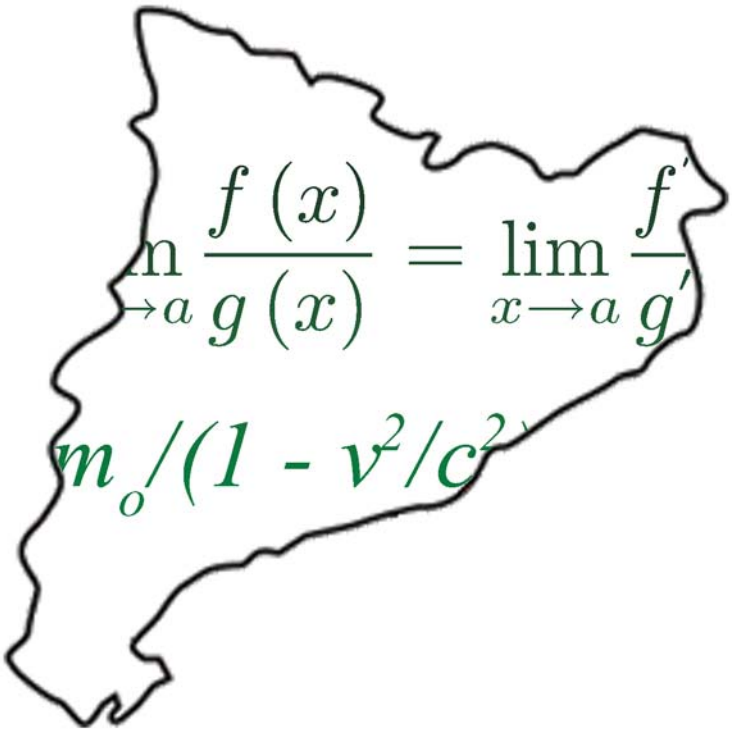
PROJECT INTERNET CATALONIA (PIC)

INTERNET AND THE CATALAN UNIVERSITIES NETWORK

Research report (synthesis document)



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Summary

Preliminary

Internet and the Catalan universities network

Description of the research

The development of Information and Communication Technologies (ICT) during the last 40 years of the 20th Century and their incorporation in different areas of human activity has led us to consider, at the beginning of the 21st Century, what profound changes have accompanied this event and what consequences do they bring, at least in the short term. The focus of this project is the analysis of the processes of change in university academic life in the Catalan context, their relationship with the current reality and the repercussions that these processes have on society in general.

More specifically, in the first place the objective is to explore the incorporation of Catalan universities in Internet from a global perspective, and secondly, analyse the process of change that this event has on training and research at the Universitat Rovira i Virgili (URV). This report presents the results of three specific studies, each with its own objectives, methodology and discussion: Configuration of the Catalan university network: physical connection and shared projects; Presence of Catalan universities in Internet; and Case study: the URV.

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Chapter 1

Presentation of the report

In this document we present a summary of the report of the Project Internet Catalonia (PIC) on the incorporation and use of Internet in Catalan universities. This research is made up of three studies conducted independently, with distinct objectives, methodology and discussion: *Configuration of the Catalan universities network: physical connection and shared projects, Presence of Catalan universities in Internet* and a *Case study: the URV.* On reading this text it should be noted that it is a summary that includes an introduction to the research conducted, a brief description of the first studies and their conclusions, and finally, a more detailed presentation of the case study on the Universitat Rovira i Virgili. At the end of the document we have included the references cited in the summary, recommending that those readers with a specific interest in any section consult the original report (http://www.uoc.edu/in3/pic/cat/pic6.html).

Chapter 2

Introduction

The development of Information and Communication Technologies (ICT) during the last 40 years of the 20th Century and their incorporation in different areas of our activity has led us to consider, at the beginning of the 21st Century, what profound changes have accompanied this event and what consequences do they bring, at least in the short term. In fact, analysing the spread and use of these technologies is a good way to understand the changes that today's society, and in particular Catalan society, are undergoing in all aspects of everyday life. In the same way, we aim to analyse the processes of change in university academic life in the Catalan context, their relationship with the current reality and the repercussions that these processes have on society in general, through the use of online tools.

2.1. Conceptual framework

The information and communication technologies, developed during the second half of last century and submitted to a process of constant improvement, have found their way into every area of human activity: they have led to the creation of a new economy, a new system for the media, a new management style both in companies and public services, a new culture and, in an incipient way, the emergence of new modes of operation of the political system, states and administrations (Castells, 2003). In particular, the world of education, a pillar of our society, is immersed in an authentic torrent of novelties, changes and uncertainties.

The new training-professional requirements and the progressive democratisation of teaching, with a considerable reduction in costs, are two socio-economic factors that have a decisive role in the changes in occurring in the educational sector. These factors are driving, in particular, the development of new forms of teaching-learning and a in-depth reflection about distance learning and education in general (Barberà et al., 2001). In the European context, the first factor becomes critical in the current structure of tertiary training. This context is characterised by “the emergence of new types of labour relations, new ways of working, new positions of employment and new workers” (Castells 2000: 51). Specifically, according to Castells, the model of stable salaried work and a clear career path has been placed in doubt and a new model has developed characterised by the circulation of workers through different occupations and modes of collaboration – freelance work, consulting, sub-contracting, part-time work, etc. – in different periods of one’s professional life. Faced with this panorama, tertiary education institutions must meet the challenge of offering professionals specific in-depth training but also with sufficiently broad training and a combination of new skills that enable them to manage this constant change. Moreover, they have seen the opportunity to offer training to people who already have an active professional life, that is, to offer training non-degree courses that responds to the needs of any person at any moment in their life. It is clear that there is a general need, both from the university as well as companies and society, for exchange that must be driven in some way. However, how should this dialogue be established? How can the demand of the Knowledge Society be defined? Who will take responsibility?

In our environment, in Catalonia, we understand that the contact and relationship between university and society occurs at different levels. On the one hand, academic

staff are conscious that the student will be required to have certain skills when they enter the labour market so consequently they adapt objectives, contents and methodology; the departments propose activities co-ordinated with specific companies and, in turn, some companies seek to carry out development projects jointly. On the other hand, the policies established by the Administration are fundamental, particularly those of the Department of Universities, Research and Information Society that consider it necessary to legislate various matters:

a) the existence of a body in the university that facilitates relationships between the university and external parties – society and the administration – (social council) that allow, in some way, the society to participate in the definition of criteria and priorities of the institution's strategy

b) the basis for the provision of services or research between the university and the company that covers direct or indirect compensation for its task

c) encouraging the entrepreneurial spirit of students by promoting the creation of companies with participation of academic staff.

Therefore, it is responsibility of the university, the administration and the social agents to ensure that somehow the creation and transfer of knowledge is guaranteed; in short, that the new requirements of society today are met.

In this context, the need to learn, to learn many things in a short space of time, has obliged both academics and business people to reflect on education, teaching, training and learning. In parallel, the need to cover training requirements, especially for companies, has led to the birth of a new training market and the increasing use of different concepts such as distance learning, virtual training or e-learning to speak of different ways of providing training using ICTs. There are different approximations for each of these concepts that present differences in one sense or another depending on where they originate. For example, the Western Cooperative for Educational Telecommunications gives a succinct definition of distance learning that has existed for 200 years in the United States: "Distance education is instruction that occurs when the instructor and student are separated by distance or time, or both". In contrast, Michael Moore (1996), director of The American Center for the Study of Distance Education, at Penn State, states that "Distance education is planned learning that normally occurs in different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic

and other technology, as well as special organizational and administrative arrangements". In a broad sense virtual training, which is also known as Internet based training or online training, is understood to be the method of non-presential or semi-presential distance learning that uses a specific methodology based on ICTs. More recently the term e-learning has been introduced, which, in principle, refers to the use of technology for learning and currently is used in different contexts for various purposes. Marc J. Rosenberg (2001) defines it as the use of technologies based in Internet to provide a wide range of solutions that enable both knowledge as well as skills and abilities to be acquired; according to this author, it is based on three main criteria: a) it happens in a network, b) it is transmitted to the user or end user by a computer using Internet standards and c) it uses innovative strategies for training.

In summary, the three key elements that shape the current educational reality – increasing use of ICTs, new needs and new training market – determine the new context for learning and the new directives for training students. In this framework non-traditional models of education that had previously attracted little attention, have been recovered and reconsidered. According to Wedemeyer (1981) this type of learning has always worked and it was not until the application of compulsory schooling legislation that concepts such as “extension” or “extramural education” began to emerge in an attempt to establish a clear division between the two models. Although non-traditional learning is not new, according to this author, aspects such as the use of new modes of communication have merited reconsideration. Thus, the elimination of certain restrictions of time and space, for example, through the widespread use of telephone and radio or the reduction of reproduction costs have favoured the development of new teaching and learning methods (Wedemeyer 1981: 25). In some cases, these methods have been incorporated in the traditional learning institutions and in others they have been established in proposals presented in the context of continuing education. We underline, therefore, that the existing teaching and learning models are currently being questioned and redefined and there is a certain agreement on some basic characteristics, irrespective of the educational mode where they are applied. The student is found at the centre of the process and technological resources play a fundamental role, both because they give the student access to a series of resources that will facilitate the learning process and because they favour the role of the teacher as facilitator in this process.

We now switch our attention to the current situation in university institutions. Flores (2002: 15) states that "The introduction of information and communication technologies (ICT) in the University, although more slowly than other sectors of society, see the

disappearance of restrictions of time and space in the educational field, the adoption of a more student centred learning model, and a new model of organisational management". Thus, in university life, the increasing use of information and communication technologies, and specifically, Internet, has been accompanied by transformations in various aspects: from administrative management to the creation of knowledge, including subject curriculum, teaching strategies and the way in which the main agents involved communicate. In-depth analysis of these transformations cannot be done without having an overall vision of the situation, if the framework in which they occur is not previously established. We have to be able to respond to a series of questions: why has Internet been introduced in universities, how, and for what purpose? what factors have guided its introduction, who has been the real promoter, who has provided the resources to make it possible? how have universities faced the challenge of its introduction and how universities have used Internet for distinct ends.

Catalan universities, like others, proposed the incorporation of information technologies in different areas at the end of the 20th Century. But what really were the reasons that led many tertiary institutions to use information technologies in teaching? A.W. Bates (2001) raises several reasons, which are basically: a) improve the quality of learning, b) provide students with the normal computing skills that they will need in work and life, c) broaden access to education and training, d) respond to the technological imperative[1] e) reduce teaching costs and f) improve the relationship between costs and effectiveness of teaching. There is another question that must also be highlighted: the introduction of ICTs and, in particular Internet, is now generally considered as an indicator of quality so it plays an important role when establishing rankings between universities, when competing directly against the others (de Miguel, Caïs et al. 2001). Specifically, aspects such as the resources made available to students, the real use of technology in classes, the existence of student websites and online newspapers, the number of students per computer and the estimated waiting time to use them are criteria that allow an evaluation to be made. Clearly the relevance and emphasis on each of the factors noted by Bates will depend on the people and the responsibilities that they have. The conditions of each university's environment are no less important in determining their priorities and in drafting strategic plans, as well as their implementation in different areas, the impact on the people involved, how they are received, assimilated and the response.

Effectively, each institution has incorporated ICTs in the key functions – teaching, research, socialisation and social commitment – in different ways: from the introduction of

1 A.W. Bates (2001) uses this term to refer to the attitude that leads some people to use technology through their own blind faith as otherwise, they will be considered to be behind the times and they may lose credibility.

virtual elements in different processes, to the creation of a virtual branch of the university or the complete virtualisation of the entire organisation. It is important to note that each institution has initiated this process from a particular starting point and multiple factors have influenced its development: strategy of the management team, infrastructures and resources, social environment and relationship with territory, profile of agents involved and tradition. In this study we have analysed the reality of one particular university that is the result of all these factors.

In short, these technologies, viewed as a means that facilitates communication and access to information, oblige academic staff, and people related to the world of education in general, to rethink their strategies and actions: from the strategic plans of the management teams to the teaching activity of the academic staff, including the processes of managing administrative personnel. When analysing these transformations, it is important to take into account the processes (conceptualisation, design and implementation) and the areas they affect (political, teaching and administrative).

As we have commented above, these transformations directly affect all people that play one role or another in the university activity: students, academic staff, administration and service personnel. Currently, people attending university do so to obtain a qualification that enables them to enter the labour market or to train in a professional area where they already have experience. In the two cases, they have an increasingly greater knowledge of ICTs and ability to use them and high expectations. In fact, it is important to take into account that during this process the basis has been created for a pedagogic model centred on the student, who learns, to the detriment of the classic models where the source of knowledge is the teacher, who teaches. Irrespective of the model, the role of the teacher is fundamental and, therefore, any change that occurs especially in teaching and research activities depends completely on the support that they give. As A.W. Bates (2001) assures, chancellors can dream great visions for the future, vice chancellors can draft plans, and deans and heads of departments can try to implement them, but without the support of the academic staff nothing will change. The academic staff, according to Bates (2001), will only change if they can see the benefits of change and disadvantages of not changing; thus, any strategy to implement the use of technology for teaching and learning must take into account the dominant culture of the university and especially the faculty.

On this point it is critical to consider the priorities that influence the behaviour of the academic staff. Although the teaching activity has traditionally being of primary

importance, nowadays research is much more widely recognised, representing a basic criteria for recognition, prestige and promotion amongst staff; combining both activities with the same effort and dedication is practically impossible, even more so during a period of change and fundamental change in all aspects of academic life. The study "The Campus Computing Project"[2] shows that there is a great contradiction in the policies to implement ICTs and e-learning in universities. On the one hand strategies are proposed that endeavour to promote the use of ICTs in the training process, but on the other hand, these types of activities are practically not considered when evaluating the curriculum of academic staff for their promotion, for example. In contrast, promotions are based almost exclusively on research activity. In this context, what is the motivation to incorporate technology in the teaching activity? It is clear that the use of technology in teaching and learning must be accompanied by some significant changes in the training systems and incentives for academic staff (Bates, 2001) as otherwise the process of transformation in the teaching activity will not become a reality at the core of the university. The introduction of online tools in teaching practice and the innovation of teaching-learning processes in the classrooms are not independent of the policies for the academic staff defined by the university, as these are what largely establish the priorities and behaviour of the academic staff.

The issue of the introduction of ICTs and, in particular, Internet in universities can be approached from many points of view: social, economic, administrative and pedagogic. In this study we have chosen to analyse two basic functions of the university institutions, training and research, undertaking a fairly generic approach that allows different specific aspects to be analysed from more specific perspectives. Firstly, we have explored the area that we propose to study, the Catalan university system, and the general changes that it has experienced with the introduction of Internet. Secondly, we have analysed how these transformations occur in the training and research processes of the Universitat Rovira i Virgili (URV).

2 "Begun in 1990, the Campus Computing Project focuses on the use of information technology in higher education. The project's national studies draw on qualitative and quantitative data to help inform faculty, campus administrators, and others interested in the use of information technology in American colleges and universities. The annual Campus Computing Survey is the largest continuing study of the role of information technology in US higher education. Each year more than 600 two-and four-year public and private colleges and universities participate in this survey, which focuses on campus planning and policy affecting the role of information technology in teaching, learning, and scholarship." http://www.campuscomputing.net/.

2.2. Focus of study: the Catalan universities

In this work we analyse the incorporation of the Catalan universities in Internet. Accordingly, we will first describe the institutions that we have covered and their characteristics.

Catalonia currently has 11 universities. The public universities are the Universitat Autònoma de Barcelona (UAB), the Universitat de Barcelona (UB), the Universitat de Girona (UdG), the Universitat Politècnica de Catalunya (UPC), the Universitat Pompeu Fabra (UPF), the Universitat Rovira i Virgili (URV), the Universitat de Lleida (UdL) and finally the Universitat Oberta de Catalunya (UOC) which despite having a private juridical structure is considered public with respect to the nature of financing and structure of student fees. The private universities are the Universitat Internacional de Catalunya (UIC), the Universitat Ramon Llull (URL) and the Universitat de Vic (UV) which is privately owned, although its legal structure allows it to combine a private initiative and management with public financing and control. Of these 11 universities, the UB, UAB and UPC are the oldest. The UB was founded in 1430, the UAB in 1968 and the UPC in 1971. These three universities, together with the UPF, represent the public universities in the metropolitan area of Barcelona.

Outside of the metropolitan area of Barcelona there are four universities: UdG, UdL, URV and UV; the first three are public universities that were created in 1991. The UdG has its centres in Girona but also has registered centres in Barcelona and Sant Feliu de Guíxols. The UdL has its centres in the cities of Lleida, Manresa, La Seu d'Urgell and Cervera. The centres of the URV are located in Tarragona, Reus, Tortosa, Vendrell and Salou. This university was created on 30 December 1991 by the Parliament of Catalonia under a law that, rather than establish the creation of a new university, integrated and gave an separate and unique identity to all the existing university centres in the province of Tarragona, which up to that point depended on the Universitat de Barcelona. The last university outside of the metropolitan area is the UV, which is privately owned and recognised by the Parliament of Catalonia in 1997. In private education and within the metropolitan area of Barcelona is the UIC, also created in 1997. Lastly there is the UOC, a university with a private legal structure and public financing that commenced its academic activity in 1995 with the objective of providing its own tertiary distance learning programme in Catalonia, which offers all its training online.

Currently Catalonia has 11 universities serving nearly 225,000 students in the 2001-2002 academic year. Having presented the institutions that make up the Catalan university system, we will briefly detail the governing bodies that regulate them.

The Catalan university system depends on the Department of Universities, Research and the Information Society of the Autonomous Government of Catalonia (Generalitat de Catalunya). This means that the Autonomous Government of Catalonia exercises control over education at all levels, independently of the central government. The General Management of Universities is the governing body responsible for preparing, proposing, monitoring and implementing the university programme of Catalonia, the creation of new public universities and the recognition of private universities. They also propose the regulations, programme, initiation of new studies, collaboration agreements and subsidies related to universities and carry out promotional activities in the sector. With respect to financial matters, they prepare, plan, propose, implement and monitor university budgets financed by public funds. Lastly, they make programme contracts with the public universities to improve quality; in addition, they watch to see that objectives for improvement in academic performance, research productivity and the use of information communication technologies (ICT) are achieved in the universities.

In the following chapters we present a summary of the three studies conducted, entering into more detail on the case study.

Chapter 3

Configuration of Catalan universities network: physical connection and shared projects

3.1. Presentation of the study and objectives

To observe and analyse the transformations that are occurring, in one form or another, in the universities of Catalonia it is important to first examine the framework, the nature of the current situation in the universities and how to characterise it. We start with the existence of various university institutions, created at different times and with varying philosophies, located in different places across the territory that, traditionally, have been formally related at an institutional level and through interpersonal relationships, for specific questions particularly in the field of research. With the introduction of Internet, how are these relations established? Can we speak of a network of connected universities? If we can, can we speak of a network of scientific institutions that share interests, objectives and projects?

This work was conducted in autumn 2002, considering the process of Catalan universities incorporating in Internet both from a physical perspective, through the scientific Ring, and a political perspective, through projects promoted by the administrations and companies, or through the collaboration between universities. In the first section we will look at the physical structure of communications; more specifically, the work of CESCA and RedIRIS in the launch, maintenance and updating of the required infrastructure for the existing connections in universities and research centres. In the second section we deal with the collaboration projects between institutions at a political level, that is, considering each of the initiatives that we have considered relevant in the context of university collaboration for the incorporation in Internet: the Consortium of University Libraries of Catalonia, the network Catalonia project where it specifically involves universities: the Digital University project, I2CAT and other initiatives carried out at individual universities.

Our final objective is to analyse the role that Internet has had in the configuration of the current Catalan university network.

This report has been prepared using various sources of documentation – web pages, annual reports and some reports presented by some of the people involved – and in-depth interviews with people who, through their position or work, have carried out a significant task in the initiatives analysed.

3.2. Conclusions

In this study we have presented the real impact that Internet has had on the current configuration of relationships between universities.

As we have shown, the incorporation of Internet in the world of the university has gone beyond the first phase of establishing the necessary physical connections. In Catalonia this need has been driven by a consortium that brings together all the universities and other parties with a common objective: the establishment, maintenance and improvement of the physical infrastructure to connect, the scientific Ring.

Prior to the existence of a physical connection there were collaboration projects between distinct institutions already underway based on of a common need. This is the case of the libraries, for example, through the preparation of a unified catalogue for all the universities. The existence of the network has changed many procedures and facilitated the coordination of teamwork. In this respect, the universities have seen the advantages of collaboration and thanks to the connection they have reorganised themselves in a network to meet the challenge.

There is another angle that we wish to highlight, which is the fact that Internet is currently viewed as a tool of progress. In line with this view, the autonomous Catalan administration has begun to promote projects with the objective of initiating or promoting the use of Internet in the university. In this sense, we highlight the case of the Digital University project and, in particular, the Intercampus initiative for sharing virtual non-core subjects. Initially these projects are also based on the organisation in network and strengthen collaboration between universities. The organisation in network, therefore, has also been promoted by the administrations.

The existence of shared projects requires a fair amount of willingness to collaborate on behalf of the universities and represent a good way of starting a new type of organisation distinct from the traditional model. To what extent will the autonomy, vision and values of the universities condition this type of organisation? What role will the administrations and society in general have in the evolution of the entire system? What relationship exists between this global dynamic and the day-to-day evolution of each of the universities?

To respond to these questions it is necessary to carry out an in-depth study of each university. Only with this perspective can we understand the importance of these projects and the real impact of the network organisation.

Chapter 4

Presence of Catalan universities in Internet

4.1. Presentation of the study and objectives

In the context of this new inter-university fabric, having identified the institutions and certain connections between them, it is interesting to see how they use Internet to present themselves to the world through their website. Websites are really an enormously powerful communications channel, easily updated, allowing a large number of people to receive a rapid response to specific questions, especially about organisations, services and specific products from anywhere in the world. All the Catalan universities have developed an information system that facilitates communication both with existing internal and external users, as well as future potential users. In this way, it becomes a key publicity tool: not only is it a good instrument to publicise its services, but it also provides a specific image, reflecting the university's vision and values. Evidently, the way the university presents itself in the web may be a key factor in the institutional message and, therefore, in attracting students. On this point, it is important to note that the use of ICTs and Internet is increasingly considered an element of quality and therefore it is a relevant factor when determining the level of excellence of each university.

In the course of this study the websites of the 11 Catalan universities have been analysed, organising the information collected according to criteria detailed in the original research report.

4.2. Conclusions

Working from the approach put forward by Middleton, Mc Connell and Davidson (1999), we have carried out an analysis of the design, ease of navigation, contents and interactivity of the websites of the Catalan universities to see what their pages offer and the use they have made of Internet, its purpose and the audience.

To begin with we analysed the communication capacity offered by the websites and found that the majority of the web pages of the Catalan universities are basically informative. Interactivity is only usually present in a limited way (the majority of pages contain between 0 and 2 interactive elements) and are usually focused on a search tool or, to a lesser extent, on the possibility of contacting the university by e-mail or using online forms. The possibility for users to communicate amongst themselves openly is rarely offered in chat rooms.

Secondly, we have analysed the services offered and the administrative procedures that can be realised through the website. We found that all the universities provide their students with an e-mail address and the possibility of consulting their e-mail in a space where access is restricted. Two areas that are also found in all the universities are those that include virtual teaching services and the library. We have verified that these services occupy specific areas in the websites where the information is predominantly informative, being spaces with restricted access that usually have a large number of interactive elements in contrast to the general lack of these features in the other pages. To a lesser extent, almost as an anecdote, some universities offer specific options in the administration area such as the possibility of registering and enrolling in some online courses, or the possibility of subscribing to a list to receive news about the university. In general, however, few procedures can be done online. These results coincide with the conclusions reached by Kenneth C. Green in this respect that North American universities have only incorporated the simplest applications that involve few technical complications (Green, 2000).

As noted above, we can also view the university websites as a means of providing information about the institution, as a channel to promote its activity. In general we have seen that the university websites tend to highlight information likely to interest the greatest number of people. The first level pages usually contain information for external users that may be potential internal users, namely, those people interested in what the

university is offering, the course content or enrolment dates. Specific information for internal users is located in designated areas within the website that are less visible at first glance.

But beyond the information that the university offers through its website we are interested in seeing how it is offered. We consider that the way in which the information is presented on the website may give us many clues about the university's underlying objectives.

We have found differences between how the universities present information based on their size: the larger universities usually present more sections and options on the home page. An initial reflection would lead us to suggest that this difference is directly related to the very size of the university, but a more detailed analysis tells us that the strategy of the university to address its potential public is also a factor. The decision to present all the subject headings in the same index means there is less dispersion, making it easier for the user looking for general information about the university, as opposed to a user who is looking for a specific service. In contrast, the option of presenting different blocks of information might lead to greater dispersion but makes it easier to find specific information. Hence, this is a website aimed at a more specialised user profile.

The coherence in the format within each university's website is another area examined in our study that provides us with information about the university's underlying aims for the site. Some universities have a base design and the content is adapted in the majority of pages; whilst this option facilitates navigation it may cause confusion between pages that are quite different. In contrast, other universities show a greater variety of formats. From the perspective of user-friendliness this is not so positive (Nielsen, 2000) but it does indicate less centralisation in the institution in the preparation of the site and greater freedom for each of the areas to create their own space in the website. This difference allows us to distinguish between universities where the website is considered as a tool that serves the institution to provide information about itself, and others where the website is understood to be a service that the university provides to those groups and people of which it is comprised. In other words, a more centralised style versus a more permissive style.

Chapter 5

Case study: the URV

5.1. Presentation of the study and objectives

Finally, we have centred our attention on one of the universities, the URV, to see how Internet has been introduced and used. We propose to study the penetration and use of Internet at the university taking into consideration and relating the various agents involved, the different styles and intensities of use. It is a study that aims to explain the relationships and processes of change, identifying the relevant factors that strengthen or moderate them.

The URV was chosen for the case study for various reasons: it is a relatively small university, young – founded in 1991 – and very active in incorporating ICTs in various areas. In fact, together with the Universitat Jaume I of Castelló, it is a pioneer in many initiatives related one way or another with the use of these technologies and one of the people that has been very closely involved is Mercè Gisbert, current vice-chancellor of Teaching and New Technologies. The fact that from the very start, on explaining the project, they expressed their interest and a strong willingness to collaborate, as well as their ability to put together a team of people fairly rapidly that we could work with on the various subjects proposed, allowed the study to go ahead without too many difficulties.

One of the challenges at the beginning of this case study, in autumn 2002, was to establish how we would observe and analyse everyday life at the university. In other words, we had to decide how we wanted to explore this area. Whilst it was possible to physically visit the university, it was also possible to work through the organisational chart – governing bodies, centres and departments – or their structure and workings. In the end we opted to choose two processes that responded to two key functions of the university: teaching and research, within the structure of the institution being studied, which covered certain relations in this environment. Through these two processes we identified aspects to analyse in depth: actors and transformations in its activity.

The main objective of this research is to study the penetration and use of Internet in the training and research processes in the university. Specifically, we propose to:

- Identify the methods of introducing Internet into the university and the factors involved in its consolidation.
- Determine if the incorporation of Internet has had a fundamental bearing on the transformation of the structure and organisation of some areas of the university.

- Check whether the introduction of Internet has been accompanied by changes in the roles and responsibilities of the people involved: academic staff, students, management and administrative staff.
- Determine the mechanisms of communication and intensity between different actors.
- List the types of uses for Internet and the different intensity of use in specific actions of the training and research processes of the university.
- Conceptualise the styles of Internet usage by the various agents involved.
- Identify the factors that impulse or moderate each of the styles and intensities of usage.

Thus, we propose to study the incorporation and use of Internet in the university that takes into consideration and relates the various people involved, as well as the various styles and intensities of usage, which may explain the directions of the relationships and processes of change, identifying the relevant factors involved.

5.2. Research methodology

As explained above, we have carried out our research on the processes of training and research; the characterisation of these processes has enabled us to define the aspects that we want to research, as well identify the people involved, their roles and the relationships that are established between them. Having fixed the work objectives, we have established the most appropriate methodology in our judgement to achieve them, bearing in mind the limitations of time and resources.

This research has been conducted under a collaboration agreement between the URV and the UOC that establishes the conditions, characteristics and procedures for coordination between the two institutions. Given that it is impossible to conduct an extensive study on how these processes emerge in all the faculties and schools, we have decided to choose three degrees that have, in principle, different levels of incorporation and use of online tools and, therefore, might display the distinct realities that exist. We have made this selection in discussion with the vice-chancellor of Teaching and New Technologies who put forward three representative centres that allow us to compare different styles of use within the same university.

The choice of each of these three courses provides us with:

- A specific group of students that are enrolled.
- A specific team of staff that teach particular subjects.
- A certain number of departments that provide academic staff for the subjects of this degree (which gives us certain infrastructures, services and PAS).
- A faculty or school that offers the course (which gives us certain equipment, infrastructures, dean's team, services, PAS and library service).

We have also studied those general services that make it possible or provide support to the training-research process, even though they are located outside the specific faculty or school, such as the Computing Service or the Academic Administration and Student Service.

Based on a detailed proposal of actions to be carried out, the vice-chancellor identified people to interview and provide documentation, putting us in contact with them. The interests, concerns and needs of those who have participated have led to the creation of a specific work team, whose members have kept in contact at all times.

Having identified the centres to be studied, we started the fieldwork by identifying the elements to analyse in the first instance and the people who could provide us with an initial overview, given their role or viewpoint. We then conducted a series of interviews, created various discussion groups and analysed documentation from different sources. It should be emphasised that our analysis is not the result of a process that was strictly planned from the beginning. Instead it was developed as our entrance and position in the different centres was understood.

Both the objectives of this project and the methodology reflect the characteristics of the area under study (Catalan universities), the resource limitations (a two-person team) and the calendar initially established (one year to carry out the work). Given these restrictions, we adjusted the initial expectations to conduct a more specific analysis that would enable us to begin to understand the phenomenon and identify some significant characteristics. Consequently, this study should not be seen as a thorough analysis, but more as an initial assessment of the process of the implementation of Internet in the university. We think that it would be very interesting to research in more depth certain aspects that we only explored superficially; we refer to a detailed analysis of the use of online tools in teaching and their profitability, for example, or the transformations that are occurring if we look at the university as a space of communication and social criticism.

Prior to commencing an in-depth analysis of the training and research processes, we looked at when and how ICTs were implemented at the university and how this process occurred in each of the faculties studied.

5.3. Analysis of the training process

5.3.1. Description of the training process

One of the processes that naturally characterises a university institution is training. This process, which must be considered in a specific geographic, social and economic context, produces year after year a group of people with a specific qualification that are either prepared to enter the labour market or are reabsorbed within the institution. Along with research, this process is critical in the university's relationship with the world. According to a study commissioned by the European Commission and carried out by an expert team under the direction of Maurice Godelier, the university system is increasingly aware of the demands of the market for training and takes the initiative, not just for economic reasons (increasing competition for finance and for students) but also ideologically (legitimacy of the system as viewed by society). This reaction affects the university programmes in terms of curriculum, teaching methods, access policies and the relationship with external partners.

In order to analyse the role that ICTs are acquiring, and in particular Internet, on the educational axis of the university, we have considered the training process in a broad sense, from the student's perspective: from when they are informed about the courses available through to obtaining the qualification.

Whilst the periods of prior information and enrolment are very important, as is obtaining the qualification, the main period corresponds to teaching, that is, when the process of teaching and learning in the specific course work takes place. Once the student has enrolled in a subject, we know the start and end dates, the examination date, the names of the academic staff, a subject index and in some cases the objectives, methodology and bibliography. In fact, from the first day of the course, the teacher who previously designed the subject is there to lead the students, and to subsequently evaluate them. The teacher must also ensure that some pedagogic decisions are compatible with certain aspects agreed by all the academic staff – admission criteria, examination processes, resources available to him. Another very important factor to take into consideration is the support that the lecturer receives from the institution for their teaching work: assistants, training, library services and technological infrastructure.

The student is the protagonist in this process and the one, in one form or another, who enters into contact with the institution, deciding to seek a qualification and every semester enrolling and completing a series of subjects. After obtaining the credits required in the study plan, the student is awarded the qualification and becomes part of the group of ex-students, being prepared to enter into the workforce.

A number of people are involved in this process that come from an area, service or department within the university and have certain well defined functions.

5.3.2. Management of the training

To begin analysing the training process just presented in detail, we will focus on studying how ICTs and specifically the Internet have been introduced into administration activities.

For this analysis it was necessary to conduct a series of interviews with personnel of the Academic Administration and Student Service and secretaries of the centre. We also conducted interviews with a group of students so that they could speak to us about administrative matters. In parallel, we collected documentation on the services studied. Finally, we sent a questionnaire to people involved to obtain information on certain specific matters.

Organisational change in the Academic Administration and Student Service

In July 2002 the former Academic Administration Service was restructured. The name of the service was changed to Academic Administration and Student Service (hereinafter SGAE), with the name indicating part of the change that occurred. In fact it involved integrating two previously separate sections in the same service, namely academic administration and student service, which was previously part of another service. This change came from the current chancellor's council with the aim of bringing together all themes related to students in one management unit; in this sense, we can refer to it as a change from functional management to management by processes.

Currently the SGAE handles all administrative issues that affect students throughout the length of their training, from when they are still at secondary school, during their stay at

university, until they leave having completed their studies and obtained the qualification and after that as an ex-student. Currently the SGAE is organised in four sections – Students Section, Registration Section for Undergraduate and Graduate Studies, Section for Educational Planning and Enrolment Income and, lastly, PhD and Qualifications Section – reporting directly to Management. The various secretaries of the centre also report directly to Management and they act as the main point of contact with students.

The unification of all aspects of administration affecting students in the SGAE represents a significant organisational change, not just limited to the grouping of all administrative issues in a single area but also accompanied by other changes such as the revaluation of student support, for example: the decision to dedicate a specific section within the management service and increase the position category for the people running it are clear indicators of this. Thus, this restructuring is a display of a model that considers the student as a person who evolves within the university, who acquires a record and has an important role beyond that of merely a user of specific services.

A second example of this new view of students, from the chancellor's team, is the position of "Chancellor's Delegate for students", which did not exist previously and is responsible for watching over all those aspects not strictly related to the teaching of university entrance students. In fact, the creation of this figure arose out of restructuring the existing vice-chancellor positions and their responsibilities. With respect to our interests in this study, it should be noted that up until 5 June 2002 there was a vice-chancellorship for Students and Teaching, which was responsible for undergraduate and graduate teaching, postgraduate teaching, the library, students and URV Solidarity (URV 2001: 24). To a certain extent this framework considered students from an educational perspective. With the new order that emerged with the creation a new chancellor's council, the area of teaching was combined with new technologies under the vice-chancellor of Teaching and New Technologies. The students, who had been separated from the former vice-chancellor, now receive the specific attention of the Chancellor's Delegate for students.

The changes that we have just presented provide evidence of a new approach with the student administration and student service being combined and gaining greater weight within the institution. This also occurs with the students, who acquire greater protagonism and a more active role. Given the importance of these processes and the changes that we have indicated, we believe it is important to study the changes occurring in the management tasks directly related to the training process.

We will centre our attention specifically on two of the aspects that we have raised: firstly, the unification of all management issues related to students, and secondly, the revaluation of student support. To accomplish unification it was necessary to have a constant exchange and transfer of information between various sections and to achieve the revaluation of student support it was necessary to move towards self-service of students and greater transparency in administrative processes.

Use of computer applications: greater transfer of information between sections and units

As we have noted, the current management team at the URV has opted to unify all administrative themes that arise during the long training process of the student, which is portrayed in the organisational chart through the integration of the students' section as another section within the academic administration service. However, beyond this change at the level of the organisational chart and some other restructuring, the real objective of unification and the changeover from functional management to process management cannot be achieved without the constant exchange and transfer of information and constant communication between the various units and sections involved.

Everything seems to indicate that if the management team can now push this unification it is because certain previous changes in the administrative processes had already facilitated greater communication between sections and services. If we want to explain how the administrative processes were automated in the URV we have to go back to when the university first began and even beyond that. Before the URV was established as a university it incorporated the GIGA as a tool for automating certain academic administrative processes. In fact, it was precisely in Tarragona, which at that time was division VII of the UB, where the pilot project for this software was conducted. When the URV was established as a university and began its own academic activity, in the 1992-1993 academic year, it inherited the academic administration system that it had used as a division of the UB. Some years later, around 1999, the need to include new features that weren't provided by GIGA led to the decision to buy new software.

One of the features sought when purchasing this new application was the possibility of having a fully integrated package that not only allowed various academic administrative processes to be automated, but also enabled information to be easily transferred between them. This was a demand that, at that time, all universities that had

computerised a large part of their administrative processes began to contemplate, requiring the easy transfer of information and integration of processes. Nevertheless, these were demands that the software was just beginning to meet. In the end the URV decided to buy online software form the company OCU (Oficina de Cooperación Universitaria) even though it had not fully developed the possibility of integration that the URV wanted; this led to different administrative processes being automated at distinct rhythms.

In our study we have verified the relevance that the use of certain computer software can have in the way administrative processes are conducted. To begin with, the use of this computer software enables information to be easily transferred between sections and units, that is, it allows information gathered in one section and processed in another to be consulted from any other section, avoiding duplication. This allows greater integration between areas, given that it provides greater standardisation in the processes and allows more detailed information to be transferred. It is possible to classify the passage of students through the university in distinct episodes where each section looks after one of these phases without losing sight of the overall vision of the process; this then allows each section to have all the information about that student, even though they are only responsible for one specific phase. Given these advantages, we consider that the use of these software applications can be understood as the first step in the path towards integrated management by processes, which would not have been possible without their use. For this reason we note that over and above the willingness of the management team to promote unification of all administrative aspects related to students, the use of certain software applications by the university's management services has already allowed progress to be made in this direction.

In any case, we cannot think that merely introducing certain software applications will on their own bring radical changes in administrative processes.

In our study we have seen that, in spite of what could be imagined, the use of this software has not completely eliminated the need for other communication channels between sections and units involved in management. The data obtained show us that the degree of physical proximity is an important element when it comes to explaining the channels used for communication between sections. For example, we see that communication with personnel in the same section or other sections in the same unit, which are all located in the same building, occurs predominantly in person, followed at some distance by e-mail, telephone and internal mail. In contrast, when we speak of

communication with other units, which are located in other buildings, the channels most frequently used are the telephone and internal mail, followed by e-mail and conversations in person. In this case, the interviews conducted have enabled us to understand that the intensive use of internal mail is related to the difficulty of incorporating changes in the computer software.

In summary, two important conclusions can be drawn from the data obtained. Firstly, although the computer software facilitates the transfer of information, it does not mean the elimination of other modes of communication between the personnel involved. Secondly, each mode of communication has a distinct use. For example, the people involved noted that one of the functions of e-mail is to confirm that certain actions have been completed. In contrast, in more informal situations, such as queries, direct conversation is still preferred, be it face to face or by telephone and, even, sending a printed note by internal mail. Hence we can say that to a large extent e-mail is a tool for formal communication that is used to register certain actions.

The information collected allows us to conclude that we can really speak of growing transversality in the administrative processes that increasingly allows students to be monitored as they pass through the university, instead of viewing them as users of specific services. In addition, we have seen how the use of ICTs is very relevant in this process given that it allows greater ease of communication and information exchanges between areas; thus, the use of computer applications together with a strategic policy that promotes these aspects allows progress to be made in this direction. It is important to highlight that this transformation occurs due to a combination of the use of computer applications and a specific strategic policy and not only as a direct consequence of the use of computer applications. In fact, we see that computer applications do not completely substitute the use of other channels but instead there is a specialisation of each channel in specific tasks and actions. Finally we underline the fact that computer applications and Internet are introduced in the administrative processes of the university in a way that fits the university's own style, allowing it to progress along the line of unification and transversality.

Creation of services and areas of information in the website: self-service and transparency

After analysing the relevance of the use of computer applications in the transformation of administrative processes, we will now centre our attention on the second premise indicated: the move towards self-service of students and transparency in administrative procedures.

Our empirical analysis has enabled us to learn about some initiatives to promote self-service and transparency carried out in the area of academic management at the URV. The first initiative that we consider to be relevant is the implementation of automatic enrolment for recognised qualifications through the website. This initiative allows each student to manage enrolment in the subjects that they wish to take through the website without having to deal with administrative staff. As we indicated, this is a service that the majority of universities have begun to provide, representing the culmination of a process of increasing automation in administrative procedures.

In the URV this initiative was implemented in the 2002-2003 academic year as a pilot project in three centres and has extended to all centres during the enrolment period of September 2003. To date self management of the enrolment process has been implemented up to a certain point: students were able to enrol on their own but to do so they had to go to special classrooms set-up with computers, with somebody on hand to resolve any doubts that students might have. We are now seeing greater flexibility in this process, as each person can enrol from anywhere connecting through the Internet.

Another relevant initiative in this area is a line of action aimed at offering more information and administrative services on the university's website. To date, some secretaries of the centre have prepared a website offering certain information to students; this is something that each secretary could do if they considered it appropriate. In parallel, the Student and Academic Management Service has recently commenced a project to offer information and services through the website, from the site of SGAE. Various factors have converged in this decision. Firstly, the perception that students might be in favour of this initiative and the perception that offering more information could improve the relationship between students and the administration areas. Secondly, the push from the Computer Service to encourage the use of the web for distribution, together with the technical support of personal from the OCU to adapt the computer applications to internet format. Finally the

increased level of training of SGAE personnel in preparing and maintaining web services, after some people from the service did a course on this subject given by the Human Resources and Organisation Service of the URV.

Some of the services offered on the website include the “timetable simulation”, which allows you to create a timetable based on a series of selected subjects and the “Academic staff query”, which allows you to see all the subjects taught by a particular lecturer and enables you to view their distribution in a table. Students have all the information about open entry courses on the website of the SGAE, where they can not only consult all the courses available, but also check the applicable regulations in this area and the steps that need to be taken to enrol in those courses.

Whilst at university, students must maintain some contact with the administrative machinery for the mere fact that they have to enrol successively, being accredited as students of the university and receive authorisation to take courses. Beyond this however, as indicated in the description of the training process, students have to carry out other administrative procedures and the university contacts them to offer various services.

Our fieldwork has enabled us to verify that the relationship between the student and the university’s administration is not ideal at the URV. The viewpoint of personnel interviewed is that there is a lack of interest, little use of the information and services by the students, which leads to errors and misunderstandings in the administrative tasks. According to the administrative staff, the changes now being made in some of the tasks and administrative processes are aimed at overcoming this problem and avoiding errors in the administrative procedures that students must complete whilst at university.

On reviewing the website we find that the purpose of the projects to create services and information areas in the web can be basically summarised in two points: self-service and transparency. Self-service is, as we explained above, the result of software applications implemented some years before to improve the internal administrative processes. The availability of more information on the web is the result of the progressive development of the university website, the increasing availability of computers and improved training of administrative personnel in this area.

So far the Academic Administration and Student Service has not made any evaluation that allows the result of these initiatives to be valued objectively. However, the interviews conducted have made us appreciate that the promotion of these two lines has not achieved the expected results and on the contrary, students often view them as barriers to communication. Students see the move towards self-service as increasing the difficulty of communicating with administrative personnel and speak of the uncertainty for them involved in having to carry out certain procedures. With respect to the information provided on the administrative processes, students say that this information is neither clear nor well organised and there is too much duplication of channels through which they receive this information, and they do not have a clear reference. In fact, we were quite surprised by the fact that quite a lot of students were totally unaware of the information spaces that we refer to above.

Thus we can see that the path towards transparency and self-service encounters certain problems in its development. Whilst theoretically these are initiatives that take advantage of the possibilities offered by ICTs to facilitate and improve the quality of communication, they are not obtaining the expected results.

One of the aspects noted by the students in speaking of the difficulty of the transition with the administrative units is the duplicity of channels through which they receive information about the administrative procedures that they are to complete. In normal circumstances the main point of contact for students in their administrative procedures is the secretary of the centre. Subsequently, at the back office level, the information collected is transferred to the Academic Administration and Student Service to systemise and process as required; only in some specific cases do students have to communicate directly with the SGAE.

In spite of this, when the SGAE opted to provide information through its website it decided to include this information in the “Students” area instead of placing it in the website of each school or faculty where the secretaries of the centre are located, being the students’ point of reference. The Students area is a space located in the pages providing general information on the university; to access this section the student selects the “students” section found on the home page of the URV website, and there they can find information on various matters that may be of interest for all students of the URV. The problem, as we understand it from the interviews conducted, is that in general students rarely consult the university website once they have commenced their studies. In this respect, a large number of students claimed that they hardly ever consult the

general website of the university and only occasionally consult the website of their faculty or school, or only for very specific matters. Taking these matters into consideration, it seems that the decision to include this information in the general pages has not been a particularly good one.

This is a problem of tension between centralisation and decentralisation expressed in the possibility of offering general information centrally and offering more specific information from each school or faculty. For one part, the secretary of the centre is a clear reference for students, but for the other part, the moment when information first began to be provided on the website corresponded with an internal restructuring and this opportunity was used to restore the role of the SGAE. In addition, this tension is increased by the lack of a clear strategic line in the website. The Office of Communications and External Relations has been responsible for the website since February 2002; from this moment, and not before, the website has been strategically thought of as a communications tool and an effort has been made to organise the contents. In any event, so far there is still no strategic place in this regard which results in these tensions and difficulties. In fact, one of the first lines of work that the Group has initiated is differentiating between the intranet and the external website, as up to this point the general information and services directed specifically at the URV community were confused.

A second source of difficulty in the transaction between student and administrative units is the difficulty involved in the creation of a new need. As we have said, currently we cannot speak of a widespread use of the website by students. For the moment this tool is seen as a place for making occasional queries and not as a tool for everyday use.

Despite the presence of initiatives that are very relevant and of note in the virtualisation of subjects, courses or services, we cannot say that accessing the university website is a normal practice of URV students currently. From an administrative perspective, the information that is currently offered in the website is useful information that the student can obtain from other sources, and therefore not strictly necessary. From this perspective, then, students are asked to consult information that may be useful but not strictly necessary, the existence of which they have not been informed about, located on a website that they do not usually visit by connecting to internet, which the university does not facilitate in optimum conditions; in short, there is a desire to impose a need which they do not have without ensuring the means to do so.

Finally we wish to note that the trend towards self-service and transparency largely arises from universities offering distance learning that had to come up with ways of providing administrative services and student support and used ICTs to do so. Many campus-based universities have adopted these tendencies without considering whether they are suited to the context where they are to be introduced. In spite of this, the differences between one context and another are evident: we cannot forget, for example, that the profile of students for distance learning is not the same as that of campus-based universities, nor their routines and, consequently, we cannot assume that the advantages of this model in the context of distance learning will be the same at an campus-based university.

5.3.3. The teaching activity

Having seen how ICTs and particularly Internet are being introduced in the administrative activities related to teaching, we analyse in depth how this process is crystallising in all aspects that directly affect education. For example, the revision of plans for specific studies that need to be innovative and responsive to the characteristics and needs of today's world, the existence of an appropriate technological structure that responds to administrative and academic needs, support and incentives for academic staff to use technology, the publication or distribution of information, or the communication and management of resources and information.

In this study we have analysed various factors that, one way or another, characterise the teaching and learning process in three specific faculties. In particular, we have observed how the Internet is used in the teaching activity, taking into account:

a) the infrastructure and resources available

b) the support that academic staff receive from the institution

c) the real experience of all those involved.

With the aim of relating innovations in teaching strategy with the use of Internet, we have analysed a specific experience where the student is the centre of the training process: the preliminary projects in the ETSEQ.

To do this we have interviewed the deans of the three faculties so that they could provide us with a general overview; they have directed us to different lecturers whose opinion could be of interest for the purposes of the study. We have also organised discussion groups with students of the three degrees and distributed a short questionnaire to deepen and in some cases complete the vision obtained. In this respect, it is important to note that we circulated the questionnaire to all the academic staff of the three faculties (approximately 150 in the FLL, 110 in ETSEQ and 120 in FCEP) and received just 58 responses (approximately 15%). As far as the students are concerned, we circulated the questionnaire on paper to a group of each qualification studied and by e-mail to all students in the three centres, receiving a total of 184 replies.

Use of Internet in the teaching activity

To analyse the use of Internet in the teaching activity we have examined in detail the qualifications of History, Pedagogy and Chemical Engineering in the Faculty of Arts (FLL), the Faculty of Education and Psychology (FCEP) and the School of Chemical Engineering (ETSEQ) respectively. It is important to stress that these centres show considerable differences with respect to the integration of ICTs in their teaching activity. Whereas the incorporation of online tools in teaching at the FLL is the result of individual initiatives, at the FCEP and ETSEQ they have been incorporated in the curriculum as compulsory subjects. At the ETSEQ, where academic staff are used to working in laboratories and doing practical activities with computers, there was an agreement to establish basic skills in the use of ICTs as a learning objective for the different qualifications.

To carry out this study it is useful to have an overview of the scale of the three qualifications being studied in terms of the number of credits for each qualification, the number of subjects involved, and the number of lecturers involved, approximately. Chemical Engineering has 405 credits, with 67 subjects taught by lecturers from different departments; the History degree has 300 credits, with 21 subjects taught by 32 lecturers from the department of Geography and History. The degree in Pedagogy has 300 credits, with 58 subjects taught by 35 lecturers from the departments of Pedagogy and Psychology.

The characteristics of these three qualifications are very different both in terms of the type of subjects and the profile and number of students and academic staff involved. Although,

in principle, the subject nature strongly conditions the interests, skills and knowledge of the people involved and, therefore, the incorporation and use of Internet in teaching, there are many other factors that matter. In this report we focus on three:

a) infrastructure and resources

b) institutional initiatives to support teaching

c) teaching practice and tradition.

Infrastructures and resources

To analyse in which context the teaching-learning process occurs and, in particular, the teaching activity, we will examine the different spaces where it takes place: the rooms where classes are usually given (lecture hall), the computer rooms for teaching (computer classrooms), the open computer rooms (open computer rooms), lecturers' offices and the library.

What type of facilities do the lecture halls have? Many rooms have a computer, but not always with an Internet connection, and a projector. In the FLL, however, not all lecture halls have a computer, making it difficult to give classes using computer support. In the ETSEQ all classrooms are cabled but, with a few exceptions, they do not have any type of equipment; there is portable equipment that can be used by all academic staff of the school, subject to prior reservation.

The ETSEQ has an open computer room with 37 PCs, 20 Internet terminals requiring username and password access and 10 points to connect portable computers. This room is pleasant and well lit, opens Monday to Friday from 8.45 am to 8.00 pm and is always full. The use of the classroom is regulated by rules on the use of equipment (http://www.etse.urv.es/recursos/aulausuaris.htm). The FCEP has an open computer room with 25 PCs and 10 Internet terminals; the FLL has a room with 20 computers and 10 terminals connected to Internet. The Pedagogy room is open in the mornings and afternoons, but there is no established timetable for the full academic year and it uses a system that allows reservations of up to two hours; the FLL room is open from 9.00 am to 3.00 pm and from 4.00 pm to 7.00 pm. In both rooms there are only a couple of connection points for portable computers. Both rooms are cramped, dark and poorly ventilated. Both the academic staff and the students of the FLL agree that the connection

is very poor, and the people involved in Pedagogy say that their connection is a little better, whereas at ETSEQ they say the connection is fantastic. The three rooms are monitored by a graduate student who tries to keep order, but lacks the necessary authority to do so. In addition, this person acts as intermediary between the users and the Computer service. Accordingly, as one of the lecturers commented, “we don’t have enough resources for students to have regular daily access to the computer room” (interview 4/7: 3); that is argument enough not to make the use of Internet and e-mail a normal part of teaching practice, in his view.

With respect to the academic staff, in Pedagogy and ETSEQ everyone has a late model computer, but it is possible to find an office for three people who almost never coincide still with a single computer.

The number of computers for students in the libraries is less than those for teaching: in the Faculty of Education and Psychology there are 10 and in the Arts Faculty there are 6. There are only a couple of computers in the provisional library at the moment whilst the new library is being built. Thus, the majority of lecture halls where classes are given have a computer and projector, in each faculty there is a computer room for student use and in the offices the lecturers also have computer access, in one form or another. In spite of the annoyance shown by some people involved, especially the students, regarding the number of computers, the lack of modernisation and the lack of connectivity, everyone agreed that the support of the university’s technical staff was more than satisfactory: they resolve practical day-to-day problems efficiently.

Apart from the hardware, it is very important to consider the software and connections (Internet and internal network) available in the teaching environment. Of note in this respect is the Virtual Campus, which is a common space for all teaching materials that have multimedia support, personalised according to the user profile. In fact, this tool was part of a joint research project between the URV and the Universitat Jaume I (UJI) de Castelló and after it was implemented by a company according to the specifications of this group it was returned to the university at the end of 1997. During 1998-2000, a second version of this tool was defined in a project co-ordinated between the Universidad de Murcia (responsible for the technological side) and the URV (responsible for the pedagogic side), simpler than the previous version, which was only used in restricted circles. Having resolved the problems of integrating this tool with the administrative tools, it will be used widely across the university in the 2003-04 academic year.

In short, the technological resources for teaching at the university are not exactly homogeneous across the different centres. Practically all the academic staff members have a computer with an Internet connection in their office, but the lecture halls where classes are usually given are not particularly well equipped in this sense and the open computer rooms are on the whole quite inadequate.

Teaching support

Whilst the provision of infrastructures is basic to achieve an acceptable level in the use of ICTs, it is also fundamental to provide academic staff with specific resources and especially pedagogic support. This is the basic function of the Educational Resources Service (SRE). This is the technical support and pedagogic service for teaching activities; at the same time, it is the main instrument to promote the use of ICTs in teaching, serving as a tool for transmitting the university policy of support for innovative teaching, through its participation in support programs that the URV may undertake with this objective.

The SRE has multimedia equipment and specific software to carry out its task in various areas. The functions of this service are many and varied: from the training of academic staff to running the virtual campus, also including technical support and the maintenance of the website servers. However, there is one function that is fundamental for the incorporation of ICTs in teaching: ensuring that academic staff have access to the material, human and technical resources necessary for this purpose. In this respect it is fundamental that they coordinate their activity with the ICE, the institute it emerged from, which organises and conducts the training activities for academic staff of the URV. Apart from special initiatives, which are few and isolated, the specific training in ICTs is covered within the Academic Staff Training Project (PFPA), as part of DUET (Docència Universitària amb Eines Telemàtiques[3]).

The main objective of the DUET project created at the end of 1998 is precisely to motivate, train and assess the academic staff members of the URV so that they can integrate these tools into their teaching work and, in addition, progressively create a technological training environment with a clear training content. In this project, apart from presenting the subjects that are currently offered virtually, they have also offered semi-presencial distance courses, visual communication and design of material for the WWW, collaborative work both in research and teaching and JLE (Java Learning Environment).

3 University Teaching with Online Tools

Initially, based on proposals from academic staff, three work groups were organised according to the profile of the people that presented the proposal. A first group that used online tools as almost a normal part of teaching in some subject matters that they covered, a second group that planned to use online tools for teaching and a third group that would be interested in using online tools for university teaching although they did not have the necessary knowledge to do so. The ICE offered these three groups a meeting space, specific training according to the needs of each group, the technical support to create teaching material, a web server and space to publish the material and resources that they generated, the configuration of a collaborative work area on the network to work together virtually and the support for the design, the development of teaching projects based on the use of online tools and financial support for the groups operating expenses (standardised material). However, the response from academic staff has not been very satisfactory. There is currently only one work group made up of people involved in specific projects and, therefore, it is still necessary to work with the group of people that are not yet included. According to the current vice-chancellor of Teaching and New Technologies, one of the clear results of this initiative has been to identify those people most willing to work on these themes in each centre and set up a network of teachers involved in the virtualisation process and the introduction of ICTs in teaching.

Having described the mechanisms that the university has put in place to support the academic staff in the area of ICTs, it is important to analyse the return. Evidently there are different positions amongst academic staff both with regard to this process and in relation to the actions taken by the institution. In particular, the first information available on the number of registrations and attendance at different courses organised by the PFPA are for the 1999-2000 academic year. In this period there were 261 people registered, with 202 attending at least 80% of the sessions.

The most requested subject area is New Technologies Applied to Education, even though the final attendance was only 67.1%. In second place is the block corresponding to University Teaching followed by the courses offered by DUET which, in this edition, involved presenting needs, deficiencies and, in some cases, the work done.

In the 2000-2001 academic year the number of people registered was the highest (473), with 302 people registered in the courses on New Technologies and University Training and attendance at these courses was 73.8%.

Surprisingly, with an attractive range of courses, in 2001-2002 there were only 141 people registered, and just 98 attended at least 70% of the sessions. Curiously, this reduction did not affect the block courses in Research Methodologies, which recorded similar figures to the previous year.

There are two results that we consider especially relevant. The first is the overall decline in the number of people enrolled in the last edition and, proportionately, the percentage of people who finish the courses. The second result is the response of the academic staff to the block courses for university teaching (declining from 120 enrolled in 2000 to 23 in 2001, with attendance of 52.2% in the later case) compared with the courses on Research Methodology that have attracted practically the same level of interest and attendance.

There are various factors that might explain this behaviour. At the beginning of 2001 there were changes in the management of ICE, and therefore very probably there were changes in the conception, management and monitoring of the courses. It should also be taken into consideration that before the LOU came into operation, which changed the system of access to teaching bodies, there were many academic staff seeking teaching positions. This means that they had to prepare for public exams, so they had little time available. This said, there are other factors that influence the response of academic staff to training plans: their previous training, the type of subject they teach and their availability.

On this point, we wish to emphasise an element that we consider fundamental in understanding the priorities of academic staff: the prestige of research at the expense of teaching. So long as there are strong incentives to participate in research projects, scientific publications and participate in conferences, it will be more interesting to do courses on the design and management of research projects, writing scientific articles in English or statistical interpretation of data rather than create teaching objectives or design for websites.

In short, there are two key elements for the success of the process of introducing online tools in teaching: motivation and having the necessary training to obtain a level of self-sufficiency. In addition, one aspect that undoubtedly would need to be provided is the practical support of the university. That is, the possibility of obtaining the necessary

resources to carry out certain initiatives such as producing multimedia material, creating a website or holding a videoconference.

In practice, which people are most motivated and most able to use the online tools? It is those people who seek help to produce materials and participate most actively in training activities, whether they are organised by the ICE or by the department. We find a group of enthusiastic people who are really the ones that make a service like SRE justified and lead the new projects in the area of ICTs and education. Therefore, we think that the difficulty in making the first step is getting lecturers who only use e-mail occasionally to dedicate enough time to training themselves, so that they are able to include ICTs in teaching.

In this section we have seen the support that the institution gives to academic staff to introduce ICTs in the training process and, in particular, we have noted the response of academic staff to formal training activities. However, in general, how do people learn to move comfortably around the network? How are ITCs and particularly Internet integrated into everyday life? In this respect, is the behaviour of university academic staff any different to that of other Catalans, described and analysed in the study about the Catalan Society under the Project Internet Catalonia (PIC) whose authors call into question the value of campaigns for formal training: “we only learn and use that which is useful in everyday life, based on the values, interests and projects of each person. And when the need appears, people get motivated, by themselves or with the person next to them. Internet expands as the network society develops” (Castells et al. 2003).

Teaching practice

The incorporation of ICTs and, in particular, Internet in teaching practice is a process that is difficult to analyse. As we saw in section 3, the current use in different schools and faculties varies and depends on a range of factors. In this chapter we will explore this a little more deeply through the study of the transformations that are occurring in the lecture halls. Whilst the way ICTs are used in each area is fundamental, it is clear that the pedagogic tradition is basic, that is, the ways teaching strategies are defined and subsequently put into practice.

More than 50 % of the academic staff members from the faculties studied that responded to the questionnaire do not do any teaching activities through the network. Those that do, do so because they participate in the intercampus project or because they have made their course virtual, and they are the ones who are most able to introduce changes of any type in their teaching activity.

In contrast the use of Internet to obtain information about transactions and administrative procedures at URV, such as questions related to research areas, is common. Practically everyone does bibliographic searches and just over half of the academic staff who responded reserve books and publish student results through the Internet. In other words, apart from a few exceptions, the use of Internet in teaching is limited to introducing a page of internet links on the subject, responding to queries by e-mail, allowing assignments to be presented in digital format and publishing student qualifications. However, there is an argument defended by many lecturers interviewed that justifies not using Internet or e-mail as standard practice, as the university cannot guarantee “normal” access to the internet for students and they do not have access from home. In addition, it is also noted that the URV is a small university, with few students, where it is easy to be contacted at one moment or another without problems; therefore, it appears that questions that students can resolve directly are not handled by e-mail, unless there is really a lack of access (at the end of term, for example, when they have exams).

Up to this point we have referred to some general questions about the practice of academic staff with ICTs. Before analysing the situation at each centre studied, we first wish to highlight an element that is critical in determining this practice: what is the previous training of the students in this respect and how willing are they to learn? The perception of almost all academic staff is that students have tremendous capacity to use computers with ease and surf the Internet. Therefore, to what point is prior specific training in the use of ICTs necessary? In principle, the SRE does not organise any specific training for students (there are not enough resources to cover the whole community). To date there was only material on new technologies offered as optional credits. In the current four-month term there is a transversal pilot course with students from different faculties that have been invited to participate. In any event, our perception about the basic training requirements in ICTs for students is that the majority are able to manage quite comfortably, and if not, they learn quickly. In this case, then, although there are no data on this transversal course, our intuition suggests that the value of formal training in ICTs in the case of students is also questionable.

Although the FCEP's own area of knowledge should mean there is great interest in innovation for teaching, in practice we have found different habits and a wide range of uses. Those who are interested in research in continuous learning and new technologies are the most proactive as far as introducing technology in teaching and undoubtedly, they encourage the others to follow their example. It seems clear that academic staff is interested in the profile of the new students that join the faculty and aware of their demands. In many cases the perception exists that it is really some of them that dominate the emerging culture and, to some extent, they can provide guidelines when considering how to search for information, prepare work, do public presentations and establish communication channels, for example.

Both the academic staff and the students are interested in ensuring that the future professionals have the necessary skills to enter the workforce and, therefore, they are very aware of the need for training in ICTs. Amongst many elements involved in the relationship between tertiary education and the labour market and, in particular, between academic curriculum and the requirements of companies, we wish to highlight two key factors to guarantee that the objectives of subjects match the training requirements for possible jobs: the professional experience of the academic staff and work experience of the students.

In the FLL, where staff on average is older, there is considerable inertia amongst lecturers. The teaching of most subjects is based on lectures and the preparation of final assignments (normally bibliographic), and the infrastructure is not the most suitable for using ICTs as standard practice. We find innovative individual initiatives from a pedagogic perspective that incorporate the use of Internet as part of their approach. In this respect the experience of Enric Olivé, current dean of the faculty, should be noted. He offers a subject in history in the second edition of Intercampus and clearly sees the need to incorporate ICTs in teaching. From the perspective of someone involved in these matters, the use of e-mail as a tool for academic communication practically does not exist; as far as students are concerned, they are used to seeing their academic life as a obstacle race and only use Internet to prepare assignments where it is only necessary to copy and paste. Hence we can say that there is a big gap between the tool's potential, the capacity of the academic staff to propose and lead activities where it is used, and the previous experience of the students to adapt: according to Olivé, it is necessary for students to have criteria to select the appropriate information, be flexible and understand that the reality is changing and therefore their job is not to assimilate a closed block of contents. With respect to doing assignments using Internet as a basic source of information, at the

outset many students have problems. Afterwards, however, they find suitable strategies to do the work required off them, and do it reasonable well. Other lecturers in the same faculty, but not the majority, see the need to use Internet to keep the information up to date and to allow the classes to be conducted in another way: in the long term, the lecturer's presentation can become a discussion based on the contents available on the internet that have been prepared previously. This dynamic presents two problems, amongst others: as the main weight of the evaluation rests on the final exam, there are students that do not see the need to go to class or participate in any activity during the whole course if all the content is available from the first day; the other problem is associated with the lecture load of the subjects. To date, and so long as the Bologna agreements are not officially introduced, each credit is equal to ten class hours; this is critical when preparing a subject to determine the "amount" of material that can be given. Naturally, if the weight is measured in hours dedicated by the student, it is easier to be flexible in the organisation of the course and the distribution of material to follow it.

In the ETSEQ, where the practical laboratory sessions traditionally have a significant weight in the planning of the subjects, the installations are new, the resources and infrastructures are reasonably sufficient to guarantee normal use of ICTs and the academic staff members are quite familiar with computer applications. This is fundamental when verifying that the use of ICT is widespread, although the use of e-mail is proportionately more limited: contact between academic staff and a student is normally in person. The URV has the chemical engineering program with the most credits in Spain; students have theoretical classes in the morning and practical sessions in the afternoon, so they are normally at the faculty all day and consult the lecturers directly in their offices. With regard to posting contents on the net, the involvement of lecturers is irregular due to lack of time and motivation rather than a lack of technical knowledge. In this sense it is important to mention the initiative and enthusiasm of the current deputy director of the school, Ildefonso Cuesta, who has led various initiatives aimed at improving this situation. The Virtual Photocopier and the school's website are two examples. Work is still being done to improve the site as it is not compatible with all browsers, not all lecturers are involved and it is only in Catalan. However, the website is currently a good tool for students to obtain relevant documentation for a subject and it allows the academic staff to have a means of easily informing and keeping in contact with students.

We cannot complete the description of the characteristics of the ETSEQ without referring to the preliminary projects. The school has a way of viewing the training of an engineer that is expressed in the preliminary project of the general chemical engineer, which is

explained in the next paragraph. This conception really represents an innovative teaching proposal, which affects both academic staff and students very directly and, in practice, incorporates the use of ICTs in a natural way. In effect, it is a particular way of conceiving the training of an engineer that gives priority to the development of the necessary skills to rapidly adapt to the professional world, specifically related to the sectors present in the territory: plan and lead a series of activities, work in a team and develop basic conflict resolution skills within the team, resolve technical problems, defend results and conclusions presented in writing and orally as well as create interest, curiosity and an innovative spirit.

We do not want to complete this section without specifically mentioning the use of e-mail as a communications tool. The university provides an e-mail account to all university personnel and all students enrolled. In practice, however, it appears that students use their personal e-mail account, which they give to the lecturer at the beginning of the course. Apart from the fact that it is practical for them to keep using the e-mail address they normally use, they consider that there are functions that the university e-mail does not have (messenger, for example) and they receive too much information that they don't find particularly interesting.

The majority of the lecturers in the faculties studied normally contact the administrative personnel by e-mail, and with the occasional exception, in an indistinct manner, by e-mail, by telephone or in person. Just over 50% of the people that responded to the questionnaire also normally use e-mail to deal with formal questions or to exchange information with teachers. In contrast, the use of e-mail is far less common in communicating with students, be it to respond to queries or provide bibliographic references related with subjects; it is still less common to speak with students about matters related to research. Almost 60% of the students always communicate with administrative personnel in person or by telephone. When contacting lecturers, around 25% request information on the subject and present assignments either by e-mail or in person, and almost 50% always do so in person or by telephone. Only 10% make queries by e-mail and 76% always request the reconsideration of an examination in person or by telephone. Around 30% normally exchange documents related to the subject by e-mail and to a lesser extent, to share doubts. In this respect student opinions are diverse. According to a group of ETSEQ students the ideal tool for communicating amongst themselves when doing assignments is Messenger. In contrast, a group of Arts students explained that they preferred to meet one day to divide the work and afterwards, if they could not meet, they would send e-mail messages. In conclusion, in our view, the use of

e-mail for questions related to teaching that are not purely informative or administrative is not very common.

Student centred learning process

Currently, the approach that in principle is most frequently applied to education at all levels, from pre-school to tertiary, is constructivism. This model can be analysed from various viewpoints, the philosophical, the social and the psychological perspective, and in recent decades, various approaches on how best to facilitate the process of knowledge construction have emerged. In any case it is fundamental to stress that the centre of this model is the person, who has previous experiences and constructs new meanings when he comes into contact with the object of knowledge, in interaction with other people. Constructivism in education and philosophy is not a new theory; in fact, Rousseau's ideas of pedagogy in the middle of the 18th Century already displayed the value of personal experience and games in learning as opposed to memorising and reciting (Lefoe, 98). In this framework, how do ICTs favour the development of the capacities and aptitudes of people that learn? It is clear that they are a key element in distance learning and that they may significantly encourage the adoption of new teaching strategies for classroom teaching. In particular, the methodological models of the tertiary educational institutions are based on the weighted combination of three main elements: the student, the academic staff, and the technological resources. In any event, it is clear that the student centred methodology favours the learning of material and ensures that the student acquires professional skills, that is, knowing how to do and knowing how to be as opposed to just knowing.

We have provided an overview of how teaching is done using ICTs and we have been able to show how, in the different disciplines, the student-lecturer-ICT triangle is configured in the context of a specific qualification. Now we will consider a specific experience where the student is at the centre of the process, where technological resources are a basic tool required to achieve the objectives set. Moreover, it is a tool that favours the development of certain skills and creates a communicative dynamic that otherwise would not occur.

There are some initiatives that clearly favour students as protagonists in the learning process. It is the case of the experience carried out in ETSEQ based on the teaching project started in 1995 called "The complete chemical engineer: combination of scientific-

technical knowledge and personal skills through the integration of subjects in preliminary projects", for which the school received the "Experiencias de Mejora del II Plan de Calidad de las Universidades"[4] prize in 2002 awarded by the Council for University Coordination, of the Ministry of Education, Culture and Sport.

Although the lecturers Francesc Giralt y F. Xavier Grau designed and began this new teaching strategy in 1995, the first experiences of group work commenced twenty years ago. Today there is a whole group of lecturers at the school who are putting it into practice and perfecting it, year by year. The director of the school, Xavier Farriol and the deputy academic director, Ildefonso Cuesta are responsible for the organisation and implementation of the preliminary projects of the different courses.

This project arose with the purpose of aligning the training provided in the studies at ETSEQ with the needs of the labour market and the characteristics of the students. More specifically, the aim is to give a broad vision of chemical engineering from the outset, reduce the number of passive theoretical classes, encourage direct and regular contact between lecturers and students, encourage the acquisition of professional skills in their training, strengthen abilities and skills through continuous practice, use the knowledge acquired in real applications, increase knowledge retention and the consolidation of basic concepts, promote self-study as the normal method of acquiring knowledge and use ICTs applied to education.

The teaching strategy for this proposal anticipates the incorporation of skills and abilities during the course using four basic tools: preparing integrated preliminary projects, making formal presentations (optional subjects, seminars...), the use of innovative teaching methods (cooperative method, open problems, destructuring laboratories...) and strengthening the professional component within the corresponding subjects (Practice in Industry, Research Laboratory, etc.). But specifically, what does this proposal involve?

In these preliminary projects, students study a chemical process on an industrial scale, whereby they must use knowledge gained in different subjects. Students work in groups and carry out the study during the whole course as a team project, with group members having to work together but being individually held responsible. To allow the work to be done, each subject cedes part of its time to the preliminary project, and at the same time, the grade obtained in the preliminary project is used in the evaluation of the subject. There are three preliminary projects, the first of which is done in the first course and is

4 "Experiences of Improvement in the 2nd Quality Plan for Universities"

coordinated with the fourth course: students in their first year carry out an in-depth study of the process of manufacturing a chemical product and fourth year students lead the first year teams. The group activity is done in teaching hours of all the first year subjects, so that each one dedicates some time. The project mark is individual, being based on four evaluations: the mark given by the lecturer responsible (50%), the mark of each lecturer of each subject (20%), the mark of fourth year students in the context of the subject of project management practice (20%) and self assessment (10%).

The second and third year preliminary projects are coordinated by a lecturer nominated by the deputy academic director of the school, responsible for the organisation, time management and information flow. There are some differences in his function and method of evaluation with respect to the first year project (see teaching guide at www.etseq.urv.es).

The department now has two years experience in using this educational tool. The first pilot program was carried out in 1995/96, and given its success it has been implemented in a structured manner in Chemical Engineering studies and in the Industrial Chemical specialisation of Industrial Technical Engineering program in 2001-2002.

According to the people who are implementing this initiative, in spite of the dedication and organisational difficulties involved, the results observed in these years are very satisfactory: the integration of students in the university environment is very rapid, there are less failures in the first year, the practical experience in organisation and project management is greater and the adaptation to different work environments is rapid.

When evaluating the quality and analysing the strong points of this teaching methodology, it is very important to take two elements into account: the effort and dedication of the people involved and the organisational complexity that the proposal involves.

In the autumn semester of the 2002-03 academic year, all the fourth year students that had to manage projects of the first year students put forward a project, called project 14.com, which involved creating a website to provide information to all students involved in the preliminary projects. At the outset, according to the creators themselves, they had a clear idea of what was required and its development was to be guided by what they expected to find in a similar web. According to the same students, it was very useful because they had everything they needed to do their projects. However, this web quickly

became a meeting place not just for those involved in the preliminary project but for all the students of the school. Unlike other discussion areas in the university website, their discussion forum was really active. It is important to underline the fact that there was a degree of conflict when the creator of the web, who acted as webmaster, decided to delete anonymous comments posted about some photos. Even though many students accepted the decision favourably, the number of contributions declined. Still, it is evident that the fact that students have a room to move, can decide according to their terms and have access to maintenance resources is very attractive; in addition they sense that they are members of a community, in this case a virtual community, and develop initiatives in an academic and personal context.

It is important to note that one of the students that participated in this initiative was given a scholarship to work on the website of the school where he is webmaster, and naturally he is making his mark.

In conclusion, we have presented a teaching experience undertaken by academic staff that has made students a significant role in their period of training, not only in terms of contents, but also in skills and abilities to respond to the demands of the labour market. It is important to stress that this experience, innovative from a teaching perspective, has triggered the birth of a community, made up of academic staff and students of all levels, which communicates through a website created by the students themselves that without Internet would probably never have occurred.

5.4. Analysis of how research is conducted

5.4.1. Description of the research process

One of the processes that characterises a university institution (apart from the learning process) is the research process; this activity allows one of the University's fundamental missions to be met: creating new knowledge and transferring it to society. In fact, the learning and research processes are intimately linked, given that research is supposedly the path to innovation and obtaining knowledge that can then be passed on to students in the learning process, which ensures continuity and evolution of the process. Taking this into consideration, it should be noted that we have approached these two processes separately to facilitate their analysis, but on no account do we consider that they are two separate processes.

We have constructed a scheme of how the research process is conducted that we have used to focus our study. There are many sociological studies that have tried to analyse the research process, something that is extremely complex as many factors are involved in influencing its development. Taking into account this complexity, our objective was to define a simple scheme that would enable us to identify the most relevant actions taken by the key actors, rather than do an in-depth study of the development of the research process or the multiple factors that influence it.

This process is focused on the researcher who carries out a series of activities that have a certain circular evolutionary logic, some of which can be repeated, partially or fully.

The first of these actions is when the researcher comes into contact with other researchers or research groups, which is obviously a phase that is closely linked to the previous research activity of the people involved and the activity that they have carried out to disseminate their research. This action, together with others, enables contacts to be established and new research groups to be formed, or new researchers to join the teams. The end result may be found in bibliographic searches and research articles, attendance at conferences and specialist meetings and the establishment of contact with other researchers. Directly involved in this process are the researcher, research personnel from other countries and also the administrative and service personnel who provide support to the researcher in these tasks.

Once contact has been established and it is agreed to carry out research activities jointly, a specific research project has to be planned. This is the moment when researchers begin to define a research project based on their prior knowledge and the bibliographic search. As it is known, defining the research project involves detailing the hypothesis and objectives, the research questions, the methodology and methods for obtaining information, but also in gaining the resources required to conduct the research, in terms of personnel, infrastructure and financial support. Therefore, the researchers must provide information about the sources of funding, with the support of administrative personnel at the university and other bodies, and meet the terms established to gain funding.

As funding and the required resources for the research are obtained, the research phase will be undertaken. The types of activities carried out in this phase depend very directly on whether the research is theoretical, experimental or empirical. In some cases, these activities are carried out in specialist laboratories but in other cases it is necessary for research personnel to travel to the place where information is to be gathered. In short, information must be obtained, stored and processed. Subsequently, once all the information is available, the analysis of data will begin. The researchers involved and the support staff work in preparing the data, using computer programs, modelling tools and other technical devices, to obtain the first preliminary results that can be shared with other colleagues. Finally, the final results are obtained and presented in research reports.

Having written up the results, the final stage of the research process consists of disseminating the results obtained. As we know, this dissemination can be driven in different ways: from the publication of articles in specialist journals, to presentations at conferences and other scientific meetings, or exchanging information with colleagues involved in the same area and activities of scientific disclosure. To carry out all these actions the researchers must look for information on the most important scientific meetings to be held or prestigious specialist journals, they must present their proposals and when accepted, prepare and present the material. This is a time to contact other researchers that may lead to the establishment of research agreements and alliances to initiate new research projects; in this way we return to the beginning of the process and repeat the actions. Each time, however, we do so having acquired more resources and a more consolidated position, and perhaps, a degree of prestige in the research area.

5.4.2. Management of the research

Our aim in this section is to present an analysis of how ICTs, and in particular Internet, have been used in the management tasks that arise throughout the research process described in the previous section.

The phase of data collection in our research has allowed us to consider the relevance of GREC, a computer application managed by the Research Management Service that has various features that support a large amount of the research management tasks. In addition, we have seen that this tool has been developed in line with the objectives established in the Scientific Policy of the university. Accordingly, we have decided to centre our analysis on the definition of the lines of scientific policy of the URV, the extent to which it has been crystallised in the tool GREC and in the repercussions that this tool has had on the research groups.

Conducting a series of interviews with researchers, as well as personnel in the Research Management Service, complying documentation and a series of questionnaires administered to research personnel, has allowed us to obtain information on these aspects and carry out the analysis presented below.

In the 1992-1993 academic year, when the Universitat Rovira i Virgili was founded as such, the academic staff continued with the research activity that they had previously carried out in the course of their career. The only difference was that they carried out this research under the new university. If the research activity has been present since the URV began, we cannot speak of the evolution of this activity without taking into consideration the milestone of 18 February 1999, when the Governing Council of the URV approved the main lines of the URV's Scientific Policy, at a Governing Council Meeting. These lines establish, basically, the willingness to encourage high-level research from two angles, both basic and applied, capable of creating new knowledge and making it available to society; they also establish the bases for the promotion of research strongly grounded in the area where the university is located, promoting agile systems for transferring knowledge and finally, the improvement of mechanisms to obtain finance.

Each of the general lines of the scientific policy that the URV establishes has been determined in a series of specific actions taken over successive years. Thus, for one part, with a view to encouraging quality scientific research in the geographical area and promote systems for transferring knowledge, the Advanced Studies Institute (IEA) (http://redotri.urv.es/iea/) has been created, for example, which "defines itself as a multidisciplinary institute dedicated primarily to giving support to groups with research consolidated in the URV and established as a virtual structure, making use of the space and infrastructure that departments dedicate to research" (URV 2000: 85). The activity of ICE has also been redirected towards scientific research in the area of education, work has been done on the visibility of the Institute of Archaeology and Ancient World Studies as centre of reference in archaeological studies and the ancient world in Tarragona and activities of scientific disclosure undertaken, amongst other activities.

In order to strengthen mechanisms to obtain financing, the University has pushed for the research of all university personnel to become a recognised function through the promotion of a specific plan of actions. They have also initiated the consolidation of the structure of management services, they have developed and improved programs for mobility and, finally, they have worked on determining and defining the characteristics of research undertaken in the university with the aim of identifying the main lines of research, the groups and specific activities carried out.

The establishment of the main lines of scientific policy represents an important milestone for research at the university, as it leads to a series of actions and projects that will be implemented in successive years, which will be accompanied by a significant reordering of research activities at the university.

GREC: Map of research groups

As noted above, a large part of the objectives established in the main lines of Scientific Policy of the URV have been realised through the creation of a map of the research groups that, together with a program for evaluating research, has enabled the university's research activity to be strictly evaluated leading to a system where the allocation of resources is justified. Whilst the definition of the map of research groups and the evaluation program has occurred with the establishment of the university's Scientific Policy, it was preceded by the systematisation of all this information across different databases in a software application called GREC.

GREC is a software application created by a team from the Universitat de Barcelona.[5] It has a group of databases that can be used to manage personal curriculums and group curriculums on one side, as well as information about projects, publications and presentations made, on the other. It also has help functions that allow data queries and data searches, and lastly, it contains some operating programs that are used to generate new information based on the data entered. When it was created, GREC was to be a tool for internal use to manage information on research carried out at the Universitat de Barcelona, also including division VII, which later would become the Universitat Rovira i Virgili.

During the early years, GREC was used as an internal management tool for research information and, as the research activity increased at the URV additional data was added. In any case, as explained above, the research activity in the early years of the URV occurred spontaneously and was not very organised. It was not until 1999 – when the main lines of scientific policy were defined –, that the university began to plan, in a strategic manner, its combined research activity. One line of scientific policy was the Program for Evaluating Research (PAR) that responded to the objectives of encouraging excellence, the need to establish criteria to prioritise the allocation of research grants and, lastly, the desire to establish a culture of evaluation, transparency and accountability.

For the PAR to work and meet its objectives of transparency and objectivity, it is strictly necessary to have a full compilation of all the information and specific data on the research activity carried out by the university. This is where GREC plays an essential role. As noted, GREC was established as a database for internal management that collected sporadic data on the university's research activity; now, however, it is necessary for the compilation of information to be exhaustive and rigorous. To meet this objective, an internal research funding round was created that established, as an essential condition, that all information on the research activity of each group be included in GREC. The first internal research funding round occurred in 1999 and thereafter, funding rounds have been held every two years (that is, in 2001 and 2003), such that every two years when the funding round is made public, the database is opened so that groups can enter information about their research activity over the past five years. Subsequently the projects are evaluated and funding is awarded. In short, these funding rounds have

5 This application was developed by the Office for Research Management and Agreements, the Computer Centre (Unit of Research Management) and the Centre for Evaluation and Exploration of Research and Innovation of the Universitat de Barcelona (UB), in collaboration with the Department of Design and Images of the UB and supportof the vice-rector of Research of the UB.

meant that various research groups have defined the scientific reality of the university (Vice-rector of Research and Internal Relations 2000: 5). Even though not all research groups have chosen to participate in these funding rounds and therefore not all groups have entered their information in GREC, it contains information on the vast majority of groups and as new funding rounds are held the database will continue to expand.

The features of GREC, however, are not limited to this. The application has evolved in line with the university's strategic policy for research. In fact, the agreement established between the URV and the UB was not limited to the purchase of the application, but extended to a collaboration agreement, which was also later signed by the Universitat de les Illes Balears, to work on the development of this tool. Thus, whilst considered at the outset as a tool for internal management, later new applications were developed that converted it into a tool available to research personnel to carry out certain administrative tasks on their own related to research and also as a tool for distribution.

Currently, according to the information provided in the application's website, the map of research groups meets two fundamental objectives. In the first place, the map has become an agile work tool that has allowed the university itself to have up to date knowledge of its scientific situation. This tool, together with the evaluation criteria for scientific activity and the quality of research established by the Research commission and the Research and Internal Relations commission in the 1999-2000 academic year (URV 2000: 17 and 83) have resulted in the university having a good system for the evaluation of research and prioritising available resources for funding research activities.

Secondly, the map has enabled the scientific reality of the university to be known outside of the institution. In fact, we can say that the map has enabled the research activity to be distributed, both through the internal recognition of the work of researchers and by strengthening the transfer of knowledge in the productive sector.

In summary, the map has become an essential tool for implementing the main lines of scientific policy approved by the Management team: provide precise knowledge of activity of the groups that, together with the program to evaluate research results, would give the basis for decision making on scientific policy at the URV.

Use and impact of GREC for research groups

In spite of the GREC's great potential as a research management tool and the efforts made by the university to promote it, we have seen that its use amongst research personnel and research groups is not very widespread. Sometimes the limited use is explained simply by the lack of knowledge of the tool, but on other occasions however, we have to be aware of deeper motives.

The questionnaire given to academic staff has allowed us to collect some opinions of research personnel about the GREC tool. Firstly, its exhaustive nature and distribution potential are highlighted, given that it captures a great amount of data and information related to research activity that are easily consulted. Secondly, it is valued as a standardised centralised database that enables comparisons to be made and to establish hierarchies with other research groups. Lastly, some people have highlighted the ease of use and agile management. On the other hand, amongst the main disadvantages it is noted that the fields and models are overly rigid, that there is little flexibility when entering changes, updating data is slow, the design is not very user friendly and, moreover, there are frequent technical problems that cause system failures.

In general we have observed a lack of interest and we received opinions that were not very favourable. Why is this the case? We have documented the evolution of the GREC application, which has changed from being a tool for internal management to a general management tool for distribution and a support for establishing the map of research groups. Taking this into account, we think that there are two relevant factors in this evolution that may be the cause of these opinions.

Firstly, we consider that the fact that GREC has been developed from a tool for internal management has undoubtedly influenced the final version; it is probable, then, that the design of the new features do not exactly meet the needs of the research personnel as direct users of the tool who admit that it is not completely useful to manage information in their day to day work as researchers.

Secondly, we consider that the fact that GREC has been implemented as a tool to introduce a particularly line of scientific policy involves, whether desired or not, the imposition of certain values that need not be coherent with the reality that they are

dealing with. In principle, GREC is presented as a tool for the organisation of information on the university's research activity and a tool for transparency and to prioritise funding objectives. In spite of this, it has a repercussion that perhaps we would have to see as a collateral effect that was not initially foreseen as a direct objective, namely the promotion of the research group as the basic working entity of the research activity. Even though this is not an acknowledged objective, it is, from our point of view, a feature promoted by the new lines of scientific policy.

In summary, we have seen that the computer application GREC has helped to introduce and consolidate the scientific policy objectives of the university and has had unplanned collateral effects of an explicit nature in principle.

The fact that a support program for research is derived from the definition of research groups, may at first seem obvious and of little importance in determining the research activity of the university. In spite of this, distinct information collected during our analysis leads us to think otherwise. We consider that the fact that the scientific policy of the university, the PAR and GREC have been based on research groups rather than specific projects or the recognition of individual research activity is a very relevant issue with important implications on the scientific reality of the university.

Whilst various hypotheses can be put forward, we tend towards saying that it is not so much an issue of the GREC program having imposed a particular order in research at the URV but more the way it has been used, where it has been implemented. This tool has had – in a voluntary manner or not – certain values and characteristics that have accompanied certain changes in the research activity undertaken at the university.

5.4.3. The research activity

Having seen how Internet has been used in the administrative tasks of the research process and with the aim of analysing how Internet has been used in those activities most closely linked with the same research activity, we wish to now focus on the other activities that we included in its definition.

With this objective, we sent a questionnaire to academic staff with specific questions about their research activity. We have also conducted a series of interviews in two periods: a first phase of interviews of researchers from the distinct faculties studied and a second phase of interviews of researchers from the three groups selected dealing with some more specific issues.

We will start by analysing in detail the data obtained from the questionnaires sent to academic staff, which offer us a general overview of how Internet is used in distinct tasks in the research activity. Secondly, we will analyse in greater depth the information collected in the personal interviews to focus on the specific study of three issues related with the configuration of research in which the arrival of Internet has accompanied significant transformations.

Use of Internet in research activity

There are many different possible uses of ICTs and Internet research tasks. In fact, we are prepared to say without fear of making a mistake that research is one of the areas that benefits most from the use of Internet.

A very important task of any researcher is obtaining information about the activity carried out in their field of study, be it by reviewing articles published in scientific journals, attending conferences, seminars and specialised scientific day sessions or participating in discussion and debating forums, amongst others. Whilst the information collected in the interviews tells us that Internet is a tool used in carrying out these activities, the data obtained in the questionnaires provides us more specific information.

Firstly, 67% of the academic staff that completed the questionnaire received some type of electronic summaries by subscription, a service that allows them to receive by e-mail indexes of those scientific journals that they have selected. Out of this 67%, the majority receive summaries for between one and three journals, whilst only 26.5% receive more than three summaries. Thus, it appears that researchers use this service to monitor articles appearing in the two or three journals that they consider most important in their field. The reason why the majority subscribe to no more than three journals is explained by the fact that wider bibliographic searches are done using other methods, although often also through Internet.

Secondly, the data obtained in the questionnaires also shows us that Internet is a powerful tool to obtain more generic information related to the research area. Approximately 40% of the academic staff that completed the questionnaire said they “always” use Internet, when asked about how often they use it to obtain information about their research area or about conferences, seminars or scientific journals. The other 60% responded “usually” to this question, with nobody choosing the other options of “only sometimes” or “never”.

Thirdly, a slightly different matter from those above refers to the use of ICTs to contact other researchers. On this question we have seen that e-mail is widely used, be it to maintain contact with researchers already known, or to establish contacts with others whose personal details are obtained from some publication, report or reference. In fact, the results of the questionnaire indicate that it is a tool that is used almost routinely. The possibility of maintaining contact with other researchers by subscribing to mailing lists and discussion groups also exists, which allows on-going conversation to be established. The data on this matter show that almost 70% of respondents were subscribed to some mailing list or discussion group, with 52% of those being subscribed to between one and three of these types of services.

In addition to obtaining information for research, a second large group of activities that we consider relevant is related to publication and the tasks of distribution. At the outset we thought that Internet could be a powerful tool to boost publication, given that it allowed anyone to create a website and post any article or research report, theoretically lessening the need to have to go through the review process of scientific journals. In spite of this initial perception, the information obtained from those who responded to the questionnaire indicates otherwise.

We have found that 58.5% of the respondents to the questionnaire stated that they had not published any article in a journal fully accessible in Internet during the last academic year. We have also seen that this figure increases even more if we ask about the publication of articles freely accessible anywhere in Internet, but not scientific journals. In this case, 82.1% indicated that they hadn’t.

One possible explanation of this is that the research groups do not have their own websites yet where they can post articles, but once again the data has refuted this hypothesis. We have seen that the vast majority of the research groups at the URV have

a website for the research group, even if there appears to be a degree of reticence to use them as spaces for publication. This is due to the fact that the path for rigorous scientific publication is through scientific journals that have a review procedure and assure the quality of their articles.

The web pages, as we have noted, are not usually viewed as spaces for the publication of articles or research reports; in contrast, they serve other purposes from providing information about the general lines of the group's research activity, to the presentation of group members and their curriculums or providing their contact details.

In completing this section, we wish to briefly outline our perception of the benefits derived from the use of Internet in research activity. Beyond the use of Internet in various activities, we consider it very important to value the opinion of academic staff on the effect its use has had on their research activity. With this aim, the questionnaire included the following question: "What aspect of your profession, in the research area, do you consider to have most benefited from the use of Internet"? The responses obtained indicated that the aspect most valued is contact with other researchers, followed by the quality of research and, lastly, closely followed by the distribution of research.

Consistent with the data detailed above it appears that the area where Internet is most used and where the greatest benefit is perceived is contact with other researchers, in a broad sense. We can say, then, that Internet is being configured as a powerful tool to interconnect research activity; thus, we can speak less frequently of isolated research activity and must increasingly understand research as an activity carried out in a network of groups and specific researchers that progress, in their research, through constant dialogue amongst each other.

The relevance of Internet in the configuration of research: research topic, mass calculation and communication

Below we present a specific study of the relevance of Internet on three issues: the research topic, mass calculation and communication. We suggest that the way computer tools and Internet have been used in research activity depends, largely, on the specific conditions of the framework in which they are introduced. In this line, each of the cases

that we show below are examples of a specific use of ITCs that have enabled certain aspects of the research process to be strengthened.

Internet as research topic

Amongst the research groups listed at the Department of Pedagogy is the LATE group (*Laboratorio de aplicaciones telemáticas*: http://noguera.fcep.urv.es/). This group currently brings together a combination of people interested in the subject of education and ICTs. At the outset, before the group was called LATE, a number of people were grouped along two lines: computer training on the one hand and experiences of applying computing to teaching, on the other. The group grew from these two lines, defining its subject area and developing new areas of interest.

The URV is quite a young university and its research groups do not have a long track record; however this does not mean that its researchers do not have an established reputation. The creation of the FCEP in 1992 based on the old Escuela Universitaria de Formación del Profesorado de EGB (University School for Training EGB (Secondary) Teachers) and the departmental sections of Educational Sciences and Psychology in the Faculty of Arts under division VII of the UB, brought together in one department lecturers with diverse interests and paths, but also with some common interests. In this context, a number of lecturers interested in the area of computing and teaching grouped together and began to develop some lines of research. It is from here that research on education and computing by the FCEP at the URV commenced.

At the same time, Internet began to enter directly in the Pedagogy curriculum, in compliance with a Ministerial directive that required all Pedagogy qualifications in the country to include a subject on new technologies. This was a difficult task, however, as at the time there was little research activity and academic staff had a low level of training in this area. Thus, a series of collaborations began between universities to help meet this challenge. A network of academic staff interested in the area of new technologies applied to education was progressively established. Subsequently various activities were developed, such as seminars, conferences, specific research projects and even research groups.

Therefore, we can explain the history of the current LATE group by an interest and an initial local activity and then a subsequent network of collective activities that took the form of research projects, leading finally to the formation of an established research group. One of the first projects to emerge from this collaboration was the PUPITRE-NET, a project financed by the Programa Nacional de Aplicaciones y Servicios Telemáticos (National Program of Telematic Applications and Services) of the CICYT, which involved researchers from eight Spanish universities[6] and private companies like ESSI (Ingeniería de Sistemas y Soluciones Internet, S.L.). Its objective was to create a virtual platform to integrate educational resources on Internet (Martínez Sánchez and Prendes Espinosa 2001). The first group formed in 1996 was the Education and Telematic Group (GET) with researchers from the URV, UJI and various computer companies with the objective of implementing a virtual environment for experimental teaching/learning in Internet; develop methodologies and didactic strategies applicable to technological environments for open and distance learning and, lastly, to design quality evaluation protocols for didactic experiences (Gisbert et al. 1997-1998). The LATE group was developed later involving a core group of researchers from the URV and other universities.

Rather than a static entity, this research group has evolved in function of the research interests, incorporating new researchers and new lines of research. For this reason, successive research groups have been formed around a central core with slightly different objectives. In short, we find a new research objective that is still loosely defined that requires the participation of researchers with very distinct profiles, from computer scientists to pedagogues and from business people to researchers involved in basic research. Therefore, this is a group with a clear interdisciplinary nature, an essential characteristic to carry out the type of research contemplated.

Whilst we can speak of a stable core group of researchers, the research activity is not always combined; each researcher has particular interests that lead them to start specific projects, along particular lines, with new collaborators. In this way, an extensive network of researchers on associated subjects is formed that carry out projects in parallel.

As explained above, one of the first activities of this research group was to establish guidelines for the creation of a virtual learning environment. This was an activity of a particularly applied nature that endeavoured to respond to the need to develop applications of this type at a time when the university first considered doing some online

6 Universidad de Murcia, Universitat Rovira i Virgili, Universitat de València, Universitat Jaume I, Universitat de les Illes Balears, Universidad de Sevilla, Universitat Autònoma de Barcelona and Universidad Autònoma de Madrid.

training activities. For example, the group created a proto-type virtual campus that was first used in the URV during the 1997-1998 academic year as a pilot project and from 1999 on as a fully developed product. It should be stressed that some of the people involved were also linked to units of the university that sought educational innovation (the ICE, the SER or the vice-rector of Teaching and New Technologies), and therefore there was a close relationship between the technical and applied activities with those directly linked to research.

Lastly, we must also mention the importance of the sources of financing. The fact that the group's area of focus is of practical interest to the university and other educational institutions encourages the proliferation of financing programs in this area, which facilitates and promotes the group's research work.

In summary, we see that the evolution of the object of research and the agenda of the group are intimately linked to the evolution of Internet, its incorporation in the university and other educational institutions and its growing importance as a research subject. We have included this case here because we believe that rather than being an isolated case, it is an example of the increasingly numerous lines of research about Internet.

Internet as a tool for mass calculation

The Experiments, Computation and Modelization in Fluid Mechanics and Turbulence Group, the ECoMMFIT (http://ecommfit.urv.es/) is made up of approximately fifteen researchers primarily from the Department of Mechanical Engineering, one of the departments attached to ETSEQ of the URV. The main objective of the group is to further the knowledge of the current structures, of their transitions and of the transfer processes of heat and mass, of industrial or environmental interest, through the use of analytical, experimental and computational techniques. The group's specific lines of research are Fluid Mechanics and Turbulence, Heat Transfer and Excess, Environmental Flows and Computational Techniques.

The researchers at ECoMMFIT made several points when we asked them about the advantages of using Internet in research activities. For example, they spoke of the ease of maintaining relationships with a very wide range of researchers and having more frequent contact; something which enabled the activity of other research groups to be

monitored more closely, as well as activities that occur in the research areas, such as conferences, day sessions, etc. They also referred to Internet's potential with respect to mobility when recruiting researchers, whether they are pre-doctoral scholars or distinguished visiting researchers. Lastly, they also mentioned the ease of bibliographic searches, the ease of working with people from other countries to co-author articles and how it enables communication with the rest of the members of the group, although this last point is perhaps not the most important advantage in the specific case we are studying because, as they told us, the members of the group have a high level of interaction amongst themselves due to their physical proximity, subject interests and the variety of matters that they share – teaching, management activities related to the school, etc. – and consequently the coordination of research is often dealt with "in the corridors" in a fairly unplanned manner.

If we focus on the research activity however, we see that one of the aspects that characterises this group is the need to make mass calculations, storing and handling large amounts of data. On this point, the members of the group agree that the computer tools and the generalisation in the use of Internet has brought about some changes in their research activity and given them a very important advantage: growing autonomy.

Some years back the fact that they did not have the computer power necessary for mass calculations and data storage was basically resolved in two ways. They depended on centres such as the CESCA (Supercomputing Centre of Catalonia), which offered supercomputing services to research groups. Secondly, collaborations and agreements with other research groups were strictly necessary to meet the costs of certain installations and equipment. The use of these facilities was shared, combining the activity of various research groups in accordance with their needs.

Currently, the evolution of computing tools has led to a constant fall in the cost of computing resources and consequently the need for agreements with other groups has diminished. In addition, the power of the computers has increased and they now occupy less space, reducing the dependence on large calculation centres, but not eliminating this need in any case. As one of the researchers explained, certain calculations that previously had to be done with large processors that could only be found in large calculation centres can now be done on a desktop PC. Moreover, these desktop PCs can store large amounts of data, making them much more accessible to the individual researcher.

The growing autonomy derived from the evolution of computer tools is therefore clear. This greater autonomy also favours changes in the type of research and in the teaching been done. As one of the people involved explained, “Before there were people who dedicated their entire thesis to calculate one equation that can now be done in 5 minutes” (Interview 3/12: 190-192). In the area of teaching they told us, “before there were some things that could only be taught in the fifth year because this was when the students received a password to access the calculation centre. Now the same things can be done in the first year with PCs” (Interview 3/12: 193-196).

In summary, according to the people involved, the development of the computer tools and the Internet has brought greater autonomy for research groups like the ECoMMFIT, which has led to great progress in the speed and ease of the research activity and, in essence, a real boost to their possibilities as a group

Internet as media for communication

In the History Department in the Arts Faculty of the URV is the group "Autoecología Humana del Cuaternario" (official name of GREC, or “Quaternary Human Ecology”) which is presented in Internet in the group’s own website (http://romani.iua.urv.es/welcome.html) under the name “URV Atapuerca Research Team”.

This group centres its research activity on the study of prehistoric behaviour and the Pleistocene. In contrast to the opinion of some people interviewed that considered research in the area of Arts to be largely an individual activity, this group brings together a large number of researchers that come from different disciplines and specialisations.

The group is currently conducting various research projects. One of these projects is centred on the exploration of the archaeological site Abrigo Romaní (Capellades, Barcelona) from which the presence and behaviour of the human groups that populated the Iberian Peninsula during the Palaeolithic is studied. In addition, various regional reconstruction projects are underway such as the Gaià-Francolí; the Ter, in the regions of La Selva or el Gironès and la Garrotxa, amongst others. The longest standing project that the group is involved with is the study of the archaeological-palaeontology sites in the Sierra de Atapuerca (Spain), a collection of prehistoric archaeological sites located in the

province of Burgos. In fact, this is one of the largest archaeological-palaeontology digs and research projects in Europe involving many groups and institutions. Specifically, the exploration of these sites is grouped into three large subprojects each led by a different institution: the Universidad Complutense de Madrid, the Museo Nacional de Ciencias Naturales and la Universitat Rovira i Virgili. Each centre has other institutions and research personnel grouped around it. However, as one of the interviewees told us, these three subprojects do not represent three completely separate lines of research. Instead they are related to one another and, in fact, the general research is coordinated jointly with the involvement of the three main centres (Interview 4/10: 24-27).

This is a group with apparent difficulties in the task of coordination, given the large number of people involved, leading us to consider the extent to which the group has used computer based communication, and what where the advantages of using this tool, if indeed it was used.

We could say that the research activity of this group is defined around the excavation activity. As one of the interviewees explained: “We begin from fieldwork and all of us are involved in the fieldwork” (Interview 4/10: 124-125). The excavation at Atapuerca is done over almost two months. But as we noted, the group has other projects, such that the excavation activities overlap and can last for a total period of six months, during which the group is constantly moving. At the outset then this group has an “obliged mobility”, tasks are not divided so that certain people concentrate on fieldwork and others on the analysis of material, but instead, in general terms, we can say that all the researchers are involved in all phases of research.

Fieldwork, however, is not a spontaneous activity, as the excavation requires prior and continuous organisation and planning. Management of the excavation and coordination of the people involved is a process that commences before the excavation gets underway and continues throughout the process and beyond, during the phase of analysis and writing up of the results. In the initial planning period research priorities are established, the specific excavation activities are planned, samples for dating are taken, the people to undertake the excavation activities are determined, the activities they will undertake and the timing for each activity is assigned. In this process there is constant communication between various members of the group and various media are used, from meetings in person to e-mail and telephone conversations.

As we said, this group has an “obliged mobility” due to the characteristics of the activity that they are undertaking, but this is not the only factor that encourages mobility. We must not forget that this is a group with great “social impact” and, consequently, they carry out many promotional activities (conferences, exhibitions, presentations to media...) beyond publications in scientific journals or presentations at specialist conferences. This leads to considerable mobility, particularly at a national level. Therefore, various members of the research team constantly meet up at different forums, making use of these meetings to deal with matters related to the management of research. Beyond this however, the researchers consider the preference for dealing with certain issues directly, in person. For example, one of these issues is the initial planning of research (an issue that is usually dealt with by the three directors of each of the main sub-groups, with the support of some other people). In contrast, there are other actions more related to the day-to-day management of the excavation where e-mail is used and highly valued; for example, finalising the excavation calendar for each person involved. In any event, it is difficult to value the extent to which the use of e-mail has had an influence on the coordination tasks of this group, given that the group has been changing over time, not just in the use of computer tools but also in other aspects.

There is another group of very important issues in the research process: the preparation of results and writing them up for scientific publications. As we explained above, the study of the Atapuerca sites brings together three major research centres. Although there is great coordination amongst these three centres, that work in the same area and need one another to advance, it is also true that each group specialises to some degree, such that the research is partially divided in sectors. This is evident in the publications, where each groups leads a line of publication more specialised in certain results; these are internal publications within each group. Beyond the more specialised publications there are also major publications, research reports, monographs, etc., where the three sub-projects are involved. As those involved explained to us, these publications of a more general nature are normally conceived in the excavation itself and, subsequently, during the first months of winter, when there is no excavation, meetings are held to coordinate their preparation. On other occasions, however, it is necessary to wait until the process of cleaning and analysing the artefacts is completed to see the results, such that the articles are not conceived until later. Lastly, numerous monographs must also be produced for international journals on the Atapuerca excavations, with the entire group involved in editing them. Consequently, this is a long process and various media are used for communication and exchanging information, both in-person and electronically.

According to the people involved, the main advantages gained from the use of Internet related to the communication between the members of the group are more agility in the tasks and greater connection between researchers. Firstly, we see that the use of Internet has led to more agility in specific activities and, as a result, in the entire research process.

Secondly, the connection between researchers has improved. The use of means of communication based in Internet has increased the intensity and communication methods, although under no circumstances can we say that they have replaced certain in-person activities; there are some issues that previously required meetings in person that are now resolved by e-mail. In summary, we can say that in this case Internet is a tool that has allowed the development of the research activity of the group as it has enabled communication between its researchers.

5.5. Conclusions

In this report we have analysed the processes of transformation that have accompanied the incorporation of ICTs at the URV in the context of the Catalan university system. The introduction of these technologies in the everyday life of the university has been progressive and has affected distinct areas to different degrees, as it has not only consisted of the creation of online courses or the introduction of the management of services via Internet, nor just in teaching approaches that combine virtual elements with the lecture hall. Instead it has been incorporated in many applications, used in particular ways according to the profile, the objectives and the interests of the people involved. Naturally, this has been accompanied by changes in the ways all those involved do things, as well as in the ways they organise themselves and communicate, and in the ways of conceiving and carrying out the teaching activity. Evidently, it has also affected how research is done and the creation of knowledge.

We have presented a study that considers this process from a dual perspective: for one part, the policy directives and the strategic vision of the management team and, for the other, the phenomenon of the specific uses of this technology in the different areas of the university.

Firstly we have considered it critical to look at the strategic vision of the management team of the university regarding the different uses of these technologies. Depending on this perspective and, hence, the model of university that is sought, computer applications are incorporated into internal management with a determined functional structure, the policy of the academic staff and their training requirements defined, a provision of the resources required to carry out these tasks is made and a communications policy is also established. This involves, amongst other matters, the issue of how the university is presented in the network, and consequently, in the world. Evidently, these policies have been defined and implemented in different corners of the university in distinct ways and at varying rhythms.

Secondly, we have selected three centres that have, in principle, a different level of integration of ICTs to see how these processes of transformation have taken place in the university. These were the Faculty of Arts, the Faculty of Educational Science and Psychology and the School of Chemical Engineering. From the teaching perspective, whereas the proximity to the online tools at the FLL is limited, the FCEP have

incorporated them as a teaching objective of one subject and in the ETSEQ they not only form part of the curriculum but the ability to use them is fully integrated in the combined objectives that the student has to reach in his academic path.

An initial analysis has allowed us to observe the way in which each centre faces the implementation of ICTs and the factors that mark the differences. We have defined four factors that explain the manner in which each of them has seen the challenge and approached it: the style of the faculty, the technological level, openness to change and their permeability to outside influences.

The style refers to the location and characteristics of the building where the centre is located and its different spaces, the structural characteristics (number of people involved at different levels, number of qualifications offered, number of related departments, number of students enrolled, number of academic staff, budget), the subject area of the qualifications that are taught and the research done, and lastly, the pedagogic tradition. Technological level means the tradition in this area, the level of training, including the evolution of the opinions about the usefulness of ICTs and their risks and/or potential, the individual initiatives for the introduction of ICTs and more specifically Internet, the creation of new roles and new skills, the strategies to meet them and, also, the characteristics of infrastructure and technological material available. The third factor considers the openness to change with respect to institutional policies and initiatives promoted by the university itself. Finally, we have taken into consideration the permeability of each centre to external influences, basically to social demands, specifically in the professional arena, and the students.

This first sketch of the characteristics of the use of Internet in the different centres studied has enabled us to analyse in depth two basic functions of the university: teaching and research. We have studied the processes of transformation in teaching and research from the analysis of two well-defined processes that involve students and the academic staff as well as administrative personnel. The two processes have two quite distinct angles, that of the internal management and the activity of teaching or research.

Firstly we have analysed how ICTs, and in particular Internet, have been introduced in the activities of managing the teaching process. We have seen that some of the transformations produced in the structure and mission of Academic Management and Student Service is based on the introduction of technological tools. For one part, we have

detected a clear willingness to unify all management aspects related to students involving, to a large extent, a constant exchange and transfer of information between areas that has been facilitated by the use of online tools. For the other part, we have seen that the use of this type of tools for communication has not led to the elimination of other modes of communication, but has forced the specialisation of each different mode for various uses. We have detected the intention to improve the attention and support to students by promoting self-management of certain administrative procedures and striving for greater transparency in this type of processes. Another notable aspect that has occurred with the introduction of the use of ICTs in administrative tasks has been a certain revaluation of this area that traditionally had been kept in the background.

In analysing the evolution of this process of change we have observed that the change has been marked by the development of different computer applications. These have changed from being simple applications that automate specific procedures carried out by administrative personnel at the university to the creation of complete services that students can manage themselves. The analysis of this evolution and its repercussions have allowed us to see that, if at an internal level the introduction of ICTs has transformed administrative tasks, the relationship between the student and the university's administration is not as fluid as was anticipated at the outset. Our impression is that the increasing tendency towards self-service has met with a series of difficulties, the most important one being a certain rejection by students who do not see why they should use these tools; they view it as an imposed need and in addition, very often they do not have the necessary resources to use them. In short, there are some administrative services that have been designed from the perspective of a distance education model which are not received positively when applied to models of campus-based teaching.

Secondly we have observed the use of Internet in the teaching activity, taking into consideration the infrastructure and resources available, the support that academic staff receives from the institution, and the real experience of all the people involved. The shortfalls in the provision of technology becomes a key argument when academic staff justify why certain practices are not introduced into the teaching activity and when we verify the disillusionment of people that would do so but lack skills in this area and need support to do so. However, in each of the centres there is a group of lecturers willing to work on these subjects, with sufficient ability and motivation to set about the process of virtualisation and introduction of ICTs in teaching. The second important point in our analysis is the support that the institution gives to the academic staff in the area of teaching. On the one hand, the university creates a resources service (SRE) through

which academic staff have access to the material, human and technical resources required to incorporate ICTs in teaching and promote a wide range of courses through the ICE; on the other hand, research activity is rewarded to the detriment of teaching and consequently the priorities of academic staff are clear: training, dedication and innovation in the area of teaching ends up in second place. The result of this situation is that only a minority of people participate actively in the training activities and request the necessary support to carry out specific tasks; they are very often the ones who find it easiest to use the online tools and undertake innovative projects in this area.

Finally, with respect to teaching practice, we want to emphasise the fact that the use of Internet in this area is very limited, except for a few exceptions. For their part, the academic staff basically limit themselves to providing a page of internet links on the subject, responding to queries by e-mail, allowing assignments to be presented in digital format and publishing the student qualifications on the website. The students, for their part, often induce the academic staff to make changes in the traditional practices; the students entering university are increasingly familiar with this type of technology, they have previous training that is increasingly adapted to the new conditions and, in addition, they are very conscious of the need to prepare themselves for their professional future.

We do not want to complete this reflection about the changes that are occurring in the teaching activity without referring to the close link between the use of online tools in learning activities and innovative teaching strategies from a pedagogic perspective. Based on our observation, the majority of people with a more technological background are those that respond most positively to initiatives of support for teaching and they are enthusiastic about leading innovative initiatives in the lecture halls; for their part, people who are very dedicated to the activity of teaching see the need to use ICTs as a learning resource and they consider incorporating basic skills in their use within the objectives of the subject they teach.

One of the aspects that we highlight in the analysis of Internet's relevance in the activities related to the process of carrying out research, has been the difficulty of this task. As we indicated, this difficulty stems from the fact that in this area Internet is used intensely. Whilst in the teaching processes not everyone uses it, and where they do, the uses are limited, the use of Internet in research is fairly widespread and we find that searching for information and communicating with other researchers are amongst its main uses. In general, the data appears to point towards an increasing connection between researchers and research centres that, consequently, leads us to discard the idea of an

isolated researcher carrying out his own research activity disconnected from the line of research in which he is involved.

We have also analysed the relevance of ICTs in administrative activities related to the research process and, in particular, the repercussions of the use of a computer application that has become a key instrument in implementing the University's lines of scientific policy and in the configuration of its research activity. One of the most notable aspects of this application is the fact that it places special importance on the group as the basic entity of the organisation for research. Therefore, it favours a policy of supporting certain research, which has principally benefited those that had already opted for this organisational framework.

The analysis of three specific lines of research has allowed us to see the extent to which Internet plays a fundamental role in the development of the research activity currently taking place in the university. In particular, we have verified that the impact of Internet is different, depending on the disciplines, the areas and the organisational framework that is used, amongst other things. In many disciplines Internet is becoming a subject of research in its own right; that is, we are witnessing the birth of a new area of research where the object of study is Internet; in other disciplines, the development of computer tools and Internet has led to greater autonomy of research groups and increased their potential; lastly, it has also been a tool that has allowed the development of the research activity of groups that are highly mobile and have a considerably complex organisational structure.

Thus, we need to place the process of incorporating online tools in the URV within a framework of the Catalan university system, with shared strategies and projects, submitted to the processes of transformation occurring in today's society and, in particular, in the educational arena. The short history of the university and, hence, the limited importance of tradition, as well as its size, has meant that the penetration of these technologies has been relatively easy, at least at a practical level, and has accompanied the growth and consolidation of the institution. In this respect, the vision and strategy of the management team has been critical, as they have strongly supported the use of technology in different areas. Can we say that this use has structurally changed the activities of training and research at the university?

Based on this study, which represents an initial look at the problem put forward, the use of online tools has changed certain habits of most academic staff although essentially, it has not modified the objectives of the subjects that they teach, nor their method of teaching; online tools are only used for very specific tasks that, really, improve the effectiveness of the process. Students, on the other hand, demand new ways of doing things but, with only a few exceptions, continue being a passive element in the pedagogic model. Use is much more intensive in research activity and the changes affect both the subject focus, as well as the procedures, the ways of communicating and the channels for distributing research results. The process is really complex and its evolution points towards a profound change in the model of higher education, in line with the economic, social and cultural changes of this Catalonia of the 21st Century.

Chapter 6

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