Technology and Services: Cars and Assistance for E-Learning Roadmaps

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Abstract

ELViRA, the University e-learning network of Verona, has been growing, but its context also needs to be well-designed. Thus, after the starting-up phase, intended to define the strategic planning and service models for the project, follow-up efforts will focus on service analysis. In this account we will describe the planning of these. To do this, we will identify a development structure and the required skills, and assign typical roles to them structuring the different activities of an e-learning roadmap for an organization. The service analysis reported in this paper also addresses the costs involved, whereby cost drivers are identified and ranked according to their growth behaviour. The launching of a University e-learning centre is expected to provide a definite start to the implementation of the University e-learning policy. The first objective of the centre will be to support and to promote the activation of a series of pilot courses, thus focusing on content production and experimentation. Their online availability will be possible also thanks to the ELViRA network architecture, designed and structured according to security and stability requirements that prove fundamental in guaranteeing the continuity of the target e-learning services.

1. Introduction

What is e-learning? Whatever the answer might be, it is not only a matter of technology as past experiences show [7]: large investments in state-of-the-art systems lavishly designed to provide simultaneous high definition broadcasting inside virtual classrooms have failed when they come up against the users’ unwillingness to use non-traditional educational frameworks. It simply failed to change teaching experiences. Where did we make strategical errors? What has been happening? Many factors do influence the acceptance of e-learning systems.

From an abstract viewpoint, the adoption of an e-learning context needs to be viewed as a “motion strategy” within a space (the organization itself): the motion strategy drives following the roadmap towards the final point, i.e. the full adoption of an e-learning framework.

As sketched in [1], one main feature is necessary for such adoption: the human factor. It is the human “user” who can “avoid obstacles” along the path towards acceptance and provide the “potential” to drive the organization step by step. And, of course, it is the human who drives the “car”.

In other words: no movements are possible, even for the most powerful car, when the driver is missing.

Furthermore, when an organization centred strategy is lacking, various “drivers” are willing to drive “different cars”: it is well known what happens in our cities when the transportation context is (even momentarily) missing. Regardless of the different cars we see around, they are all suitable for well-designed roads and drivers can obviously understand well-designed traffic signals.

It is not a duty of the organization to force users to adopt a precise car, i.e. a precise e-learning framework. Rather, the organization must establish a set of requirements in the field: cars and drivers only need to conform to those features to be able to run.

Cars need facilities as well: can you imagine a car that does not need any refuelling, mechanical work or whatever else during its life? The motivation for e-learning services is this: providing facilities for the various actors an e-learning context can have.

In this paper we would like to address the “facility” context, providing examples of e-learning services that can be set up in the field to help the organization in getting the most from an e-learning framework.

In Section 2 the phases, skills and roles are outlined which are required to implement a successful e-learning service model. Its realization is considered in Section 3, where the launching of an e-learning centre is described as a starting point of the University e-learning policy. Section 4 takes into account the network architecture adopted for the ELViRA services. Section 5 looks at the perspectives of future research into the e-learning university context. Brief conclusions are drawn in Section 6.
2. E-learning services management: phases, skills, roles

A successful e-learning system involves a systematic process of planning, design, development, evaluation, and implementation to create an online environment where learning is actively fostered and supported. An e-learning system should be meaningful not only to learners, but also to the whole set of stakeholders, including instructors, support services staff, and the institution itself. Therefore, people, processes and products play fundamental roles in the e-learning services management and development.

2.1 The phases: planning, design, implementation and delivery

In this section an e-learning services development model for a generic course is presented. For the sake of simplicity, the model is organized in a four phases sequence. Each one of which is characterized by the professional expertise needed to address its specific activities.

2.1.1 Planning

This phase is typically focused on the development of the project plan, by means of an analysis of the people, processes and products involved in the e-learning initiative. This plan should be pedagogically and economically effective and should therefore guide all the groups involved to help them carry out the tasks they need to do. The result of the planning work must be monitored during the different phases of the whole process: planners, developers, auditors, learning and support staff need to adhere to the previously established guidelines to implement a quality framework for the learning environment.

2.1.2 Design

The coordinator of the research and planning activities guides the design phase of the process. He is both responsible for the pedagogical effectiveness of course content and for the choice of a suitable means of delivery, forming his assumptions with reference to student needs. Taking into account the course objectives, he can design different ways to evaluate user knowledge. According to the contents category, he will choose the best educational strategies and the most effective technical solutions related to the reference target. In addition to this, he will provide a user-friendly learning environment for students. The final product of this process will be the storyboard.

2.1.3 Implementation

During this phase the online course is implemented, starting from the storyboard which emerges as a result of the planning phase. This phase requires the work of different experts: the LMS responsible, the programmer, the graphic designer, the multimedia developer, the video operator, the learning object expert and the quality expert responsible. Each of these team members will contribute to the production of the course materials, which must be ready for use, before the system is tested.

2.1.4 Delivery

This is the last phase of the project management. The central role is played by the e-learning administrator, who manages the learning platform and the tools chosen for use by the educational services. The administrator is assisted by technical and methodological experts: the former manage hardware and software resources and services offered by the LMS; the latter give different types of support such as cognitive, organizational and educational consultancy.

2.2 Roles and skills: the managing group

The e-learning project management requires the approach adopted by the workgroup to be systematic and integrated. The group should be made up of experts who are able to guarantee the quality of the system and back up for problem solving. It should also take costs into consideration, define roles and duties, and check progress, resources and hardware maintenance. Every single activity has to be planned, taking into account the person’s availability and their particular skills.

2.2.1 People and resources

An e-learning project involves people that have different expertise, knowledge, experience and skills. The managing group should also clearly lists roles and responsibilities, specifying who does what. It should organize the staff in such a way as to guarantee everybody’s collaboration and cooperation. The effective management of an e-learning project requires a good communication level: a knowledge of management systems could be a useful way to share information. We cannot forget that the success of an e-learning initiative also depends how capable we are of using the resources, which are available inside and outside the organization, thus deriving the maximum benefit.
2.2.2 Cost drivers’ analysis

The managing group must know how to design and respect a costs budget, including all the expenses related to an e-learning project. In order to design a precise costs budget, all the expenses involved need to be identified, focusing attention on factors which can increase (or, rather, reduce) the costs. During a course-study lifecycle it is possible to define three different phases where costs are involved.

1. **Production**: starting investments (LMS, courseware, buildings) that will be offset in the long run. The increasing speed of the training rhythms for e-learning courses entails a decreasing time span for this phase, thus giving rise to a rapid growth in the costs at this phase.

2. **Delivery**: in this phase the maintenance costs and the general running expenses (material, technical support) are concentrated; these costs grow more slowly than the production costs thanks to the power of technology.

3. **Evaluation**: this is related to three different evaluation levels (educational, assessment, organizational) that, from the point of view of the costs, have the same characteristics of the previous phase.

Taking into consideration a generic course, Table 1 depicts the results of a qualitative analysis.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activity</th>
<th>Cost driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Organizational production</td>
<td>n. of reports</td>
</tr>
<tr>
<td></td>
<td>Didactical production</td>
<td>n. of learning objectives</td>
</tr>
<tr>
<td></td>
<td>Equipment</td>
<td>n. of software</td>
</tr>
<tr>
<td></td>
<td>Digital contents’ production</td>
<td>n. of types of templates</td>
</tr>
<tr>
<td>Delivery</td>
<td>Education</td>
<td>n. of specialization hours</td>
</tr>
<tr>
<td></td>
<td>Marketing</td>
<td>n. of contacts</td>
</tr>
<tr>
<td></td>
<td>Motivation and involvement (participation)</td>
<td>n. of questionnaires to carry out</td>
</tr>
<tr>
<td></td>
<td>Tutoring</td>
<td>n. of educational events</td>
</tr>
<tr>
<td></td>
<td>Technical support</td>
<td>n. of assistance weekly bandwidth</td>
</tr>
<tr>
<td></td>
<td>On-line educational activities</td>
<td>n. of reports</td>
</tr>
<tr>
<td></td>
<td>Archives’ management (administration and finance)</td>
<td>n. of requests</td>
</tr>
<tr>
<td></td>
<td>Organizational support</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>Educational assessment</td>
<td>n. of educational tests</td>
</tr>
<tr>
<td></td>
<td>Learning assessment</td>
<td>n. of evaluation tests</td>
</tr>
<tr>
<td></td>
<td>Result assessment</td>
<td>n. of result tests</td>
</tr>
</tbody>
</table>

3. Service realization

3.1 The university e-learning centre

The University of Verona belongs to the 10% of Italian Universities which does not have an e-learning centre but has a central structure supporting the ICT adoption for educational needs. This structure, with relatively limited additional efforts, could extend its services to cover also the e-learning area, becoming one of the University e-learning providers. The real growing perspectives of the Italian e-learning market during the last year, brings to intend that other Universities will move towards this direction: for these reasons, acting promptly seems to be very important to maintain a significant quote of the national and local market.

3.1.1 Objectives and strategies

The University e-learning centre aims to recommend the adoption of technology-enhanced educational methods, to implement the learning policies of the University. The desired innovation is intended to extend opportunities to access the educational services and to improve their quality, usability whilst, at the same time, answering real educational needs. The starting point is the definition of a University policy, which focuses on some strategic principles [1], fundamental if the adoption of technology is to become effective in achieving quality in the learning services, in its territorial spread, as well as in being economical from a management point of view. The need for an e-learning structure is justified and understandable: it is a need which must be met in a very short time. The urgency of starting the construction of the centre is dictated by some very basic considerations:

- taking part in a foundation, named Univirtual, which comes from an idea developed by seven public Universities in the Triveneto area, in order to integrate resources and expertise common to all the aforementioned Universities.
- having an autonomous local structure designed to spread the e-learning service exchanges among the different structures in and outside the University.
- having the right approach to promoting and documenting the University e-learning policy, when compared to those of the other local Universities.

Obviously, is very important that such a structure does not limit itself to acting as a typical service centre, but
also develops a significant profile in terms of research about methods and technology-enhanced learning. Research and services need to have, in short, two orthogonal directions of characterization and development of the work in the centre that we hope to create and develop.

3.1.2 Categories of the learning services

A preliminary classification of the learning services becomes helpful in exploring the variety of services managed by the e-learning centre. The proposed categories of the online educational services are:

- triennial courses
- magisterial courses
- I and II level masters
- specialization courses
- life-long learning courses
- research learning courses

3.2 Pilot courses activation

It is obvious that the practical reasons that make online educational facilities interesting to different types of students, like students in full time employment, students who live far away, disabled students, etc., mean that what is needed online is an entire course on the Network. It is a matter of topical interest to identify those courses that, past experience has shown, enable us to predict the realization of such a learning paths in a short time and at a reasonable cost. Promoting e-learning at the University of Verona does not concern only institutional or online education. In fact, the first condition is exceeded by the fact that the only kind of deliverable online courses are Masters and training courses for secondary school teachers, the second condition is exceeded by the comprehension of the difference between distance learning and online learning, where the latter is one example of the former. It must be seen to be also a blended approach, a type of approach which is considered to be one of the most effective learning modalities for achieving high quality didactic objectives. Our services aim to create an environment where specific online projects may be developed and promoted, both related to undergraduate courses and to post-graduate and life-long learning courses.

3.2.1 Modalities of the learning courses

At our University, the experimentation of educational activities with e-learning methods and technology, even if limited to a single discipline and on the initiative of a single teacher interested in it, involves different modalities. Our idea is aimed at promoting and extending our work economically and consistently with the learning objectives of every single discipline and of the courses that are a part of them. Consequently, we would like to address our efforts to cataloguing whole courses offered online by our University. In fact, this “online entirety” is conditio sine qua non for the attendance of the course, especially if the users are disabled persons. For this reason the requirements necessary to consider e-learning activities as being at a sufficiently developed stage as to be included in the online educational options available are:

- Third generation distance learning: strictly known as e-learning, it differs from the traditional distance learning because, by means of interaction with teachers, tutors and other users, the student becomes an educational path actor, not only thanks to the web content support.
- Availability on the web of content supporting lessons and/or exercises;
- Availability of human resources able to guarantee a good interaction level with students online;
- Availability on the web of technical and administrative services supporting both the development of learning processes and their integration with other services of the University network;
- Accessibility of the service in keeping with the more advanced technical norms.

3.2.2 Development of online courses

The learning services already existing for the courses which have been developed to a sufficient extent as to be included in the university catalogue of the educational options include some post-graduate life long learning courses. An initial list of courses which have been proposed as a starting-point for the production and experimentation of learning content, aimed at developing both new undergraduate and post-graduate courses, is described in the Table 2.

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**Table 2. Development hypothesis of new online courses for the years 2005-2007**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Type</th>
<th>Faculties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>Undergraduate</td>
<td>Science &amp; Economics</td>
</tr>
<tr>
<td>Preventative and Adapted Motory</td>
<td>Graduate course</td>
<td>Exercise and sport science</td>
</tr>
<tr>
<td>activity Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intelligent and Multimedia</td>
<td>Graduate course</td>
<td>Mathematical, Physical and Natural</td>
</tr>
<tr>
<td>Systems</td>
<td></td>
<td>Science</td>
</tr>
<tr>
<td>Design and Realisation of highly</td>
<td>Graduate course</td>
<td>Education</td>
</tr>
<tr>
<td>complex social service operations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The choice has not come about by chance but as a result of the following factors. In effect, the three-year degree in applied mathematics is mentioned first because, starting this year, it represents the ideal course to use experimentally online, since it is a matter of only the first year discipline which needs to be implemented. Besides which, it could provide the Mathematics Science with the right input, attracting the students attention. The fourth proposal is an idea which comes from the Educational Science Faculty, one of the first to be interested and involved in e-learning. The proposal by the Motor Science Faculty has grown out of previous experiences in different e-learning modalities. Both these last two degree-courses cater for public organizations to also be involved socially and locally in order to attract sponsoring. The content delivery of the course about intelligent and multimedia systems already began in 2004 and is likely to be continued. The reasoning behind the final three Master courses is different; the Motor and Information Science Masters are attracted by the opportunity of reusing the content already implemented for the degree-courses proposed above. The Educational Science Master has two reasons: experimentation of blended e-learning activities in the last edition of the Master as well as the specificity of the skills which are developed, and which are useful for other e-learning work.

### 4. Network architecture

To guarantee service availability and choice of platforms, ELViRA services are implemented through a network of servers, where many of the available platforms can be evaluated and services can be moved to compensate temporary higher loads due to one particular course.

#### 4.1 Movable services

The backbone of the ELViRA’s network is a group of web servers with central storage, to ensure both data backup and fault tolerance. All ELViRA services can be moved from one server to another by a simple procedure, to allow transparent server maintenance and quick (if not automatic) failover. The server management guideline is to provide as much fallback as would be expected by presence learning structures: should a classroom have some kind of problem, teaching activity would go on somewhere else. By giving administrators the ability to assign one or more services to a single server and to move them between the servers, ELViRA services can also be redistributed according to load peaks, even on an hourly basis (e.g. if one service is used during the morning as a support for one course while another one is used in the evening by life-long learning), to allow the most demanding service to always run at the best possible performance levels.

### 4.2 Software platforms

ELViRA’s approach towards the choice of software platforms has been made in order to allow for evaluation and testing, and to support customization and in-house development, the only constraints being content reusability and standard compliance. To allow customization and prevent vendor lock-in, the usage of Open Source solutions is highly encouraged, where possible, while the use of Open Standards will become a basic requirement for all the content provided by ELViRA. Together with service providing, new platforms are constantly being evaluated by the ELViRA staff, both from a technical and a pedagogical point of view, to avoid gaps between the services provided and the current technology. Every evaluated platform must be smoothly integrated inside the University central information systems, which provide a uniform authentication method, so that once students are registered for administration purposes, they are also provided with access to all the information services available.

### 5. Future work

The next few years will pose growing challenges for the ELViRA team, as the trend towards distance and asynchronous learning is accelerating. This will mean both that the information infrastructure will become more and more vital for our University and its teaching work, and that more and more traditional course procedures will have a correspondent on-line procedure. At the moment, a relevant part of the administrative part of a student’s career can be processed online through various parts of the University website. Some courses can be held both as online courses and in presence, and there has also been a thesis discussion for the first time via videoconference systems.

#### 5.1 Resiliency
Relying heavily on information structures implies constant service quality monitoring and both high availability systems and quick recovery from disasters. A network problem or a component failure can result in many hours of interrupted services, in loss of confidence of both students and teachers, in financial loss (e.g. if a failure interrupts a synchronous event, like a conference or a seminar with paid speakers) and in organization problems, if a planned online exam cannot take place. Hardware failure may result in data loss and in long recovery periods, if there is no planned strategy for this kind of event. ELViRA’s implementation for the next few years will be as resilient as possible, preferably by means of its “resilient design”.

5.2 Relaxing the space constraints

By creating an online counterpart for every process or part of a University, most of its spatial constraints will become unnecessary. By Italian law, exams cannot be held if the identity of the student cannot be verified. Combining face recognition with videoconference systems and electronic identity cards (based on PKI), exams could be held in a way which is compliant with current laws, allowing for spatial constraints to be even less of an issue. Platform integration will have to be combined with standard authentication and certification services, and protected communication. A University centre for e-learning will be important to guide all the stakeholders through this process and design unified policies for this kind of innovation.

6. Conclusions

The metaphor of cars and assistance represents an alternative way to highlight the choice to follow the services direction. The motivation is to provide facilities for the diverse actors an e-learning context can have and to help the organization in getting the most from an e-learning framework. Examining phases, skills and roles necessary to implement a successful e-learning service model, we have presented our realization, built on precise learning objectives and strategies, but also on practical solutions, planned in the short and long term.

7. References


