



E-LEARNING PROGRESSION AT POLITECNICO DI MILANO

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Abstract: This paper is a case study on the progress of the e-Learning activities at the Politecnico di Milano. It uses a balanced scorecard (BSC) worked out by the French, Italian and Polish university teams involved in the European eLene-EE project. Our aim is not only to describe the trend but also to evaluate the accuracy of the BSC in strategic and operational management for e-Learning activities.

Key-words: e-Learning, management, higher education, balanced scorecard, strategy, control.

Introduction

The main purpose of this paper is to answer for the period 2004-06 in the context of the Politecnico di Milano the questions: Are e-learning activities progressing? And if yes how are e-learning activities progressing?

To reach these objectives, we choose a particular way a Balance ScoreCard (BSC) that provides information for managers.

This BSC, adapted for e-Learning activities in High Education Institution, is inspired by KAPLAN R. S., NORTON D. P. (1997). They developed a scorecard, which gives a balanced representation of the life of a company by combining the indicators from 4 perspectives: financial, customer, internal processes and organisational learning.

Bring into our e-Learning context, the BSC used adapted the 4 dimensions detailed into specific indicators. In the most summary form, we should present it in the table below:

Financial	Customer / Student
1. Proportion of expenditure of the establishment allocated to e-learning (general running costs, investment and maintenance of investment) 2. Proportion of profit generated by e-learning in relation to total profit.	1. Proportion of students enrolled in e-learning/ Mixed formula/ enhanced face to face in relation to total numbers. 2. Proportion of instructors using e-learning/ Mixed formula / enhanced face to face 3. Proportion of courses offered in e-learning/ Mixed formula/ enhanced face to face 4. Number of complementary Internet services offered (administration, CROUS, library, leisure...)
Internal business processes	Learning and growth
1. Pedagogical matrix: Proportion of digital media available and rate of evolution per category in terms of media and tutoring offered. 2. Infrastructure dedicated to e-learning measured in terms of capacity and charge rate for the servers, network and staff. 3. Training: Proportion and average number of training hours followed by the student, administrative staff and teachers in the use of e-learning tools. 4. Degree of overall satisfaction with e-learning on the part of e-tool users.	1. Degree of university participation in an e-learning related event (all types of communication). 2. Number of national or international e-learning projects organised by the university. 3. Number of new e-Learning partnerships with public or private organisations.

Table 1: Balanced scorecard on e-learning development in higher education (full version in appendix)

This work was done in the “workpackage 3 (WP3)” of the eLene-EE¹ project. It is one of the three projects of the network named “eLene”² for “e-Learning network”, funded by the European Commission in the framework of the e-Learning programme.

The three partners involved in WP3, the Polish Virtual University³, the University of Nancy 2 and University of Nice Sophia Antipolis on behalf of the CANEGE consortium⁴ are all in the emergence and structuring of their model of learning via the Internet. They clearly need to show, within their own establishments, how their e-learning activities are progressing. All eLene-EE partners collectively decided to focus the study on higher education establishments and to adopt a resolutely managerial approach in a European perspective.

This decision was taken because e-learning activities brought important stakes for the future of higher education establishments, and there is an apparent lack of tools to monitor the development of e-learning activities. Consequently these changes will lead to more and more changes in the way university operates. Universities will find themselves in an environment in which information circulates faster and where changes with a financial impact occur more quickly. The management, solely based on an annual budget with a balanced distribution of resources, will be insufficient to have an accurate management in an environment where changes will inevitably accelerate. So, WP3 focused efforts on a Balance scorecard approach.

Now through the BSC elaborated in the eLene-EE WP3, we will present the case of the Politecnico di Milano. From historical aspects, strategic aspects and Impacts and issues, we

¹ For further information, please see the website: <http://www.elene-ee.net/>

² For further information, please see the website: <http://www.elene-centre.net/>

³ Marie Curie Sklodowska University in Lublin, on behalf of the Polish Virtual University

⁴ University of Nancy 2 and University of Nice Sophia Antipolis on behalf of the CANEGE consortium.

should be able to draw the e-learning evolution observed from 2004 to 2006 in our establishment. We will conclude our paper by a discussion on the BSC interests.

Historical aspects

The Politecnico of Milan has been between the first Italian Higher Educational Institutions investing in e-Learning. In 1995 Politecnico decided to focus e-Learning activities under specific staff by creating a Centre devoted to this aim: The METID Centre.

METID is devoted to the ***development and adoption of innovative tools and methodologies in university teaching***. In particular it promotes support for teachers in didactical innovation via the use of computer, multimedia and telecommunications technologies. With this aim METID realized, developed and maintained videoconference for enabling students to follow lectures in all Politecnico Campuses without the need of travelling. For instance, the “Laurea On Line” is a degree in Computer Engineering and it is the first Italian university degree totally online. The project started in 2000, and the first students completed their studies in July 2003. A great attention has been posed to guarantee an high level didactical offer: teachers and tutors are exactly the same of the face to face course as well as programs and examinations. In the year 2007 more than 450 students are enrolled in this online degree.

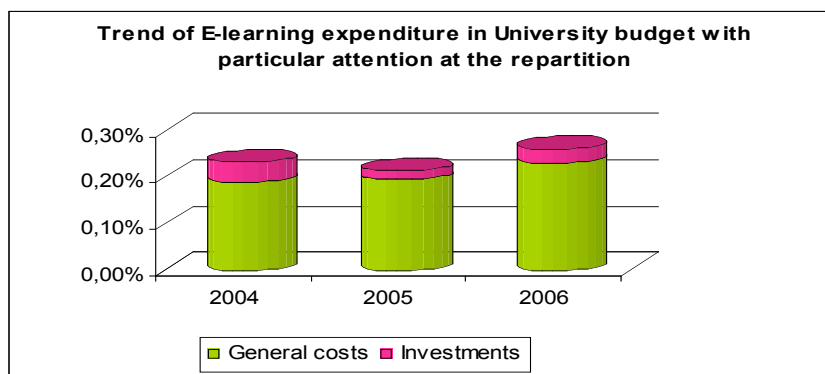
In 2005, METID has also taken care of multimedia and technological aspect in several projects addressed to new targets: schools, enterprises, inclusion of special contexts (prisons, people with disabilities, etc.). These projects have been developed in partnership with subjects external from the University: Ministries, Regional or local administrations, private companies or other kind of associations, like Syndicate, No profit Associations etc.

Currently the Politecnico is developing e-Learning as a strategic support in three different directions: increase of the quality of the traditional didactic activities, development of new extracurricular paths (particularly in the order to develop Long Life Learning) and the development of international projects. Particularly in this last direction e-learning seems to be a very strong mean for the enhancement of the internationalisation process of the University

Strategic aspects (Financing and Internal Business process)

Focusing on the last period, data show that the absolute value of expenditures increased a lot between 2004 and 2005 raising from 951.000,00 € in 2004 to 1.501.000,00 € in 2005 and has decreased to 1.280.000,00 € in 2006. The reason of this trend is linked to the fact that a consistent part of investments in e-learning are connected with projects funded by External Institutions that float each year according to the different settings of the context.

As shown in the Graph 1, the proportion of these values respect the University expenditures is variable as following: 0,23% in 2004, 0,21% in 2005, 0,26% in 2006. The expenditures are concentrated in “General costs” that concern, in particular, staff costs. In fact, the conception and realization of an e-learning project needs a strong human resources engagement in multimedia, software and methodology development and, moreover, a detailed activity of management and monitoring along the whole didactic path. Between 2004 and 2005 there has been a strong increase in expenses for human resources that arrived over 1 million of Euro, this because in late 2004 the staff increased significantly after the inclusion of the e-learning department of a dissolved consortium in which Politecnico was partner. The proportion of this increase has not been so evident (is equal to 0.01%, passing by 0.19% to 0.20% in 2006) because “general costs” as well as “annual costs for e-learning” have had a similar rise in 2006.



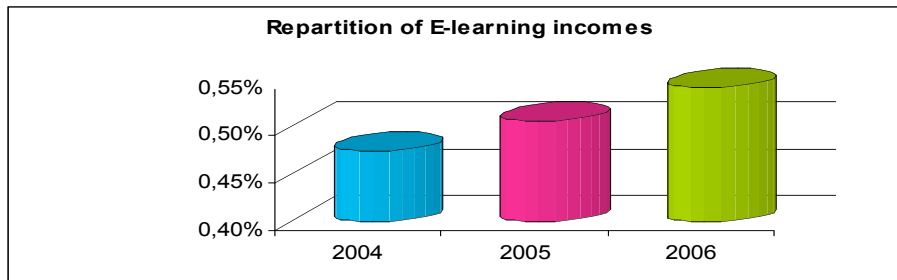
Graph 2: Trend of e-learning expenditures respect total Politecnico expenditure

On the other side the investments amounted at 180.000,00 € in 2004, decreased to 130.000,00 € and raised again to 155.000,00 € in 2006. This because in 2004 a big effort has been done for enhance the hardware and software equipment for supporting the increase of staff and the growth of the e-learning projects: the percentage of investments arrived to 0,04% of e-learning expenditures in University budget. This effort had a little slowdown in 2005 (the percentage of investments drops to 0,02%), because the purchases of the previous year covered a part of the projects requirements 2005, and began again to raise the following year (in 2006 the percentage of investments raise to 0,03%).

Analyzing the incomes in the last three years period (2004-2006), we can recognize a constant increase in the amount of incomes by the University in e-learning (See Graph 2). In fact it grows from 1,354 million of Euro in 2004 to 1,763 million in 2006 with a particular strong rise between 2004 and 2005. These values represent, respect the total University budget, 0,48% and 0,54% respectively: the BSC graph shows this trend very clearly.

In fact, e-learning development is funded by a variety of resources: part of them comes directly from the University but most of them are external, from public institutions or private organizations. It's important to highlight this situation because annual e-learning activities are strictly linked to the origin and the amount/quantity of financing. In 2006, for example, the change of the Italian government, linked to a reorganization processes in the public institutions, caused a temporary slowdown in the economic flux about new projects. This lack is not evident in the total amount of the e-learning incomes (that continues to raise also in 2006) because it has been compensated by the proceeds of other new internal incomes as the extra fees paid by the students of the online degree on Informatics Engineering that before 2006 were cashed in by an external partner who partially funded the initiative.

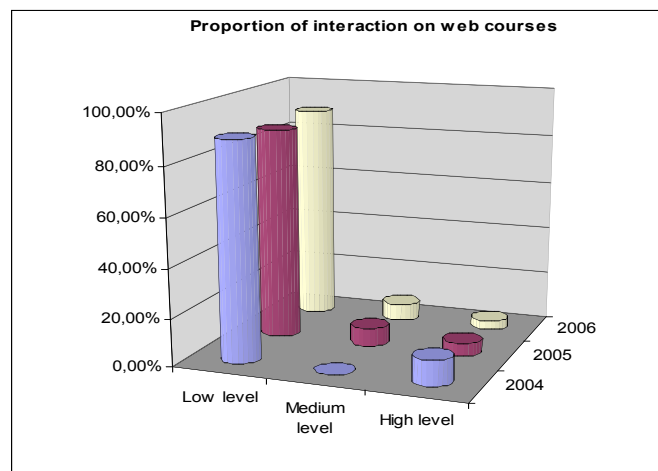
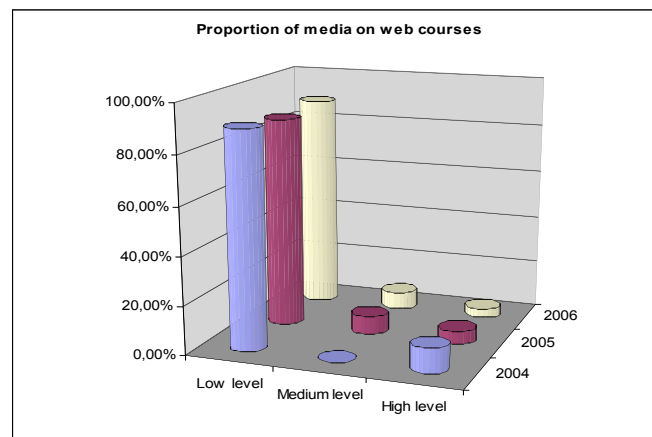
It is interesting to remark that the percentage of e-learning incomes in University budget is significantly higher than the incidence of expenditures: the best rapport has been reached in 2006 with a percentage of e-learning incomes in University budget of 0,54% and a percentage of expenditures of 0,26%.



Graph 2: Repartition of e-learning incomes

Let us now analyze in which directions University expenditures in e-learning are directed to.

The first and more relevant direction is the development of standard services offered to students. In particular improving services that work as support to didactic activities, like platforms for sharing materials, course formats, help desk.



Graph 3: Proportion of media and interaction on web courses

As showed in the Graph 3, the highest value of courses correspond to courses with low level of media and interaction (provided by the Learning management System that supports face to face Learning): in both cases the percentage was around 89% with a little drop off in 2005. In this year, the percentage reached 87,11%, even though the absolute number increased between 2004 and 2006 (low level courses represent quite the totality of web courses for every year, so the proportion is still similar). All these courses are offered through a Learning management System accessible by students, that use their enrolment number for entering, and by professors who have a personal area where they can activate their course and enrolled the students who have this particular course in their curriculum. The platform COL (Corsi On Line) is today a standard service offered by the Politecnico to students and teachers that can reach the whole university community.

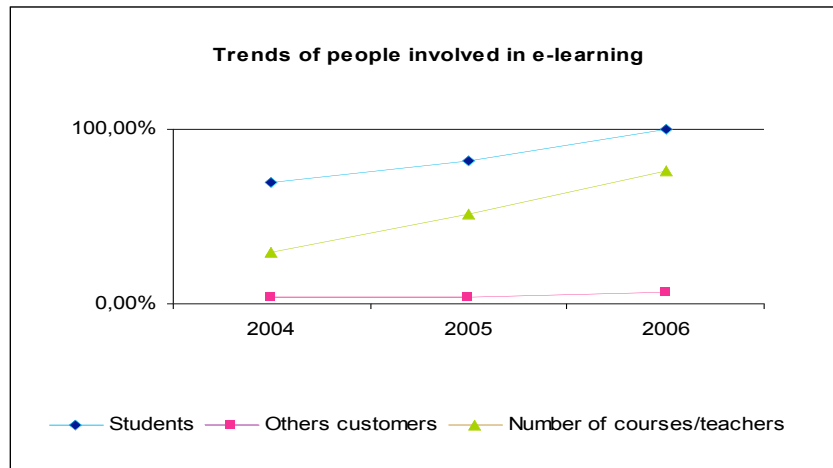
The rate of courses with medium and high level of ICT integration remains low but they are very important as situations where innovative solutions may be tested and develop for being in the future integrated in the standard services of the University. The number of courses with high level of media and human interaction has raised during the last years even if they represent a little portion of the total number of web courses: moreover, their rate has decreased from 10,45% in 2004 to 3,64% in 2006 because of the parallel relevant growth of low level of media and interaction courses provided by the University.

Most important courses with medium level of ICT integration have been activated are the blended Masters and extracurricular course. Blended courses represent a very peculiar situation in which the investment in media services and in human interaction do not arrive to very high levels because resources are shared with the needs of face to face didactics.

Impacts and issues

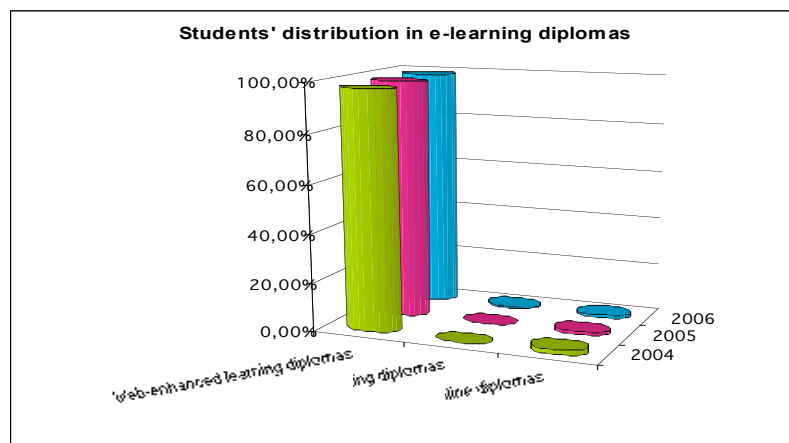
The Politecnico di Milano is ranked as one of the most outstanding European universities in Engineering, Architecture and Industrial Design, and in many disciplines is regarded as a leading research institution worldwide.

The medium number of students enrolled to one of its several degrees, postgraduate courses, doctorates in the last three years hasn't change significantly. In 2004 they reached a total number of 38.610; no substantial differences have been found in 2006 even if there has been a peak in 2005 with 40.485 enrolled. It's interesting to point out that the number of students involved in e-learning at any level has constantly grown since 2004 arriving to represent quite the entirety of Politecnico's students. In fact, as showed in Graph 4, the representative percentage is equal to 69,85% in 2004 and become 99,61% in 2006. Going deeply, the most part of "web" students follows the web-enhanced diplomas through COL platform where teachers make available their course materials. Every University's student, who have a registration number, usually accesses the platform for downloading materials, seeing latest notices and exams dates, participating to forum.



Graph 4: Trends of people involved in e-learning

As showed in Graph 5, blended and e-learning diplomas represent a little part of university's students, but they are very relevant form the strategic point of view in order to enhance the exploration and development of new technologies and methodologies.



Graph 5: Student's distribution in e-learning diplomas

Learners that follow online diplomas have decreased until 2006, passing from 527 in 2004 to 343 in 2006: this trend is particular due to the activation of new similar paths in other universities in Italy, often easier and cheaper than the one, very selective, offered by Politecnico. No more "fully online" projects have been developed for traditional courses, because the University strategy is oriented more towards the development of blended courses. This modality appears to be more successful in case of postgraduate classes where learners usually have a job and, by consequence, less time to dedicate to study, or live far away. In our country, the pure e-learning is still perceived in a reductive way, as a lower quality course in comparison with a similar face to face course even if, as it happens in the online degree of the Politecnico di Milano, teachers and exams are exactly the same of the face to face course.

So blended diplomas are privileged respect e-learning because they offer a synergy between the two approaches: the online part meets time availability of students, lessons in presence guarantee needs of direct contacts between students and teachers. In the future we expect to have a growth in this kind of educational offer in particular because it requires less initial investments than a totally e-learning degree.

Beside to this projects developed inside the University, Politecnico promotes also several projects that involve new targets: people from outside contexts (schools, enterprises, Public Administration, etc.) or dependants of the University (technical and administrative staff) that are not enrolled in any university course. The representation of this portion of engagement respect the total number of University students, doubles from 2004 to 2006 reaching almost 7% (See Graph 4). The most part of the projects demonstrate the external market demand is inclined, unlike internal demand, more to e-learning courses. In 2004 people involved have been 860. This number fall down in 2005 because of there has been a temporary stop, caused by a lack o funding, in one of project with secondary schools, named MOL (Mathematics On Line), which involves a high number of students. In 2006 this number jumped up to 1094 learners thanks to the restart of MOL that brings at least 200 among the best secondary students, to follow the online course in mathematics. In the same year, University organized a course for updating its administrative staff on the new normative about privacy policy which involved more than 600 employees. Blended courses show the highest number of participations with a remarkable increase: beginning from 600 people in 2004, in 2006 they arrive until 1522 learners. Blended course students people are MOL participants, teachers and pupils of the last three years of secondary school, for whom Politecnico has made available a plentiful platform of material that every school can use as they prefer.

The external web-enhanced demand is null or, anyway, really weak as this kind of offer has not a significant added value that could justify an external involvement by a specialized partner. Open source tools, available on the net, can do the same job with a very low economic investment.

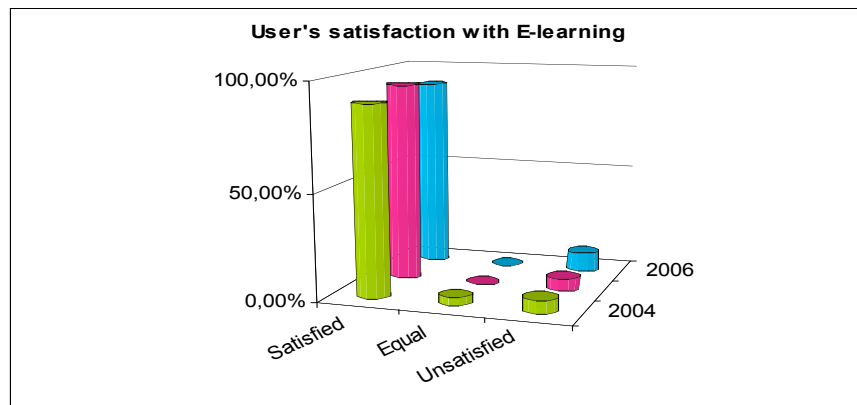
On line extracurricular supply has had a strong impact on the total university offer for external learners. This offer involves 70% of people in 2005 and 2006. 2004 presents a peculiar situation in which the Politecnico organized, thanks to FSE funds, a support system to institutional didactics that has involved more that 19000 people.

About the different subjects involved in web enhanced, blended and e-learning projects data show that new technologies train a significant involvement both on the teachers and on the students side.

As professors could have more than one course we decided to use as indicator a proportion between number of web courses and number of University professors. This percentage increases constantly in the three year period, from 30% to 77%, particularly due to web-enhanced diffusion. As teachers are stimulated to open their own course area on the COL platform, their confidence with ICT tools and methodologies grows. Moreover student requests become more and more choosy from a quality point of view as well as quantity of courses available on the platform.

University e-learning staff is on charge of managing and monitoring how projects going on, testing the platforms, furnishing help desk to “clients” and programming satisfaction surveys on technical and technological aspects of ICT service. University is particular interested in probing the satisfaction of ICT users. In the last three years users’ feedbacks have always been positive with percentages over 90%. As showed in Graph 6, the collection modalities are usually based on submitting the questionnaires during exams sessions or face to face events in order to obtain the highest value of responses. If it’s not possible we privilege online

questionnaires sent by e-mail. Sometimes we have developed telephonic interviews, like the survey for IOL students in 2006. The survey, in this case, was really successful compared with results of previous years when questionnaire have been submitted on line, receiving no more than 25% of replies. In 2006 we could realize satisfaction surveys for blended and web-enhanced diploma as well. That's why numbers are so high. The percentage of feedbacks receives from web-enhanced students is very low respect the total number of students enrolled to the platform because we have to use e-mail. Negative replies, that have reached 9% in 2006, are due to discontinuities in supplying the service caused by servers adjustment necessary for sustaining users growth and to the improvement of the new login system that allow students to use the same login code for every university service online.



Graph 6: User's satisfaction with e-learning

As presumed, teacher feedbacks have been lower than student replies but very positive. They are specially satisfied by help desk, that gives them a strong support and assistance during their activity on the platform.

Innovation

METID is a centre dedicated to develop new and innovative methodologies in education and didactics. There is not an established definition of innovation. It's strictly connected to time and technology evolution. The experimentation has changed since 1995, when METID was established. At the beginning e-learning market was focused on having high multimedia level for educational contents. Materials presented through videos and audio, that could be downloaded and listened on i-pod, or through interactive games. After this phase, priorities change and suppliers moved to develop the potentiality of human interaction on web tools already available. The challenge has been to enrich web spaces with communication tools, like forums, chat, conference meetings that could be used for enhancing human connections. Today the research activity is focused on Web 2.0 services. Web 2.0 is a new conception of the Web in which web-based communities create contents and make possible sharing them. By this starting point, METID brings this mechanism in education, giving users a variety of tools for producing materials through collaboration on the web. It has integrated the open source tools such as social-networking sites, wikis, MOODLE platform with the other instruments already present.

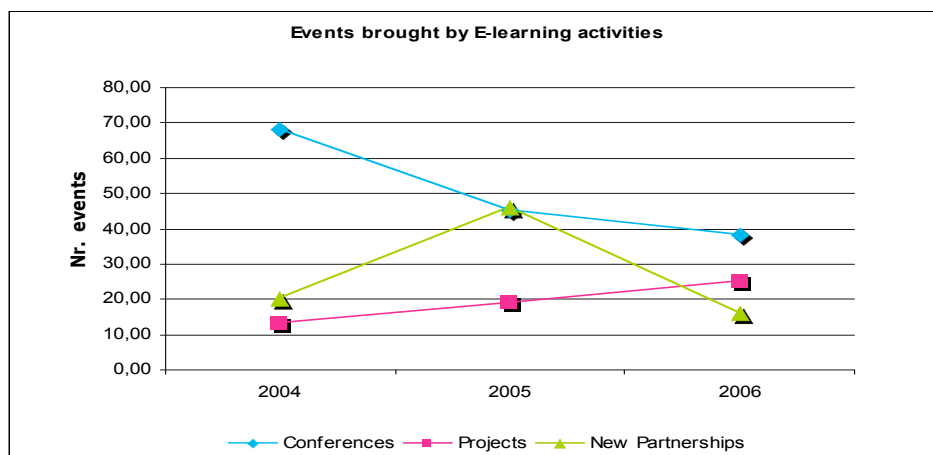
This represent the new frontier of education, together with the creation of different formats of video and audio, in particular, that, new mobile instruments can support. Moreover current learning stiles are quite different from the past and they need an innovation of teaching stiles.

Reputation and relationship

Communicational aspect has a great importance for all Higher Education Institutions. E-learning shows to play a very remarkable role in the diffusion of university name and brand. In fact, as data show, e-learning gives relief to Politecnico activities in the media and provides occasions to create and foster partnerships with national and international institutions and companies.

The last three years have been very profitable from this point of view (See Graph 7). The data collection has been articulated as following:

- CONFERENCE - collecting participations in conferences, forums, research papers, signs on media (newspaper, TV, radio)
- PROJECT - project start up by university as well as projects in which university participates like partner
- PARTNERSHIP - means only new partners that get in contact with university thanks to e-learning projects



Graph 7: Events brought by e-learning activities

In 2004 the communicational campaign of the Online Degree in Informatics Engineering (IOL) has generated a strong impact on newspapers, on-line magazines and TV and represents almost half of total number of conference indicator. Notice that in the BSC have not been included paid spots on radio or advertising communication on newspapers.

As data show, 2005 collected the highest number of events, it depends, in part, on the high number of signs appeared in printed media. The articles regard, in particular, two international projects: IAOL, a collaborative online Workshop on architecture, with the University of Tianjin and the “Cooperation projects” for promoting social inclusion and digital divide

contrast focused on young people in Rwanda and Congo. These kind of broad-based projects can attract the attention of national TV and radio, guaranteeing a wider diffusion than projects addressed to a focused territory. In this year the number of projects organized by the university has had a boom, in particular in the field of national projects that has brought, as consequence, lot of new partners.

In 2006 data show an increase in the number of new projects activated that become 25. In 2006 is also growth Politecnico people participation to national and international conferences, not only as simple participants but also like contributors. It's really interesting to highlight that the number of international organizations Politecnico get in contact thanks to e-learning projects, has increased in the three years period: it demonstrates the Politecnico effort in expanding its contacts abroad.

Conclusion and discussion of the BSC interest

This work has represented a real challenge for every WP3 member. During our path, we come across several problems. For example, creation of an efficient collaboration flux between us, data collection, choice of the best method for comparing our national e-learning situations. Despite these inconveniences, we think the Balance Score Card could be a real useful decisional tool. The collection of information essential for fitting the table, hasn't been easy. In an organization so branched like the Politecnico, it has been particularly hard to get in contact with right person who affords to give us what we are looking for. Nevertheless this hard work, at the end we have had a lot of information that, we are sure, could be vary useful also in other contexts.

Thanks to this bulk of data, we thinks that the BSC will permit to evaluate a single problem, through a multifaceted point of view in which, different aspects are integrated. In e-learning this characteristic become more and more relevant because of the complexity of the field. We defined four macro areas: financial, customer, organizational and communicational area. We though these areas could synthesized, in the best way, the e-learning reality in academic institutions. It could be used by other Universities as a model for investigating their e-learning reality and having enough information to take right decisions. It's evident that every institution has to personalize the model because there could be aspects more significant for them than others. For Politecnico di Milano, for example, it has been very important quantifying positive feedbacks from e-learning users or evaluating how many learners, who are not Politecnico students, follow web courses offered by the University, as the most part of these courses are financed by the government. These aspects are fundamental for Politecnico in order to programme future actions and participating to national calls.

After a first analysis, It's interesting to note that e-learning seems to have a very positive impact in University under different aspects. First of all, it's a quite remunerative activity not only by extra fees paid by students for some specific e-learning courses, but because e-learning competencies makes the Politecnico able to participate to external funding. This makes possible to maintain an high level Centre totally devoted to e-learning with a very limited impact on University expenditures.

Second, e-learning demonstrates to be an effective way for reaching high number of learners, diffusing the knowledge of the University in other national and international contexts and involving people in the use of new technologies. The last aspect has a strategic relevance in the aim to the reduce digital divide and to foster the integration of ICT tools in every aspect of life. It's evident that, having to use web tools for studying, learners could become more confident with them and they could increase their informatics competences.

Moreover, as BSC has demonstrated, e-learning activity has a very positive influx on diffusing the reputation of Politecnico as an innovative and technological institution and help to spread its brand in contexts far away from the academic one.