Web-Based Education: Learning from Experience

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Chapter XXIV

Integrating Online Educational Activities in Traditional Courses: University-wide Lessons after Three Years

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ABSTRACT

This chapter presents a case study of how a university responded to educational and technological change. After an introduction to Bocconi University (an Italian private business university) and the recent changes in the Italian university system, the case describes the initiation and management over three years of a project to integrate Web-enhanced learning (WEL) into classroom-based courses. The case includes identification of profiles of WEL adoption and description of the technology choice, how the teachers adopted the innovation and how students responded. The project is presented as organizational innovation and compared with the stages of the Rogers’ model of diffusion of innovations. Two groups of conditions for success were identified. Conditions common to IS innovation included top management commitment, a supportive environment, and appropriate ICT infrastructure. Conditions specific to WEL included teacher preparedness, appropriate use, appropriate scale, and flexibility.
This chapter addresses the issue of integration of online learning into classroom-based learning to achieve effective and manageable Web-enhanced learning (WEL) for on-campus students. The focus is on change across a university system rather than in an individual classroom. While some excellent works are now available on implementing new approaches to learning in individual courses (e.g., Palloff & Pratt, 1999; Palloff & Pratt, 2001), and general texts and models of conditions needed for wider diffusion are emerging (e.g., Bates, 2000; Surry, 2002), the available case studies tend to be about new wholly virtual universities or about the adoption of new technologies for wholly distance learning. Many of these are short vignettes rather than analytical case studies, and with few exceptions (e.g., Friedlander, 2002; López del Puerto, 1999), lessons are not clearly drawn from these cases to wider principles or to applications for other universities. Those principles that are drawn tend to focus on specific lessons for implementing distance learning (DL) rather than for using Web-based technologies to complement or to improve the quality of classroom-based learning (e.g., Friedlander’s “Use DL only when other traditional forms do not work,” p. 3).

Systematic studies of traditional universities’ attempts to introduce large-scale WEL have not identified great success. After a two-year study of the UK context, Pollock and Cornford (2000) concluded “that the universities which we have studied have found the introduction of new technologies, alongside their more traditional methods of providing teaching and learning, extremely difficult… What we have found is that the Virtual University works in theory but not in practice.” Pollock and Cornford place the blame on the approach taken by universities. They criticize the bottom-up approach, in which individual teachers and courses adopt new technologies in the absence of a university-wide vision. They note how implementations have failed to engage all aspects of the university required for success, including academic staff, computer services departments, and partner institutions. Finally, they caution against approaches that call for standardization without vision.

Attempts to identify characteristics of successful diffusion of instructional technology in higher educational institutions have produced several different models. Some focus on aspects of diffusion: Hall & Hord (1987) considered the role played by people in facilitating change; Ely (1999) considered the conditions that facilitate the implementation of an innovation; Stockdill and Morehouse (1992) developed a checklist of the factors that affect adoption; Farquhar and Surry (1994) listed four categories of factors affecting the adoption. Other authors have taken a broader view, incorporating evaluation of teaching technologies among their models of success (Bates, 1995, 2000; Surry, 2002). Despite their apparent differences, most of the cited works have roots in diffusion of innovation theory and, more specifically, the work of Everett Rogers (1995), yet none uses Rogers’ complete framework of organizational diffusion of innovation to systematically study technology-based innovation in education.

The case study presented here describes how Bocconi University, a private business university in Milan, Italy, is developing methods for integrating Web-based education into its classroom-based courses. The case identifies the vision that has driven the change, and the ways in which critical actors have been engaged during the first three years of the university’s experience. Diffusion of innovations theory (Rogers, 1995) is used as the organizing and analytical framework for the case. Working from this established theory, the case demonstrates how change associated with adoption and diffusion of new educational technology follows stages similar to those of innovation processes in other types of organizations (Holloway, 1996). As Pollock and Cornford’s work suggests, the case demon-
strates how nontechnical, as well as technical, issues are critical to the success of changes that involve information technology.

**BACKGROUND: CHANGES IN ITALY’S UNIVERSITY SYSTEM**

In Italy, as in other countries, universities are undergoing great change. During the academic year that began in October 2001, the entire university system moved from a mix of short (three-year) and long (four- to six-year) first degrees to a two-tiered system designed to be more compatible with the systems in other European countries. In this new system, all universities offer a three-year first degree that may be followed by a two-year higher degree.

At the same time, the availability of new educational technologies has fueled debate about the ways in which teaching and learning are conducted. Italian universities have traditionally emphasized theory over work tools, methods, and other techniques. Most lessons consist of lectures, often in large lecture halls, with little student participation and few tutorials or other forms of small group work. University teachers in Italy are not required to have undertaken any formal education in pedagogy or the practice of teaching. Leading educators have suggested that new technologies provide an opportunity to improve the quality of teaching and learning at Italian universities. Proposed advantages include opportunities for self-study at a distance from the classroom and for small group work through online collaborative learning (Calvani & Rotta, 2000).

**RESPONDING TO EDUCATIONAL AND TECHNOLOGICAL CHANGE: A CASE STUDY IN WEB-ENHANCED LEARNING AS TECHNOLOGY-ENABLED CHANGE**

This case study examines how Bocconi University responded to the challenges and opportunities presented by changes in the university system and technological environment, at the same time as the university was planning significant growth. The case traces the university’s introduction of Web-enhanced learning to support new approaches to teaching, from the time that the changes were announced in 1998 to the end of the third year of implementation, in 2001–2002.

**Bocconi University and the New Educational System**

Bocconi University was founded in 1902, the first Italian University to have a faculty of economics and commerce. Today, it is one of the world’s leading business universities (http://specials.ft.com/businesseducation/FT3S5ND9MWC.html), with graduates in senior positions in government and industry throughout Europe. Bocconi is a private (nonprofit) single faculty university that offers seven first-level degree programs in economics and commerce, and several courses at higher levels. (The university also has a semi-autonomous business school, SDA Bocconi, which offers executive programs including an MBA. This case study is concerned with actions taken by the central university rather than by SDA.)
In total, 14,000 students are enrolled to take the formal degrees of the university, 1,000 of them in postgraduate programs, including the new higher-degree courses. More than 300 units are offered within the first level programs.

The university sets high standards for students. It was the first university in Italy to introduce admission exams. Demand for places exceeds availability, student motivation is high, and the university has higher completion rates than other Italian universities. In the period before introduction of the new system, 89% of enrolled Bocconi students completed the four to six year Laurea, while the national mean for students enrolled in economics and commerce was 38%. Mean completion time for Bocconi students was 5.9 years, while the national mean for other universities was 7.8 years.

The quality of education provided is also important to the university. Bocconi introduced the new Italian university system for students who commenced their course in the 1999–2000 academic year, thus beginning two years before adoption of the new model was compulsory. This initiative was combined with two others: a plan to substantially increase student numbers, and a push toward further improving the quality of education at the university. The university set several quality goals, including to break with the traditional way of teaching at Italian universities by increasing the active participation of students in their learning.

The first two years of undergraduate study at Bocconi consist primarily of compulsory core courses, while in the final year(s), students take a combination of core and elective courses. Each year, students are assigned to a class of around 150 students for their core courses. Depending on the degree, a first-year core course may have up to 15 classes. Each course has a coordinator, and a team of teachers who teach to a set syllabus. In some courses, all teachers use common material. In others, the teachers have more freedom to choose how to meet the needs of the syllabus. All courses have a classroom component, and at the time the changes were announced, almost all followed the common model for Italian universities, consisting entirely or almost entirely of lessons delivered by the teacher from the front of the room.

Investment in educational services reflects the university’s commitment to quality. It has long made a significant commitment to information and communication technology (ICT). By 1999, the university therefore had a well developed ICT infrastructure which was widely used by staff and students for administration. Nearly all teachers and administrative staff had a PC connected to the university network, email was widely used for communication within the offices of the university, and an increasing number of applications was available to cover internal administration needs. Students were able to interact with the university via Internet (e.g., for enrollments) or to obtain updated information, such as timetables and last-minute changes of classroom. Each student was supplied by the university with a personal email address. A network-connected PC was available in each classroom for use by the teacher, but relatively few PCs were provided for student use: 240 computers in general access laboratories and 200 in classrooms. Around 25% of students had their own PCs. These facilities were sufficient to meet demand.

The strategy of the university is to maintain its investment in ICT (continually updating to new technologies) to be able to satisfy a growing number of users for increasingly sophisticated applications. Even before the new educational initiatives were introduced in 1999, Bocconi had an established multimedia committee and had planned to upgrade all network infrastructure to provide sufficient bandwidth to carry streaming video for educational purposes.
Initiating the Web-Enhanced Learning Project

In May 1998, the multimedia committee established a working party to introduce a platform for Web-enhanced learning. The working party began work on what came to be called the B-Learning (Bocconi eLearning) project in June 1998.

The cross-functional working party consisted of all the people needed to implement an initial pilot project, from the pilot teachers, to the people in charge of technological infrastructure design and implementation, to those responsible for computer center operations. This composition was designed to ensure that the working party was able to monitor all aspects of the feasibility of the project from its initiation. In addition, the most senior figures in university administration (the Managing Director) and teaching and learning (the Pro-Rettore for teaching) participated in working party meetings, where key decisions were to be made. In this way, information could be exchanged directly, and decisions could be made quickly. This arrangement ensured that all the people involved in the project were not just personally involved in planning, but also shared responsibility for project success.

One characteristic that set the Bocconi working party apart from those set up in other universities at the time was its focus on a long-term vision. From the beginning, the Bocconi working party saw the aim of the project as effective implementation of Web-enhanced learning to improve the quality of teaching and learning at the university, a long-term vision rather than a one-off pilot or test project. The group’s short-term goal was to introduce Web-enhanced learning in a limited number of pilot or exemplar courses, commencing in the first semester of the 1999–2000 academic year.

The first actions of the working party were to identify the critical technical elements in an eLearning project and a model for representing use of the World Wide Web to enhance the learning of on-campus students. Critical technical elements included the availability of PCs, provision of laboratories, network bandwidth, remote connections, and training.

Drawing on Angerhn’s (1999) classification of Internet business strategies as creating virtual spaces for information, communication, distribution, and transactions (the ICDT model), the working party defined five profiles of use of the Web to enhance on-campus learning. The profiles are listed in Table 1 by increasing level of complexity. Each of the higher levels includes the features of the lower levels.

All courses at Bocconi have a Traditional Web presence. The project was therefore concerned with enabling Advanced Web and more complex uses. The university’s goal to increase active student involvement in their learning would be achieved partially through use of WEL to support the Interactive Web profile, and more fully in implementation of CSCL environments.

The working party decided to support the most complex of the operational profiles, the CSCL profile. In addition, they decided to include a large number of students in the initial implementation. This approach carried some risk. Nonetheless, it was decided that the best test of an approach that would be suitable for the entire university would be a pilot implementation that incorporated all the components of successful larger-scale implementation: teachers, students, organization, network, hardware, and software.

In August 1998, a report on the working party’s considerations was delivered to the Pro-Rettore for teaching and the Managing Director. These senior university decision makers then met with the working party to confirm the strategy and business plan for the project, and to give the go-ahead to commence work. This meeting confirmed the working party’s approach.
Selecting the Software Platform

Once the decision had been made to enable teachers to use WEL for CSCL, and to reach a large number of students from the beginning of the project, the working party studied the approaches taken by similar universities. In the absence of published case studies, most of this analysis rested on use of the contacts of teachers who already had experience in online and computer-supported learning, and on visits to other universities. A template was developed for collecting and reporting data, and four detailed case studies of leading business schools in the United States, UK, and Europe were collected. The most well-known software platforms were examined, taking into account not only system features but also compatibility with the university’s current technical environment and the availability of personnel with the skills required to run the system. A key criterion for selection was the availability of support for the proposed innovative and extensive implementation of the learning platform. At the end of this period, Microsoft and IBM were identified as providers in the Italian market with the most potential to meet Bocconi’s criteria. A solution from Microsoft would involve development of a custom-made system, while a solution from IBM

Table 1: A Hierarchy of WEL Use Profiles

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<th>Level</th>
<th>Label</th>
<th>Use</th>
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| 1     | Traditional Web | An environment to inform about the course.  
This is the course website structure usually available at universities, containing at least: description of the course, list of suggested textbooks, lesson timetable, teacher name(s) with location and availability for students, exam procedures, and calendar |
| 2     | Advanced Web | An environment to distribute educational material.  
In this case, the Web becomes something more dynamic, and the contents are put online from time to time during the life of the course. Some examples of contents: educational material used by teachers in the classroom (slides, case studies, newspaper articles, and site URLs related to the course content), text of past exams, exam solutions, communication from the teacher(s) and the University |
| 3     | Interactive Web | A bidirectional interactive environment.  
This profile includes teacher–student and student–student interactions. The interactions are mainly based on the use of course forums, resource contributions, self-evaluation tests, delivery of assignments, and secure online exams |
| 4     | CSCL | A CSCL (Computer Supported Collaborative Learning) environment where the teaching and learning are mainly based on student groups.  
This profile is more complex than the interactive Web, in that it supports collaborative group learning and activities that go beyond those possible with simple course forums. Activities supported may include group projects that involve sharing materials or preparation of joint documents. |
| 5     | Experimental | An experimental environment for pilot applications testing new ideas.  
The final profile was thought of as an environment available for teachers to experiment with new tools or technological solutions. |

a. Use at each level includes the uses at each preceding level.
b. This level was later split into two: (2A) Distribution of standard course material and (2B) Distribution of additional material by individual teachers
would involve implementation of IBM-Lotus LearningSpace (an application based on Lotus Notes client and Domino servers).

By the end of November 1998, the working party had received preliminary proposals. During December 1998 and January 1999, members held meetings with Microsoft and IBM-Lotus and evaluated the companies’ offerings. By the end of the period, group opinion was split between those who preferred a Microsoft-based solution and those who preferred to adopt IBM-Lotus LearningSpace. The dilemma was referred to the university’s senior managers who opted for LearningSpace, but allowed those who wished to do so to experiment with Microsoft-based development.

Despite potential compatibility with the university’s desktop environment and earlier success with a small-scale online learning environment developed with Microsoft tools, development of a custom-built Microsoft-based solution as a potential platform for use across the entire university was not considered feasible (at least in the short term) on several grounds. Management considered the Microsoft option too risky in terms of the effort needed for the application design, the time required to have an application running, and the people and skills required for development and maintenance.

A university-wide solution based on IBM-Lotus LearningSpace had several points of particular strength. The solution was based on a software product that had been in the market for several years and was fully supported in Milan by IBM-Lotus. From a user’s point of view, it has a simple but powerful structure that permits it to be used as a course management environment. The four components of the system—course schedule, repository for course materials, testing and assignment submission facilities, and a system to support student group activities such as discussion and document sharing—are linked. Furthermore, the system architecture (based on the Lotus Notes concept of replication) is robust and suitable for a multilocation campus and for staff and students working from off-campus locations. The contents of the system (or a subset of it) can be replicated across servers and between a server and a client. All contents are published as Web documents and are, therefore, accessible by Web browser.

Some points of weakness with LearningSpace were also identified. The most critical of these was user definition. Ability to rapidly enroll large numbers of students in the online course environment at the beginning of semester was critical, but in the version available at the start of the project, the system administrator was required to establish each user account individually. This weakness was resolved by assigning a group of temporary administrators to the task of enrolling students during the first weeks of semester.

The Technology and External Support for the Project

The choice of technology was strongly influenced by the technology provider’s commitment to the project. On the technological side, there are many layers involved in a Web-enhanced learning platform: the network (including the need for adequate bandwidth and reliable connections inside and outside the university), the server(s), and the application. Configuring the server requires attention to several interrelated factors, including appropriate configuration of the physical machine to react properly to a high volume of transactions, appropriate positioning within the network, the operating system, and tuning the operating system to work in the presence of the applications. The application relies on several layers of underlying software, including a Web application. Diagnosing a problem encountered by a user can therefore be quite complicated, and the solutions may be complicated. A support
mechanism was required to enable rapid identification and resolution of problems in such a complex, but time-critical environment.

Senior management decided that the best solution was to make an agreement with a single partner who would have responsibility for all layers of the technology. A special agreement was signed with IBM Italia (whose software group is now responsible for the formerly independent Lotus software). The agreement involved IBM as a partner in all aspects of the project: network capacity planning, identification of the characteristics of the server to be used, its position in the network, installation of the server software and of the LearningSpace system, tuning, and monitoring of the system. In addition, IBM provided specialized personnel on-site and training for the computer center personnel involved in the project. IBM was also charged with organization of training courses for all the teachers, tutors dedicated to system support, and students.

This agreement was challenging for IBM as well as for Bocconi. The complexity, the approach, and goals, and the numbers involved, made the project unique in Europe. The project and the agreement would, if successful, provide a model to be reproduced in other universities.

**Internal Organization for Project Support**

The risk associated with introducing a technologically complex new system at the beginning of the academic year, with relatively large numbers of students enrolling and placing a heavy and somewhat unpredictable load on the system, was sufficiently high that other aspects of project initiation were designed to be as low risk as possible. The teachers involved in the pilot project were chosen because they already had considerable experience in use of technology in education. Within the university’s strategic vision, and with the support of a platform that enabled a variety of uses of WEL, each teacher was free to find their own way to integrate the new technology with their teaching.

The computer center was selected as the most appropriate internal organizational unit to take responsibility for the project. The computer center already had a small subunit dedicated to supporting teachers’ use of technology. This subunit acted as project manager, point of reference for the teachers involved in the project, and interface with IBM.

**Preparing for Implementation**

Preparation for implementation required much effort. Detailed analysis of the technical and human requirements for implementation was conducted between February and April 1999.

Three courses were selected for pilot implementation in the first semester of the 1999–2000 academic year, beginning in September 1999. One course was a core fourth-year unit in Strategic Management; three classes of students in this course participated in the pilot. The other two courses were electives available to students in their third or fourth year. One of the electives was a unit in management consulting, while the other was an advanced course in the Internet and Data Processing. Altogether, around 500 students in five classes were involved in the pilot implementation.

Training for the teachers began in May 1999. The teachers prepared their course materials in parallel with their training. The training, provided by experienced IBM LearningSpace trainers, combined online course design with technical skills for use of the software. This approach provided an opportunity for trainers to advise the teachers on ways
in which LearningSpace might be used to meet their educational goals. All of the courses were at least partially redesigned to include group learning activities for students. All these pilot courses, therefore, adopted the approach described as the CSCL profile (level 4) in Table 1.

By July (after a delay) the teachers involved were equipped with high-end multimedia capable portable PCs. The system was made available to the teachers through Lotus Notes client software on their portable PCs. Students were able to use the Lotus Notes client installed in student laboratories and specialized classrooms or to access their class LearningSpace via Internet using a standard Web browser.

By August 1999, almost all was ready for implementation. The information technology infrastructure was upgraded, a Lotus Domino server was activated, and the buildings office had fitted out two new classrooms, which were equipped with 60 and 90 PCs dedicated for the semester to project activities. Online courses in use of LearningSpace were developed for the students, and a tutor was assigned to each of the new classroom/labs to help students if they encountered problems. By the first day of the semester, initial course materials were loaded, and the system had been tested and load simulations done.

**B-Learning Goes Live!**

There was great tension as the courses that used LearningSpace began. Even though system testing and load simulations had been done, all the people participating in the project had enough experience with new system implementations to expect the unexpected. In the spirit of excitement and team work that had accompanied the seven months of preparation, the entire implementation project team (both internal and external) was prepared to manage unexpected problems or failures. The university and IBM were conscious of the size of the project and the extent of innovation it involved, and each group had confidence in the other, creating a strong spirit of collaboration.

The most critical problems appeared during the first weeks following implementation, but the implementation task force was able to deal with them. Perhaps the most significant of these problems was that the system, under peak load, had poor response time. This problem generated a chain of subsequent problems. The tools used to monitor the situation revealed bandwidth saturation at a critical point in the network. In a combined action, the computing center and IBM rapidly installed and configured a second server and reallocated resources within the university network. This solved the problem and provided information with which to review some components of the system architecture and plan additional features to balance the load.

**Initial Evaluation**

One month after the start of semester, the project team held a planned review meeting. Despite the early problems, all the teachers involved in the project declared their full satisfaction and intention to continue. Students had not raised any significant problems with their teachers or tutors, either in the labs, or in response to specific questions in class; instead, they seem simply to have accepted the LearningSpace, and therefore WEL, as a normal part of their university learning environment.

At the end of semester, a formal evaluation was conducted for the advanced course in Internet and Data Processing. This course retained standard classroom lessons. In addition, the new design used directed online discussions, collaborative online group work, and in-class group presentations to provide opportunities for more active student engagement with
the material and with the teachers and one another. Participation in the online and group activities was voluntary, but those who chose to participate received grades for their work during the semester, and the percentage contribution of their final exam was reduced commensurately. Of the 104 students enrolled in the course, 95 chose to participate in the LearningSpace supported activities. While participation in the WEL activities was not expected to result in higher grades, it was expected to result in higher student satisfaction with the course and higher achievement of meta-outcomes (generic competencies and attitudes) believed to be important among university business graduates. Responses to the postcourse evaluation questionnaire returned by 75% of the completing students confirmed that student satisfaction with the course was high for all students except a small group that preferred a more theoretical than active approach to learning. Students who participated in the CSCL activities had higher self-efficacy for learning and a stronger preference for collaborative work at the end of the course than at the beginning, thus confirming that participation in these activities had valuable meta-outcomes over and above subject learning. These effects were greater for those students who participated most actively in the collaborative activities than for those who participated less actively (Klobas & Renzi, 2001).

Semester 2, 1999–2000: Implementation for Simple Uses of WEL—and some Spontaneous Adoption

After the success of the ambitious pilot project, an unexpected problem emerged. The pilot demonstrated that LearningSpace was suitable for CSCL. But, would it be suitable for more simple uses of WEL? Some members of the working party suggested that there may be a need to select another software platform designed specifically to support simple uses. They argued that providing the same platform for both simple and complex uses could be a barrier to adoption for simple uses and, therefore, to initial trials of WEL. Others argued that, while a simpler platform might be easier to learn and use, it could become a barrier to migration to the more complex uses required if the university is to meet its goal for more active student participation in learning.

It was decided to test the performance of LearningSpace for simple WEL use profiles with a full test in a real course. A new course was therefore added to the project. The selected course was a compulsory first-year course in Financial Accounting. This course was taken by 2000 students in 2000–2001. LearningSpace was used to put online, and therefore to make available electronically to all students, educational material that existed elsewhere in electronic form. This was a test of the second-level WEL use profile, Advanced Web, in a simple form that involved no additional preparation of material and no change to course structure or teaching methods. LearningSpace was simply a mechanism for distribution of existing material.

This type of use did not require identification of individual students or of the class to which each student was assigned. The LearningSpace system was activated for the course as a whole, rather than class by class, and all students used a generic user-id and password to access materials. Within LearningSpace, only the functions needed to view and download material were activated. Because use of the Notes client provided no substantial advantage for this type of use, student access was limited to access by Web browser. In this way, the PC labs remained dedicated to students in courses that used LearningSpace to support more complex forms of WEL. This implementation proceeded smoothly.
A surprising development occurred during the semester. Teachers who had used LearningSpace in the first semester and who also taught second semester courses asked the computer center to make a LearningSpace environment available for their second semester courses. After the semester began, other teachers who had observed the success of the initial implementations, also asked for LearningSpace environments. In all, eight standard courses used LearningSpace outside the formal pilot project during second semester, 1999-2000.

Overall, the second semester ran smoothly, confirming that the configuration of the system (software, hardware, and network) was able to support WEL for relatively large numbers of students. The decision was made to continue to use LearningSpace.

**EVOLUTION OF THE B-LEARNING PROJECT**

**2000–2001: Spontaneous Adoption**

As the university prepared for the 2000–2001 academic year, the computing center received additional requests from teachers not involved in the pilot project to enable them to use LearningSpace in their courses. Access was provided to all teachers who requested it. Two additional courses used LearningSpace during the first semester, bringing the total to five courses and 10 classes. In the second semester, there were 18 (including Financial Accounting). In the full year, 44 classes used LearningSpace for 22 different courses: two compulsory first-year courses, two compulsory second-year courses, and one compulsory third-year course, in addition to 17 elective courses for third- or fourth-year students. This represents around 3,000 enrolled students (the precise number is not available) and 5,910 instances of LearningSpace use (many students used LearningSpace in more than one course).

One of the courses activated for the second semester was a first-year core course in microeconomics. This course had 15 classes, around 2,300 students in total. Each class had a different teacher. While the full LearningSpace environment was activated for the course as a whole, each teacher was free to use it as they wished. The use varied from a simple implementation of Advanced Web, which delivered just the base educational material for the course (adopted by two teachers), to an enhanced Advanced Web, which included the base educational material and other material selected by the teacher (five teachers), and an Interactive Web that enabled student-led discussion forums (eight teachers). The course coordinator reported that the procedure to put material online for the simple Advanced Web was quick and easy.

The wider implementation in 2000–2001 demonstrated that LearningSpace was technically robust, even for large student numbers. It was able to satisfy, in terms of functions and ease of use, the teaching needs of simple WEL use profiles as well as more complex ones, even across different classes in the same course.

**Evaluation of Student Response in 2000–2001**

Student response to this wider implementation was mostly positive. In his informal evaluation of the microeconomics course, the course coordinator estimated that 80% of the students had no trouble using the system, while 20% encountered some difficulties. More formal evaluation among a larger subset of students who used LearningSpace during 2000–2001 confirmed that the majority, but not all, found the system valuable.
The university’s office for educational evaluation conducted an independent evaluation of student satisfaction with participation in the LearningSpace-enabled courses. (The Financial Accounting course was omitted from this evaluation.) A total of 2,869 responses was received. Frequency of use varied considerably: 27% of students used LearningSpace more than once a week, 25% used it weekly, 28% used it every two weeks, and 20% used it only at the end of the course. The low-frequency uses were associated with courses in which LearningSpace was used only to distribute material.

Student opinion about the value of LearningSpace was mostly positive. Sixty percent of the students described it as a useful and effective innovation, but 16% said it was not. More than three quarters of the students (77%) agreed that LearningSpace should be used for more courses.

All four primary system functions were more often rated as useful than not. Provision of access to educational material through LearningSpace was rated positively by 56% of the students, but negatively by 19%; teachers speculate that a substantial proportion of the negative evaluations came from those students who found it less convenient to download material from LearningSpace at the end of the semester than to buy a course package from the bookstore as they could have done in the past. Use of the LearningSpace Courseroom as a forum for discussion with the teachers and other students was evaluated as a way to improve the learning process in 41% of responses, but not considered so by 28% of the students. Of the 27% of responses related to courses where the teacher used LearningSpace to support collaborative learning in student groups, 57% described this as a useful experience with the potential to improve the learning process, while 13% disagreed. Student response to uses of LearningSpace for CSCL was therefore more positive than their response to more passive methods of enabling student interaction through discussion forums.

An additional evaluation study was conducted under a nationally funded research project to study psychological metaresponses (Klobas, Renzi, Francescato, & Renzi, 2002); this study was an extension of the study conducted in one course in 1999–2000. While there were no differences between the learning of students in classes that used Web-enhanced learning and those that did not, students who used Web-enhanced learning were more confident about their ability to use computers and more willing to use them for learning in the future.

**Teacher Observations on the First Two Years**

In July 2001, the most active LearningSpace teachers held a meeting to reflect on their experiences during the first two years. Until this meeting, there had been little discussion among teachers in different courses about the ways that they had used LearningSpace.

In addition to exchanging experiences, the 14 teachers at the meeting discussed their overall evaluation of their experiences and specific problems they had encountered. As a result of this discussion, the teachers developed a list of 11 suggestions for enhancement of WEL at the university:

1. Developing a revised framework for description of the ways in which WEL is used, allowing for a distinction between simple use of the Advanced Web to distribute shared course material and use by individual class teachers to post additional material
2. Enabling planned and ad hoc enhancements or additions to the Web platform (such as support for synchronous chat) to meet specific teacher needs and therefore to enable uses more complex than asynchronous CSCL
3. Providing a suggested migration path for teachers as they move from traditional classroom-based teaching to online teaching
4. Providing a suggested migration path for teachers who begin with simple uses of the Web, to enable and encourage them to move to more complex uses
5. Ensuring students have the necessary skills to participate in courses that use all levels of WEL, from simple distribution, to CSCL
6. Providing guidelines for preparation of educational material
7. Considering new methods of student assessment, given the potential for continuous individual and group evaluation rather than the single, final oral exam common to most Italian university courses
8. Conducting deeper analysis of the relative roles of teachers, tutors, and other support staff as the modes and methods of teaching and learning change
9. Reducing class size to support more active student participation
10. Providing incentives for teachers
11. Increasing the role of the project support group in production of multimedia material and managing WEL platforms

2001–2002: The Point of No Return?

University planning for 2001–2002 assumed that LearningSpace would be available as a tool for Web-enhanced learning. Regardless of the issues identified by the more experienced LearningSpace teachers, the project had arrived at the point of no return. More teachers adopted LearningSpace for their courses, and students pushed teachers to adopt LearningSpace, at least to put material online.

Nearly 20% of the courses offered by the university during first semester 2000–2001 used LearningSpace (31 courses in all, an increase of 25 over the same period the previous year). Four of these courses used LearningSpace to distribute material to all enrolled students, using the single user-id and password system introduced during 2000–2001 to support simple distribution of material. The remaining 27 courses (plus one course in which both course and individual user-ids are being used) used LearningSpace for distribution of additional material, interaction, and CSCL. A total of 41 classes was involved.

In second semester, 25% of courses (44, an increase of 26 over the same period in 2000–2001) used LearningSpace. The range of uses was similar to that of the first semester: three courses used the single user-id and password system to distribute material to all enrolled students through a simple Advanced Web. The remaining 41 courses (plus one course that adopted a mixed solution) used LearningSpace across a total of 85 classes.

June 2002: Formal Review

In response to the issues raised by teachers at their July 2001 meeting, and to further discussion within the university during the 2001–2002 academic year, the Pro-Rettore for teaching initiated an eLearning workshop. The workshop was held at the end of the third year of the project, in June 2002. The goals of the workshop were to share experiences in WEL and its adoption across the university, to collect more detailed information about the ways that WEL is being used across the university, to evaluate the different uses of WEL in different disciplines, to identify actions to improve coordination among the different organizational units involved with eLearning activities, to identify problems or areas for improvement and to propose solutions, and to define future directions for eLearning within Bocconi University.
Prior to the workshop, several issues were raised in informal discussion among teachers. Many of these issues expanded on those raised at the July 2001 meeting, while others were associated with observations that can be drawn from this case study: not all students are satisfied that the system improves their experience at university; some teachers are still reluctant to adopt the system; there has been no test of the assumption that teacher adoption for simple WEL use profiles will lead to adoption for the more complex profiles needed to engage students more actively in their learning; and evaluation of progress toward meeting the university’s goal of more active student involvement would benefit from introduction of systems for recording the ways in which WEL is used, accurately monitoring levels of adoption, and obtaining consistent and regular feedback from students and teachers.

New suggestions emerged from the informal discussions and the subsequent workshop. Many of these strike at fundamental aspects of the university’s organizational structure and systems for measuring teachers’ work and contribution. Among the issues raised at the June 2002 meeting were: the need to reestablish a formal working party to take responsibility for redefinition of goals and for defining the strategy for future directions; the value of establishing a center for innovation in learning to coordinate efforts and support teachers and students; the need to develop proposals to conduct more systematic research and evaluation of educational technology-based innovation in a model similar to that of the Stanford University Learning Laboratory (Friedlander, 2002); the potential for a community of practice among teachers to share experiences gained and to act as a forum for sharing successes and resolving difficulties; and changes in the system for measuring teacher workload and contribution as the relative proportions of hours in the classroom, course preparation, and student interaction change.

Another set of issues concerns ICT infrastructure and support for WEL environments and software other than LearningSpace. Although Bocconi has continued to upgrade its infrastructure, some signs that specific attention to infrastructure for WEL is needed have emerged from student and teacher evaluations. Student demand for computers to access LearningSpace is putting pressure on the computer laboratories. While the university has a scheme to help students buy portable computers, and new buildings are amply equipped with network ports in all student work areas, student take-up of the purchase scheme is low, and satisfaction with access slipped between the second and third years of the project. In addition, as more teachers use computers in the classroom, the demand for portable computers and for upgrade of the classroom demonstration computers is also higher than can be met by the standard university infrastructure upgrade plan.

While the project has successfully introduced a single platform that supports use of WEL up to the level of asynchronous CSCL, a development environment is needed to support the highest level in the WEL use hierarchy, the Experimental level. Although IBM-Lotus offers a development environment, members of the multimedia committee who are active in developing alternative WEL environments are more familiar with the Microsoft environment and are proposing that extensions use this environment rather than IBM-Lotus. The advantages and disadvantages of selecting one environment over another, or of formally committing to the dual environment, are yet to be considered.

REVIEWING THE B-LEARNING PROJECT

At the end of its third year, the participants in the B-learning project consider it a success. It has demonstrated that the selected system is technically feasible. The system is
able to support active student involvement in learning in ways that are satisfactory to teachers and students, and student use of the system for CSCL can enhance the meta-outcomes of being a university student. The technology has enabled and encouraged improvements in the quality of teaching by enabling and encouraging teachers to adopt more varied approaches to teaching and learning than they have used in the past. Where teachers have incorporated more active learning in their courses, students have expressed high satisfaction with the learning technology and a desire to have it adopted more widely across the university.

The project did not allow for monitoring of the WEL use profile adopted by each teacher, or for each course and class. Nonetheless, it is possible to see that most courses enabled student interaction (fitting the Interactive Web or CSCL profile) rather than simply using an Advanced Web to distribute material. Table 2 distinguishes between those courses that enabled interaction among students who had their own user-id and password, and those that only adopted LearningSpace to distribute material to all students using the same shared user-id and password. Only 5 (6.5%) of the 77 courses that used LearningSpace in 2001–2002 used the system just to distribute common course materials.

**WEL Adoption over the First Three Years**

The extent of adoption of WEL during the three years since the first pilot implementation in Semester 1, 1999, is summarized in Table 2. Course and class numbers in this table are precise. The exact number of students using the system in courses for which the single user-id and password system was adopted is unknown but could be estimated on the basis of class size and computer center logs. Overall, several thousand students—a significant proportion of the university’s student body—were using LearningSpace by the end of the third year of the project.

The rate of adoption of WEL over the period is demonstrated in Figure 1, which plots the percentage of courses that used LearningSpace in each semester. This chart clearly shows the marked growth in adoption over the three years since the initial pilot implementation in first semester 1999. Although the university has never formally invited teachers other than

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Sem</th>
<th>Individual student user-id and password</th>
<th>Shared course user-id</th>
<th>Total Courses</th>
<th>Total Student instances</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Courses</td>
<td>Classes</td>
<td>Student instances</td>
<td>Courses</td>
<td>Student instances</td>
</tr>
<tr>
<td>1999–2000</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>500</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>2000–2001</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>1150(^a)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>17</td>
<td>34</td>
<td>3910(^a)</td>
<td>1</td>
</tr>
<tr>
<td>2001–2002</td>
<td>1</td>
<td>28</td>
<td>41</td>
<td>4715(^b)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>42</td>
<td>85</td>
<td>9775(^b)</td>
<td>3</td>
</tr>
</tbody>
</table>

\(^a\)Calculated as number of classes times average class size.

\(^b\)One course adopted a mixed solution.
the initial pilot group to adopt WEL, spontaneous adoption has resulted in 25% of its courses using WEL in some form, and almost all of these for uses beyond simple distribution of material to students.

**Influences on Adoption**

Close inspection of Figure 1 suggests that the greatest growth each year occurred between Semesters 1 and 2 rather than at the beginning of the academic year. This pattern suggests that adoption is influenced by observation and word of mouth among teachers and students, and by the availability of time for teachers to prepare their course LearningSpace environments and revise their courses. The summer holiday between academic years reduces the visibility of WEL implementations and the time available to prepare.

Differences in use were also associated with course coordinators’ approaches to use of LearningSpace and WEL. In some courses, such as microeconomics, the full LearningSpace was made available for the course, but individual class teachers were free to adopt WEL in their own way. Students enrolled in these courses were able to compare the different uses made of the system by different teachers. Student pressure encouraged teachers to adopt the Interactive Web in these cases, even if the teacher had not initially considered this level of use. The teachers were able to observe students using the Interactive Web informally, even when formal course activities did not require it. In other courses, where the coordinator...
activated a single LearningSpace solely to act as a repository for teaching materials, and students accessed materials anonymously, there was little incentive for individual teachers to adopt more interactive profiles and to move to more engaging educational models.

Discussion among teachers also played a role. In multiclass courses in particular, the teachers were able to support one another by sharing methods, experiences, resources, and tips in teaching team meetings.

**The B-learning Project as Organizational Innovation**

The progress of Bocconi University’s eLearning project closely mirrored the stages of organizational innovation identified by diffusion of innovation theorist, Everett Rogers. Rogers (1995) described five stages in the process of innovation within an organization. Although there may be overlap between stages and some reiteration of earlier stages later in the process, the five stages can be distinguished as agenda-setting, matching, redefining/restructuring, clarifying, and routinizing. The stages reflect two higher-level activities. The first of these, *initiation*, consists of agenda-setting and matching of an innovation with the organization’s agenda. At the end of this period, a decision is made to adopt (or reject) an innovation in a particular form. The remaining stages in the innovation process represent the *implementation* period, when the innovation is redefined or “reinvented” to fit the organization, its role is clarified, and its use finally becomes such a familiar part of the organization’s activities that it is no longer recognizable as an innovation. Figure 2 presents these aspects of the innovation process using Rogers’ words.

![Figure 2: Stages in the Innovation Process in an Organization](image)

**Figure 2: Stages in the Innovation Process in an Organization**

<table>
<thead>
<tr>
<th>I. INITIATION</th>
<th>2. MATCHING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AGENDA-SETTING</td>
<td>Fitting a problem from the organization’s agenda with an innovation.</td>
</tr>
<tr>
<td>General organizational problems that may create a perceived need for innovation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. IMPLEMENTATION</th>
<th>4. CLARIFYING</th>
<th>5. ROUTINIZING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. REDEFINING/RESTRUCTURING</td>
<td>The relationship between the organization and the innovation is defined more clearly.</td>
<td></td>
</tr>
<tr>
<td>The innovation is modified and re-invented to fit the organization, and organizational structures are altered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The innovation becomes an ongoing element in the organization’s activities, and loses its identity.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 maps the steps of the project against Rogers’ stages. Agenda-setting occurred when the university established its goal to improve the quality of education through more active student involvement in learning. The working party’s initial activities—identification of the different ways in which WEL could be used and development of the profiles described in Table 1; identification of potential technology platforms; and assessment of the platforms against the technical and business criteria established for WEL at the university—consti-

<table>
<thead>
<tr>
<th>Rogers stage</th>
<th>Time line</th>
<th>Bocconi steps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Agenda-Setting</strong></td>
<td>pre-May 1998</td>
<td>Management sets goal to improve quality of education through more active learning</td>
</tr>
<tr>
<td><strong>2. Matching</strong></td>
<td>1998 May</td>
<td>Working party established to consider potential for WEL</td>
</tr>
<tr>
<td></td>
<td>1998 June</td>
<td>Working party starts works</td>
</tr>
<tr>
<td></td>
<td>1998 August</td>
<td>Working party final report and top management go-ahead for the B-learning project</td>
</tr>
<tr>
<td></td>
<td>1998 September</td>
<td>Evaluating learning technology solutions available on the market</td>
</tr>
<tr>
<td></td>
<td>1998 November</td>
<td>Microsoft and IBM-Lotus preliminary proposals received</td>
</tr>
<tr>
<td></td>
<td>1998 December</td>
<td>Evaluating Microsoft and IBM-Lotus proposals</td>
</tr>
<tr>
<td></td>
<td>1999 January</td>
<td></td>
</tr>
<tr>
<td><strong>Decision</strong></td>
<td>1999 February</td>
<td>Choice of IBM-Lotus LearningSpace</td>
</tr>
<tr>
<td>3. Redefining/Restructuring</td>
<td>1999 February 1999 April</td>
<td>Detailed analysis of the technical and human requirements for implementation and selection of teachers and courses for pilot implementation</td>
</tr>
<tr>
<td></td>
<td>1999 May 1999</td>
<td>Training for teachers; pilot course preparation, including course redesign; Other preparations for start</td>
</tr>
<tr>
<td></td>
<td>1999 August 1999–2000, Semester 1</td>
<td>Initial pilot courses began</td>
</tr>
<tr>
<td></td>
<td>1999–2000, Semester 2</td>
<td>Pilot of simple Advanced Web for large classes; Spontaneous adoption following requests to computer center</td>
</tr>
<tr>
<td></td>
<td>2000–2001, Semester 1</td>
<td>Spontaneous adoption grows</td>
</tr>
<tr>
<td></td>
<td>2000–2001, Semester 2</td>
<td>Spontaneous adoption continues</td>
</tr>
<tr>
<td><strong>4. Clarifying</strong></td>
<td>2001 July</td>
<td>Experienced teachers meet to review the first two years</td>
</tr>
<tr>
<td></td>
<td>2002 June</td>
<td>Management-initiated university-wide eLearning workshop</td>
</tr>
<tr>
<td><strong>5. Routinizing</strong></td>
<td>Began 1999, Semester 1</td>
<td>For participating students, routinizing may begin with their use of WEL</td>
</tr>
<tr>
<td></td>
<td>Began 1999, Semester 1</td>
<td>For individual teachers, routinizing begins with their first use of WEL</td>
</tr>
<tr>
<td></td>
<td>Began 2000–2001, Semester 1</td>
<td>For the university, providing access to LearningSpace for WEL is routine, but many organizational aspects remain to be routinized</td>
</tr>
</tbody>
</table>

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tuted the matching stage. Throughout this period, and indeed throughout the project, the innovation was defined as eLearning or Web-enhanced learning for on-campus students, rather than in terms of adoption of specific software. The project was therefore a business project, driven by business goals, and implemented through new ICT. The initiation period ended with the decision to adopt IBM-Lotus LearningSpace.

The implementation process began with the working party’s definition of the technical and human requirements for implementation, and the selection of teachers and courses for pilot implementation. Redefinition of the teaching and learning process began for these teachers during their training. As other teachers adopted WEL and LearningSpace, they too redefined their modes of teaching and learning. Redefinition of the innovation occurred at several stages during this initial implementation period, notably when the university adopted a reduced LearningSpace for simple Advanced Web courses, enabling all enrolled students to access material using the same user-id and password. Clarification of the relationship between the organization and the innovation began with the teachers’ meeting in July 2001 and their subsequent report to the Pro-Rettore. The Pro-Rettore initiated workshop in June 2002 continued this process.

Routinizing is occurring at different rates at different layers of adoption. For individual teachers and students, WEL using LearningSpace becomes routine during the first course in which it is used. Once a teacher has used LearningSpace in one class, it seems natural for them to use it in other courses that they teach. Student pressure on teachers to adopt LearningSpace is an expression of how its use is routine for the students. At the organizational level, routinizing began when the computer center, without questioning, activated LearningSpace for any teacher who requested it. Nonetheless, the issues raised at the teacher’s meeting in July 2001, in informal discussions leading to the June 2002 workshop, and at the workshop itself, indicate that implementation is not complete and that each stage will need to be revisited. While the June 2002 workshop was an important step in clarifying the role of WEL at Bocconi University, it showed that several issues, including those related to organizational structure and organizational reward systems, need to be resolved if WEL is to become routine.

LARGE-SCALE INTRODUCTION OF WEL: CONDITIONS FOR SUCCESS

The success to date of this innovation process reflects attention to the several interrelated dimensions of technology-related change: business, human, and technical. Many of these have also been noted by Bates (2000) in his overview of managing technological change in universities. They are summarized in this section in two categories, those associated with successful information systems projects in general, and those associated specifically with successful implementation of WEL.

Information Systems Success and WEL

The need for attention to nontechnical as well as technical factors in successful organizational information systems projects is well known (DeSanctis & Poole, 1994; Markus, 1983; Swanson & Ramiller, 1997). They include an existing environment that is supportive of innovation and change; appropriate ICT infrastructure (Weill & Broadbent, 1998);
management support and involvement in the change project; focus on business goals; strong communication and teamwork among those involved in the change; and good planning with attention to technical detail and process redesign.

**An Environment Supportive of Innovation and Change**

The B-learning project was initiated in an organization that had a focus on and a reputation for quality in education. There was already a group of teachers who were experienced users of technology in teaching. These teachers had wide networks of contacts among educational technology innovators in universities throughout the world. The computer center already had a group of staff who had considerable experience in implementing educational technologies ranging from computer-based training to support for multimedia case studies. The project was therefore able to build on an already sound basis of technology, knowledge, and skill.

**Access to Appropriate ICT Infrastructure**

At the initiation of the B-learning project, Bocconi had a robust, fast, and mature university-wide technical infrastructure, a high level of use among teachers and administrators, and experienced and knowledgeable support staff. Attention to ICT infrastructure at the start of an initiative is, however, not enough. The infrastructure must be maintained and modified in order to meet changing demands and growth. Student and teacher demands for more or different computers to access LearningSpace suggest that revision of the university’s ICT upgrade plan should be included in the university’s steps toward routinization of WEL. This is a business issue, not just a technology issue.

**Focus on Business Goals**

Rather than being limited to initial pilot implementation of technology, the project was guided by the university’s business vision. This was therefore a long-term project with goals that would be achieved only when the university’s wider, business goals of higher quality teaching and learning and more active student participation in learning were met.

**Top Management Sponsorship and Involvement**

Throughout the project, senior management participated, attending working party meetings when requested and making key decisions quickly and firmly. The value of this approach was particularly evident when the working party was divided on the best technology solution to adopt. Senior management, with a clear view of university strategy, decided on a solution to fit that strategy, rather than relying on the more technology-focused arguments developed by the working party. At a critical stage for continuation, during the third year, management again took a critical role by initiating a workshop to review progress and define future directions.

**Communication and Teamwork**

The project benefited in clear, practical ways from the decisions made about project management. The decisions to establish a cross-functional internal working party with ready access to senior management, to appoint a single external project partner, and to have these two work as a single implementation task force, enabled a 360 degree view of the technical and nontechnical issues associated with implementation, and rapid and effective reaction to
problems as they arose. The strong spirit of cooperation among all internal and external participants in the project, along with shared understanding of the business goals, provided incentives for participation in the project.

Specific Dimensions of WEL Success

Ten principles associated with the introduction of educational technology to enable distance learning have been identified by members of the Stanford University Learning Laboratory (Friedlander, 2002). Some of these principles echo those already known for information systems projects: “Let educational values and not technology drive your projects,” “Central institutional planning is vital.” While other principles are expressed in ways that are specific to distance learning, the description of the principles suggests issues to consider when planning and managing Web-enhanced learning for on-campus students. We have called these issues appropriate use, appropriate scale, and flexibility. In addition, several of the issues raised by the Bocconi teachers at their July 2001 meeting echo those raised elsewhere in the literature of online learning and suggest additional conditions for success of WEL: teacher preparedness and support, educational material design (or redesign), and the economics of new educational models.

Appropriate Use

Based on Stanford University’s experience with distance learning in undergraduate courses, Friedlander noted “Undergraduate education is perhaps the most problematic…we have successfully used DL within large lecture courses as a way to promote joint work among students and venues for discussion and experimentation not possible in a large group” (p. 3), and “The most successful programs are combinations of on-site and distant learning” (p. 4). The Bocconi experience echoes that at Stanford: WEL in which educational technology supports interaction among students is an appropriate approach to improving undergraduate students’ experience of and growth at university.

Appropriate Scale

Friedlander’s principles included “Scale versus quality is the central dilemma” (p. 4). Bocconi’s staged approach to WEL has not yet encountered this dilemma. By beginning with pilot studies designed to test the ability of WEL to improve quality in a large-scale implementation, the B-learning project began with a deliberate attempt to maintain quality and scale. Subsequent extensions have demonstrated that WEL can support quality on a larger scale. Nonetheless, important issues of scale are emerging in student demand for more computers and in teachers’ requests for smaller class sizes.

Flexibility

The B-learning project permitted more flexibility than most university-wide eLearning projects. Bocconi enabled voluntary adoption of WEL, as well as individual teacher definition and redefinition of how the LearningSpace technology could be used. It also permitted individuals and groups to experiment with other technologies, albeit without the substantial human and financial effort invested in LearningSpace. It is difficult to tell at this stage whether this model of voluntary or “free” adoption will be successful in the long term. The more common model is where a university adopts a single software platform and requires it to be used in a standardized way. One university that has had particular success with this model
is Monterrey University in Mexico (López del Puerto, 1999). As Pollock and Cornford (2000) pointed out, however, many universities have had limited success or failed with this approach.

How important, then, is flexibility? While the Bocconi and Monterrey projects differ on this apparently fundamental aspect of the approach to implementing eLearning, they are similar in their attention to all the other dimensions described in this section. It is possible that attention to these elements of implementation is more important for success than the decision to permit voluntary adoption or define compulsory technologies and methods of use. Nonetheless, the free adoption model may have some advantages over standardization, as we note in the next section.

**Teacher Preparedness and Support**

When teachers are already proficient users of technology, as they are at Bocconi, the most valuable kind of support that can be provided for implementation of educational technology is pedagogical (e.g., for migration from traditional delivery to more active involvement of learners) rather than technical. Such support is best provided just-in-time, i.e., when the teacher is ready to change (Brown, Collins, & Duguid, 1989). Bocconi’s flexible, free adoption model may have built into it a method of identifying when educational support is needed. If the university leaves teachers free to use Web-enhanced learning as they choose, but identifies those situations where only the simplest profiles are being used, it will be able to identify those teachers who have begun to adopt the technology but may value assistance in using it in more interactive ways. Concentration of initial efforts on support for teachers who wish to move to more interactive uses of Web-enhanced technology should provide a greater overall increase in quality than concentration of support among those teachers who have already adopted more complex WEL profiles.

**Educational Material (Re)Design**

A related issue is support for the production of educational material. When slides used by a teacher in a classroom lesson become available to students online, the way the material is used is changed. For fully distance learning, a different approach to development and presentation of material is required. But, is it also necessary (and worthwhile) to redesign material prepared initially for classroom use so that it can be used effectively outside the lesson when accessed from a WEL platform? While use of slides and graphics in class is common, video streaming provides a potential solution for delivery and storage of classroom-based lessons, but do lessons on video really add value to the business model the university is introducing? The university needs to consider the cost of production in relation to the relatively short life of the material and to provide appropriate assistance to teachers (either training to replace existing methods or production staff to prepare new forms) if material of a new kind is needed.

**Incentives for Adoption**

An additional issue concerns effort and incentive for adoption of WEL. There are no formal incentives at Bocconi for use of WEL. While there is little extra effort involved in adopting WEL for the Traditional Web or simplest forms of Advanced Web profile, more complex uses involve quite considerable effort, particularly during the course redesign.
phase. The teachers who had implemented more complex uses were in no doubt that an improvement in the quality of the teaching also involves more work for the teacher.

**The Economics of New Educational Initiatives**

The economics of WEL need close attention from many points of view. Bocconi teachers have recommended an increase in tutoring and a reduction in class size to support more complex uses of WEL. They suggest that classes of 150 be divided into smaller sections to support effective discussion and collaborative learning, but Italian universities do not have a tradition of tutorials and small group work, and the economics of introducing smaller class sizes is daunting. The educational models adopted must therefore be economically manageable, adding to the complexity of each of the issues discussed here.

**CONCLUSION**

We are often asked “What software platform do you suggest?” This case demonstrates that the choice of software is only one of the many choices to be made in a multidimensional decision, and that the software implementation is just one of many aspects of successful implementation.

High commitment is required to deal with a project of this complexity: a clear vision of the business and educational goals, the need to ensure the software meets teacher and student needs for usability and functionality, sustainable technology choices, capacity planning for the entire university network, and assessment of the organizational impacts of change all need to be understood in themselves and in terms of how they are related to one another. Additional dimensions to be considered include: an environment supportive of innovative and change, appropriate ICT infrastructure, focus on business goals, top management sponsorship and involvement, communication and teamwork, appropriate use of WEL, appropriate scale, flexibility, teacher preparedness and support, educational material design and redesign, incentives for adoption, and the economics of new educational initiatives.

In addition, an understanding of innovation in organizations reminds participants that innovation is a process during which clarification, redefinition, and reinvention occur and recur. Furthermore, because innovation is a process, and implementation a subprocess within it, a project that is considered a success at one point in time may not be a success in the long term. Difficult issues associated with successful innovation, including organizational redesign and redesign of reward systems, need to be reviewed and resolved before an educational innovation such as WEL becomes routine.

**ACKNOWLEDGMENTS**

Many people provided information and data for this chapter. They include the members of the working party, the project management team, teachers whose courses were formally included in the pilot implementations, the senior management of the university, and the university office of statistics. We acknowledge their contributions with thanks.
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