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PROGRAMME



InTraServ

Intelligent Training Service for Management Training in SMEs

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1. Setting the Scene

1.1 The Context

The managerial capacity paradigm argues that a firm's growth is limited by the speed at which it can expand its managerial capacity. This is generally true but it is more and more true for Small and Medium Enterprises (SME) that often don't have a well defined managerial structure causing, in many cases, strategic and decisional lacks that obstruct enterprise's growth.

Conventional training systems based on lecture-oriented classrooms and textbooks are predicated on an instructional model that is in many ways insufficient to meet current demands. The main drawbacks of such approach can be summarised as follows:

- lengthy time between an intervention and its results: conventional training is a slow-response intervention;
- lost production: while in classrooms, learners are not able to perform their job functions.

Moreover, there is a great potential for training ineffectiveness inherited from traditional learning environments themselves. Rather than focusing on an individual, in fact, education evolves around representation of knowledge to groups of learners. This involve that rarely learner-tutor communication ends up in a complete understanding of one another's learning/teaching deficiencies. In classes, it is impossible for tutors to adapt to very specific learning needs of every learner.

A further constraint on the effectiveness of classroom education in groups is the disparity between what is communicated in the classroom to the group as a whole and the actual tasks that are encountered by each individual learner in the workplace. This constraint can also reduce the effectiveness of videotapes and CD-ROMs delivering generic content which learners can only access as a whole rather than enabling them to quickly identify and receive a single yet critical piece of information.

In order to address SME managers training needs it is necessary to address, at least, the following set of key challenges¹:

- distance, time and location (training must serve a dispersed group of learners where and when they require it),
- flexibility (training can be undertaken between work tasks),
- availability (training material can be easily located),
- immediacy (user can obtain quickly solutions to daily working problems).

Moreover it is necessary, from one side, to apply a continuous managerial learning in order to upgrade company managerial skills and, from the other side, to act in way that the on-the-field knowledge acquired by managers will sediment inside the organisation in order to improve the ability of adaptation to context discontinuities.

1.2 The Project

The InTraServ project moved exactly in this direction: its purpose was to try and evaluate an innovative Web-based intelligent training solution for manager upgrading in real European SME environments operating in different fields.

The InTraServ solution is based on a training platform obtained as integration of the results of several previous research projects carried out by the main contractor. It includes several state-of-the-art technologies such as: metadata and ontologies for knowledge manipulation, fuzzy learner modelling and case based reasoning.

¹ European Commission. Trials and Best Practice Addressing Advanced Solutions for On-the-Job Training in SMEs. FP5 IST Action Line III.2.3 Background Paper. <http://www.proacte.com>.

Within the InTraServ environment, a learner can choose between three different training approaches.

- The learner can select a set of topics from an ontology of arguments and let the system arrange a personalised self-adaptive course about such topics (the personalisation is based on user profiling).
- The learner can use the system to solve daily working problems: problems are faced by the system using a case based reasoning (CBR) methodology i.e. comparing the current problem (case) with similar solved problems in a case base and ranking all found solutions.
- The learner can exercise about learnt topic using a set of embedded working scenario simulations (business games) that allow concrete experiences through experimentation (learning by discovery).

Basing on such characteristics, the InTraServ project aims to introduce in small and medium European enterprises a complete on-the-job intelligent training system geared toward managers upgrading and able to tailor courses upon user needs and inferred user profiles (just-in-time on-the-job personalised training).

Among the InTraServ project, a course on Business Decision was developed in three languages (Italian, English and Spanish) and experimented with real users. Other three courses are now under development in order to cover several aspects of the managerial training: Marketing Management, Marketing Research and Management Control.

Within the InTraServ platform, moreover, a business game on Strategic Decisions addressing the business decision process through a “what...if” approach was integrated and experimented with real users. A new business game on Management Control is currently under development.

Using the InTraServ solution, it is possible for a manager to take personalised training between working tasks, to evaluate the formal knowledge acquired and to transform it in practical knowledge by experimenting what learnt in simulated situations exploiting InTraServ business games. When, finally, the manager will master such knowledge, he can apply it inside the organisation. Moreover, using InTraServ, a manager can be supported during his decision making process by exploiting the CBR real case solver component.

The platform is available via ASP (Application Service Provision) i.e. the platform can be reached from clients remotely, over the Internet. This offers customer access to InTraServ without making up-front investments in buying the application and the required servers or in hiring new specialised staff. In this way, moreover, the service can be managed, supported and extended by the technology provider from a central location rather than by each customer at his own site.

1.3 The Consortium

The InTraServ consortium is composed by a technology supplier (CRMPA) and by five member SMEs coming from different economic sector and different European countries.

The two main partners of the consortium are:



CRMPA (Centre for Research in Pure and Applied Mathematics) from Salerno, Italy, is a not-for-profit consortium working in the Information Technology field and dealing, mainly, with distance learning and training. It co-ordinated the whole project. Its contribution interested mainly the system customisation, the learning material creation, the management, the dissemination and the exploitation. The work concerning user needs gathering, experimentation and evaluation activities was carried out in strict collaboration with ASIMAG.



ASIMAG (Alonso Y Garay S.L.) from Bilbao, Spain, is a SME dealing with training consultancy addressing both classical and new technologies based training. It provided the appropriate experience to evaluate project results. It collaborated strictly with CRMPA during the training need gathering activity, it participated strongly in the definition of the evaluation plan and leded the Spanish experimentation and evaluation phase. Bein g a SME, ASIMAG acted as a user too during the experimentation phase.

The following four member companies participated only in the user needs gathering phase and in the experimentation phase.



9ICTA (Iniziatives de Comunicaciò I Telemàtica Aplicada S.A.L.) from Barcelona, Spain, is a SME dealing mainly with applied telematic.



MA (Metafore ed Analogie S.r.l.) from Avellino, Italy, is a consultancy SME.



CAVAMARKET (CAVAMARKET S.p.A.), from Salerno, Italy, is a commercial SME.



PASI (PASI S.r.l.) from Naples, Italy, is a commercial SME.

Moreover, two further Italian SME joined the experimentation phase:



MOMA (MoMA S.r.l.) from Salerno, Italy, is a SME dealing with technological transfer, design and development of information systems and specialized software.



JOBIZ (Jobiz.com) from Salerno, Italy, is SME dealing with design and implementation of information system and e-business solutions.

1.4 Summary of the Work Done

The work done during the project can be briefly summarised as follows.

First of all, all partners focused on SMEs training needs and on the knowledge domain that had to be covered by the training service (the managerial training). The main result of this activity was the formalisation of system and content requirements. After that, activities of learning material preparation and system customisation was planned and started contemporarily.

The course of business decision was developed and divided in learning objects: small training modules covering a little set of specific arguments. A formal ontology about business decision was realised. Learning object were then translated in each partner language, indexed using metadata and linked to the main ontology.

Contemporarily, the existing training platform was customised by integrating a business game already available as outcome of an other research project. The platform was then filled with developed content and real cases and installed on a centralised server at CRMPA. The InTraServ service then started.

A detailed evaluation plan was defined and made available to companies involved in experimentation phase. The experimentation phase started in SME environments by applying such plan and by letting experts collect empirical data in order to evaluate at what extent InTraServ was able to fulfil training requirements.

Basing on experimentation results, a sustainable business model and the related business plan were defined. All trial results were disseminated through usual EC channels (concertation meetings), through the participation in fairs and exhibitions and through the publication of papers in e-learning related journals and conferences.

Next chapters are dedicated to the description of the main activities carried out during InTraServ in order to reach project objectives. For each objective, a chapter is dedicated that demonstrates how the objective was fulfilled. A chapter about conclusions and future work will follow.

2. The Training System

The first objective of InTraServ was...

...to build a Web-based training service around the proposed platform ... the training platform will include several state-of-the-art technologies such as: metadata and ontologies for knowledge manipulation, fuzzy learner modelling and case based reasoning.

The InTraServ training system was realised and is now reachable on-line through the InTraServ site at www.intraserv.org. This chapter is dedicated to the description of such a system.

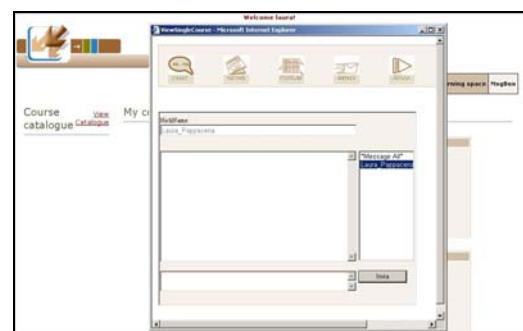
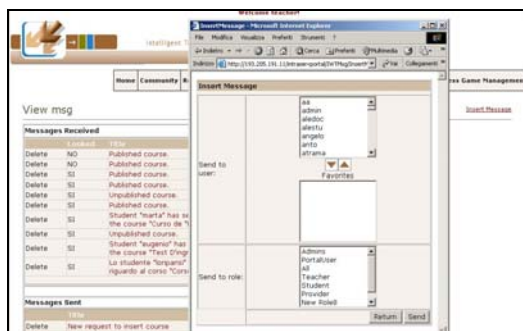
2.1 InTraServ Main Features

The main functions offered by the InTraServ system are summarised as follows.

- **Content Management:** integration with the main software tools for content creation (MS PowerPoint, MS Word, MS Producer, etc); possibility to import content from the main Web formats; availability of integrated tools for test management; support of the main standards for content description (IMS, IMS-QTI); possibility to manage contents at an higher abstraction level through ontologies compliant with the main standards for knowledge representation (DAML+OIL, SHOE); possibility to extend the system with a set of drivers to manage new kind and formats of content.



- **Collaboration:** possibility to associate discussion forums to courses or inter-course and intra-course workgroups; integrated Messaging System and Textual Chat for synchronous and asynchronous message exchange; management of a remote repository to store and share documents.

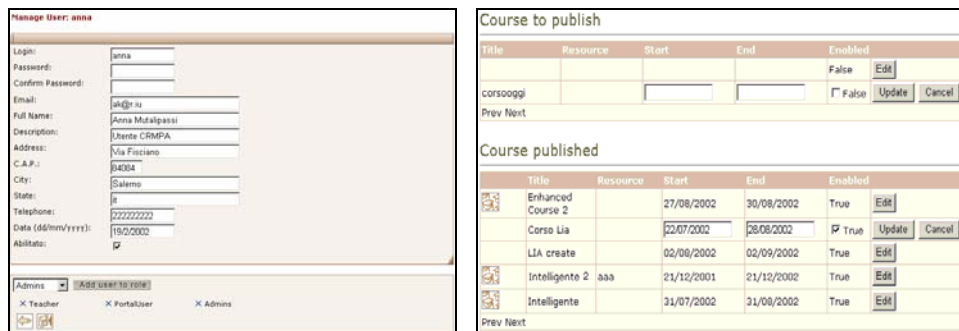


- **Course Management:** possibility to create didactical paths through the aggregation of basic content (Learning Object); support of the main standards for course description (SCORM 1.2, IMS-CP); possibility of automatic or aided generation of didactical paths starting from learning goals;

possibility of automatic customization of the training experience basing on previous knowledge of single learners and from their learning preferences; support for the automatic learner monitoring and evaluation in relation to the acquired knowledge and to the shown cognitive abilities and perceptive capabilities.



- **System Administration:** Web-based portal completely customizable in relation to layout, content and section access rights; integrated tools for the management of users, groups, roles and access rights; possibility to extend the platform through plug-ins that allow to add new services and through drivers that allow to manage new kind of Learning Objects; possibility to completely administrate the system remotely.



All InTraServ learning material is organised in Learning Objects (LO) indexed through IMS compliant **metadata** in order to let the system know what each one of them is about and how it can be used during the learning process. To provide, also, information about LO relations and interdependency, InTraServ applies **ontologies** allowing to design abstract, simplified views of training domains. Within InTraServ, ontologies are used to define and relate concepts of a training domain with four kinds of relations: (is_part_of, requires, suggested order and explains) and, also, to link concepts to LOs.

InTraServ infers and maintains a **learner model** compliant with the IMS-LIP standard composed by a cognitive state and a set learning preferences. The cognitive state stores, for each concept of a specified training domain, the knowledge degree reached by the learner represented as a set of fuzzy numbers (allowing, in this way, to manage uncertainty in the evaluation process). Learning preferences, instead, include all information about learner cognitive abilities and perceptive capabilities i.e. to which typology of resources a specified learner is more receptive.

An InTraServ **course** is composed by an user selected set of learning goals (key concepts that the learner has to learn) and by a learning path (a sequence of LO that has to be used to provide, to a specific learner, all necessary knowledge to fully understand chosen goals). Different learners can require different paths to learn the same goals depending on their learner models. For this reason, InTraServ provides an **automatic curriculum generation procedure**: the learner can choose what to learn (goals) and let the system organise a personalised learning path for him. Such path can change dynamically during the learning process adapting to learner needs in relation to learner performed

activities.

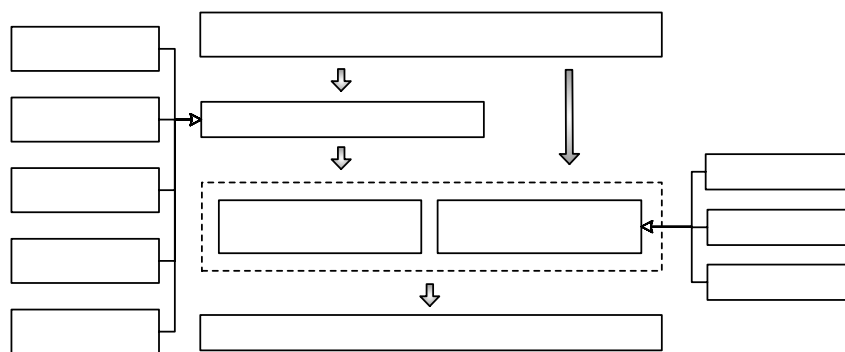
InTraServ, moreover, gives learners the possibility to solve daily working problems by exploiting a **CBR methodology** i.e. through a sub-system able to solve cases comparing the current problem with similar solved problems in a case base and ranking found solutions. The system is able to extend its knowledge by including solutions proposed by learners and validated by teachers. The strength of this approach to problem solving is that the knowledge base is maintained as concrete problem descriptions. In this way the system maintenance could be made by a domain expert rather than by a system expert.

2.2 InTraServ Architecture Sketch

Through the application of a paradigm based on the “adapter” pattern, InTraServ is able to allow the utilisation of an huge range of possible LO categories. The base concept of this pattern is the **driver**: a component that can be programmed to handle any type of LO by allowing its creation, its delivery and its eventual feedback in a transparent way with regard to the remaining part of the system. By exploiting drivers, the system can be extended in any time with a particular LO category by simply writing a driver capable to handle the new object following the released specifications.

The system architecture, moreover, allows to add in any time new ad-hoc services written for the system through the implementation of **plug-ins** conform to system specifications.

The resulting architecture of the system can be sketched as follows².



The **Data Layer** stores all persistent information related to used data structures: Learning Objects, Metadata, Ontologies, Learner Models, etc.

The **Base Services** include all general-purpose e-learning services as described below:

- User Management Services: allow registration and logging and provide all user and groups management functions including profiles handling;
- Learning Objects Management Services: provide all functions to manage LOs, Metadata and related Ontologies (including access rights handling) and to index and retrieve LOs basing on associated Metadata and Ontologies.
- Collaboration Services: include synchronous (text and visual chat) and asynchronous (messaging system and threaded discussion forum) tools for collaboration between users.

The **Plug-In services** allow to add at any time new specific domain or context dependent services through the implementation of plug-ins compliant to system specifications. Three plug-ins have been included in InTraServ:

- the Case Based Reasoning (CBR) plug-in that is responsible for case bases reasoning functions (see

² N. Capuano, M. Gaeta, L. Pappacena. An e-Learning Platform for SME Manager Upgrade and its Evolution Toward a Distributed Training Environment. Accepted to the 2nd International LeGE-WG Workshop “e-Learning and Grid Technologies: a fundamental challenge for Europe”, Paris, France, 2003.

- previous paragraph);
- the Agent Based Intelligent Tutoring System (ABITS) plug-in that is responsible for “intelligent” training functions related to learner models management and automatic curriculum generation (see previous paragraph);
 - the Business Games (BG) plug-in that will be described in chapter 4.

The **Driver Layer** allows to add the support for any typology of LO. At the moment InTraServ includes the following set of drivers:

- Passive Learning Object Driver (manages generic LO without feedback);
- Multiple Choice Test Driver (a multiple choice test is composed by a question and a set of possible answers: the user that have to solve the test, will have to choose one or more answers between those visualized, while the system will estimate the given answer);
- Module Driver (manages aggregation of LO);
- Course Driver (manages didactical courses)
- Business Game Driver. (manages a LO storing a Business Game as detailed in chapter 4).

The **Web Portal Layer**, finally, includes the Web based presentation tear of InTraServ.

2.3 Applied Technologies and Standards

InTraServ has been entirely realised in Microsoft. NET environment, using ASP.NET language (for the front-end) and C# language (for the back-end). For the main functionalities of the platform a Web Service type interface has been realised so that the standard invocation on Web is allowed (through the SOAP protocol) from external applications.

InTraServ uses widely XML in the representation of the data structures related to the maintenance of the Metadata (standard IMS), of the Tests (standard IMS-QTI), of the Ontology (standard SHOE e DAML+OIL), of the Courses (standard SCORM e IMS-CP) and of the Information about the Students (standard IMS-LIP).

The DBMS of InTraServ is Microsoft SQL Server 2000. The access to the database happens through ADO.NET. The IWT Server is installed on Microsoft Windows platform version 2000 having Microsoft .NET Framework and Web Server Microsoft IIS version 2000.

The client access to IWT happens through a common Web browser. Given the presence of some complex controls it is recommended to use Micro-soft Internet Explorer version 6.0.

3. The Training Content

The second objective of InTraServ was...

... to create a metadata indexed learning object base covering a set of common training needs for member SMEs about the managerial training ... course material will be provided in three European languages (Italian, English, Spanish) and will concern Business Decision topics.

The training course about Business Decision was realised and included in the system together with an ontology of the domain and a set of real cases covering the manager decision making process. This chapter gives an overview of such material.

3.1 The Course on Business Decision

The course "Business decision" introduces the learner to principal problems of enterprise management in order to create a reference framework synthesising principal issues concerning strategic and operative management, with particular attention to the methodology.

After that, the theme of the Information System is explained and a methodology based on it consenting to pass from planning to operating is introduced. The goal of this module is to define an analytic methodology and different techniques for business able to be applied to different enterprises.

Finally, the course presents fundamental topics about the business decisional process starting from a traditional analytic approach and then suggesting a systemic approach based on an holistic and an ecologic business vision. In addition, strategic business issues are considered and distinguished in different typologies basing on the decisional contents and on the business organisation.

The course has been developed by CRMPA in collaboration with the Department of Enterprise Studies and Research of the University of Salerno. The course is divided in three modules. The first module is about the decision problems and problem solving in a enterprise. The second module concerns the Enterprise Information System. The third one, finally, concerns the decision making and the enterprise strategic decision.

The **first module** introduces the user to the main problems of the enterprise management. Its main purpose is to create a tool able to synthesize the main problems of strategic and operative management, mainly by a methodological point of view. Its logic process can be synthesized in:

- individuation of enterprise management problems;
- strategy in enterprise organisation;
- approach to the enterprise problem solving.

The **second module** is about the information system theme. It suggests a study and analysis methodology to pass from the project phase to the functional one. Purpose of the module is to define an analytic methodology and operative application technics extensible to the different situation of the enterprise or market. Its logic process can be synthesized in:

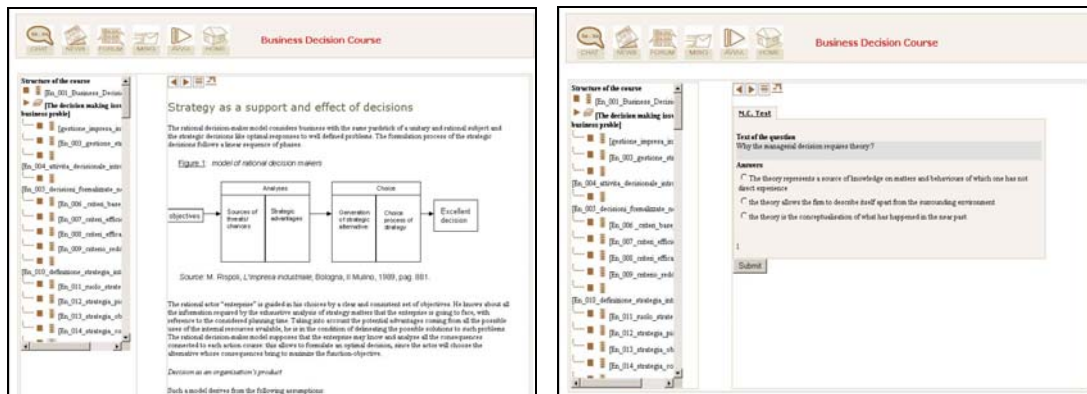
- practical and theoretical appearances common to all economic system and enterprise;
- study of the typical features of a sector "X";
- projecting and realizing an Information System for the "X" Enterprise.

The **third module** concerns the main themes about the enterprise decision process. It starts from a traditional analytic approach to come to a systemic approach, based on an holistic and ecological vision of the enterprise. Then, the module explains the themes concerning the enterprise strategy, distinguishing the different types of strategy related with the decisional content.

Main purpose of the module is to give to the enterprise managers a conceptual and practical landscape of analysis of the enterprise decision process. Its logic process can be synthesized in:

- methodology of decision process approach;
- models and technics for the decision making.

The course includes 117 Learning Objects (including 40 tests) available in three languages: English, Italian and Spanish.



3.2 The Domain Ontology

InTraServ knowledge representation paradigm is based on ontologies. Ontologies describe relations among domain concepts able to be exploited by the planning mechanism in order to create personalised training experiences.

In order to create the Business Decision Ontology, we firstly individuated, together with a domain expert, the conceptualisation of the domain, which consisted of all the nuclear concepts composing such domain. Basing on such a conceptualisation we designed the Ontology by drawing all relations between the individuated concepts.

InTraServ provides the following the admissible relations among the Ontology's Domain Concepts.

- HP (Has Part): $HP(x, y_1, y_2, \dots, y_n)$ means that the concept x is composed of the concepts y_1, y_2, \dots, y_n , that is to say: to learn x it is necessary to learn y_1 and y_2 , and, ..., and y_n .
- R (Requires): $R(x, y)$ means that to learn x it is necessary to have already learnt y . This relation poses a constraint on the Domain Concepts' order in a given Learning Path.
- SO (Suggested Order): $SO(x, y)$ means that it is preferable to learn x and y in this order. Note that also this relation poses a constraint on the DCs' order but now it is not necessary to learn y if we are interested only in x .

Furthermore, we have the following relation linking Domain Concepts and Learning Objects' Metadata:

- EB (Explained By): $EB(d, l)$ means that the Domain Concept d can be explained by means of the Learning Object indexed by the Metadata l (l is sufficient to explain d).

The Business Decision domain conceptualisation produced for InTraServ is composed by 94 concepts and 166 relations between concepts.

3.3 The Business Game

The third objective of InTraServ was...

... to customise the actual training platform prototype by integrating a set of simulations covering aspects of the manager decision making process ...in particular, during the lifetime of the project, we forecast to include a business game for Strategic Decisions.

The business game about Strategic Decision, already available as output of another CRMPA project, was fully integrated in the InTraServ environment by realising a system plug-in. This chapter gives an overview of the purpose and of the functioning of such a business game.

3.4 The Business Game for Strategic Decisions

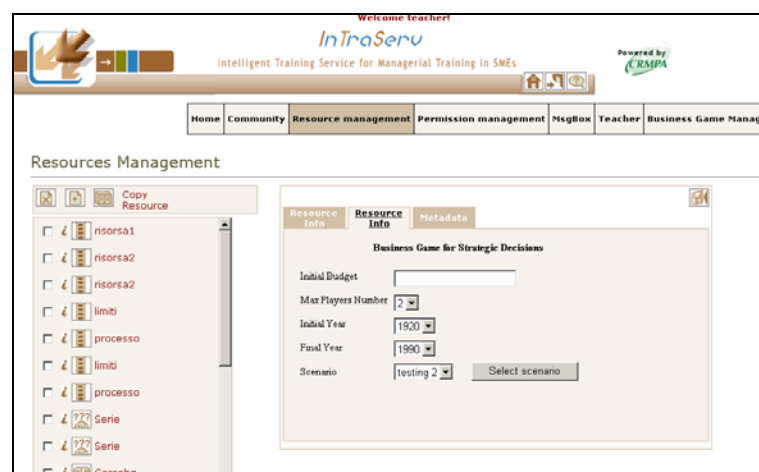
The business game for strategic decisions is aimed to favour a wider strategic vision in the business government. It concentrates its attention on commercial enterprises and allows users to take strategic decision and to implement the consequent tactical actions. In fact, given the present evolution and the competitive scenarios that are forecasted for the next future, such enterprises have to face continuous restructuring and competitive repositioning processes.

The game consists in the creation of a competition between commercial enterprises constituted by one or more outlets in different sale compartments. The game is played in a scenario described by a population trend, income's distribution and infrastructure considered in a given period. The scenario is very dynamic, in fact it evolves year by year. For each expansion, players may dispose of new outlets by participating to an auction.

The game is characterised by a simulation model that presents different difficulty levels that may be chosen in relation to players skills, abilities and knowledge. In addition, it offers the chance to face different problems concerning sale points acquisitions, sale prices management, promotions, merchandising, financial management, etc. Thanks to the multi-dimensionality of the faced issues, this game allows players to apply to the simulated reality all methodologies, government and management techniques belonged to commercial enterprises.

3.5 Running the Business Game

Inside InTraServ, a Business Game is handled as a particular learning object and a tutor can create a new BG through the resource management portal area. He can specify the resource info that describes the BG (e.g. the initial budget) the maximum number of players associated to the BG session, the initial and the final year in which the game is developed, and the game scenario (People Distribution and Income Distribution).



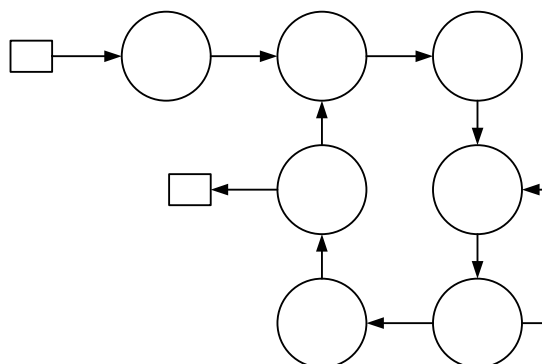
Tutor can manage the business game sessions, he can perform this type of functionalities:

- **Server Management:** in this section the tutor can manage the Business Game Server running in Tomcat environment. He can start, stop and check the server status
- **Create Session:** For each business game, the tutor can create a game session or list the associated game sessions. For each session the tutor can view session details (who and how many players are in the session game, game scenario, etc.), he can set the session start date (**Date** and **Hour**) and he can delete a particular game session. Furthermore the tutor can associate a student to a particular game session and control the active student sessions.
- **Session Mastering:** the tutor can enable (set off or on) the game sessions and master them. He can start, stop, delete the game session, he can view game session details, delete a player from the game session, insert a player in the game session. Furthermore the tutor can control the game status.
- **Manage Interrupted Sessions:** tutor can manage interrupted game sessions and set game session information.

A student registered to a course including a business game learning object can play to the game only if his tutor enabled the game session. The following images shows the panel of the game. The student has to perform a set of strategic choices in order to improve his/her virtual enterprise (on the left). The student can view in every moment the game scenario (on the right).



The following automata shows the game process phases.



To each phase it is associated a panel that the player must fill.

4. Experimentation and Evaluation

The fourth objective of InTraServ was...

... to evaluate the benefits of the InTraServ approach to training in terms of the degree of satisfaction of SMEs training needs ... [to do that] ... the system will be experimented with real users in real SME environments.

The experimentation phase was planned at the end of the requirements gathering phase and was executed in three steps:

- step 1 (September 2002): the experimentation sites were settled up;
- step 2 (October to November 2002): a first experimentation of an InTraServ intermediate prototype took place with few users for system debugging and upgrading purposes;
- step 3 (from December 2002 to April 2003): once the final prototype was ready, the final experimentation phase for system evaluation purposes took place.

4.1 Experimentation Objectives and Methodology

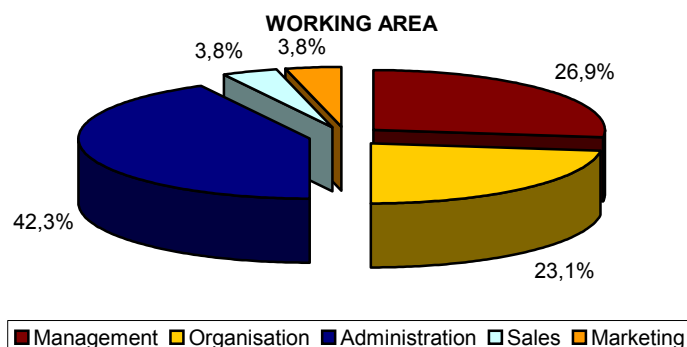
The objectives of the InTraServ experimentation and evaluation process were:

- to study and analyse the qualification reached through the access to training i.e. to know if participants have assimilated knowledge and have developed values and attitudes that were aimed to be achieved through this training;
- to know the participants attitude towards the offered training as well as to analyse satisfaction concerning contents, teaching staff attitude, obtained results, etc;
- to analyse the concrete e-learning environment: installation, versatility, clearness, contents frame, audiovisual environment, navigation and interaction, reliability, security, forum;
- to analyse the efficiency of CBR (Case Base Reasoning) methodologies;
- to analyse the impact and the benefits of the learning-by-doing paradigm through the Business Game approach;
- to assess the success of the learning process.

Used methodologies for processes evaluation focused on quantitative methodologies based mainly on surveys and on qualitative methodologies based on personal interviews.

The evaluation agents (i.e. those who provide information for the evaluation process) were learners, learner supervisors, teachers and training experts that have taken part in the training experience. In particular, the InTraServ experimentation involved:

- 28 learners from 7 Italian and Spanish companies representing different economical sectors, mainly from services and industrial areas (all the learners were managers in different areas);



- 7 worker supervisors (one for each company);
- 1 teacher from CRMPA to follow the training process;
- 1 training expert from CRMPA interested in courses development.

On this basis, the evaluation procedure was divided in three main stages.

- **Processes Evaluation:** at this point we focussed in all the processes that led to the training realisation. The main objectives of this stage was to study and analyse the qualification reached through the training, to know participants attitude and also to analyse the e-learning system itself.
- **Fulfilment Evaluation:** this tried to define which has been the application of the imparted training in the tasks fulfilment, the factors that have hindered or favoured transferability and the influence of training for the evolution of employment and working conditions.
- **Impact evaluation:** was the last step in this process. The main objective of this activity was to know the efficiency of the training to solve workers needs, to analyse how the training contributed to the improvement and also to know how it influenced the achievement of strategies and results.

4.2 Evaluation Results

InTraServ platform was fully approved by potential users and also by their supervisors. E-learning method and course contents were proper and suitable to the users needs. The presentation and methodology fulfilled the users needs and the only suggestion in this sense was the introduction of more practical cases.

Both interface and navigation environment were satisfactory for most of the users, who also perceived the system secure. Some initial technical problems (solved in the second version of the system) did not interfere on apprenticeship in a special way, and this question is especially important, as many of the students were not accustomed to using ICTs at all.

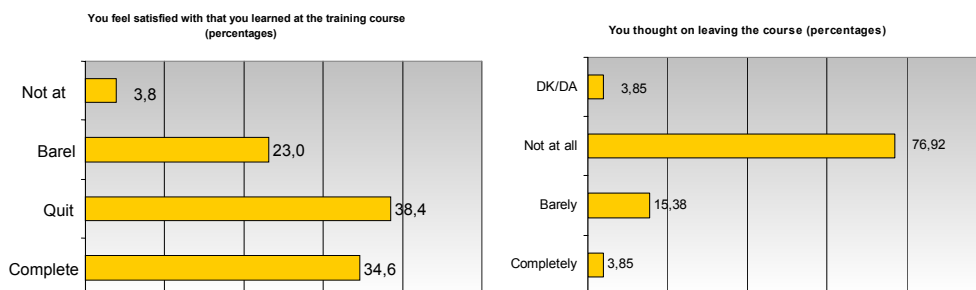
Learners did not use to a great extent the communication means that were available, as forum or email to communicate among themselves and with the teacher. In contrast, most of them felt satisfied with the teachers activities. The lack of habitual use of Internet tools by InTrServ users could explain this lack of communication.

Concerning the use of acquired knowledge, most of the students expressed a complete interest in applying it at work. In this sense, it is also remarkable the fact that most of them also think that the training received was suitable to their needs as more than a half of the contents directly dealt with daily working problems.

When taking about training impact the results are also very positive. Most of the users considered the experience as profitable for them. Supervisors also expressed they detected time saving and, in general, training profitability is clear.

Following we will summarize the most significant data.

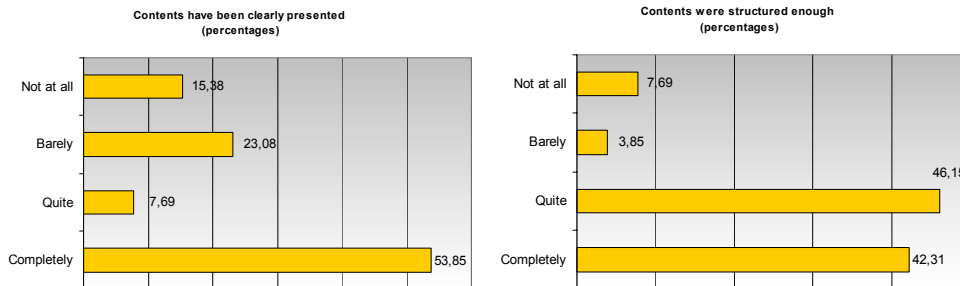
- Most of the students felt satisfied with the training course and the knowledge acquired, around a 96%. Around a 77% never thought on leaving the course.



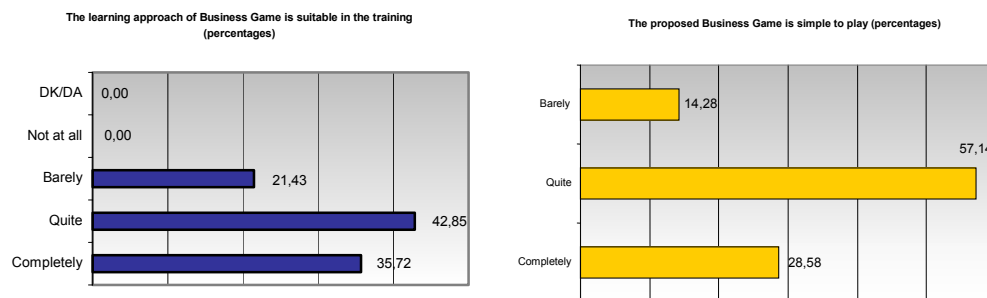
- The training tool was pointed as versatile and suitable for the needs in more than an 88% of learners, and more than a 92% considered that their training needs in the course area were covered.
- Three out of four students expressed a positive feeling about the overcoming of space and time

barriers. The 73% of them were completely or quite able to take advantage of e-learning system in this sense, and another 23% barely did it.

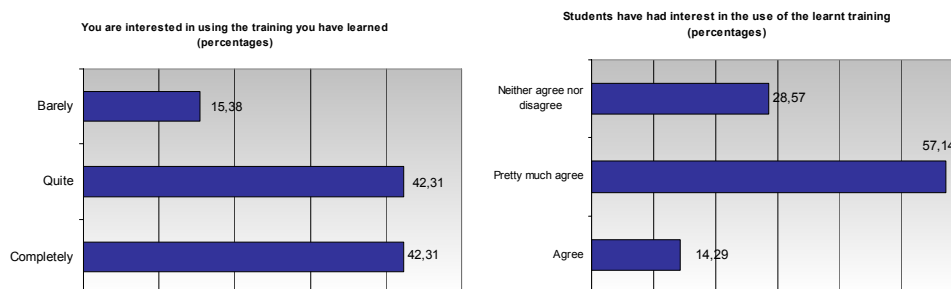
- At the very beginning, almost a 60% considered that presential training would not have improved received learning, figure that increased until an 80% once the training process finished.
- Contents were perceived as clear and well structured for more than an 84% of the students.



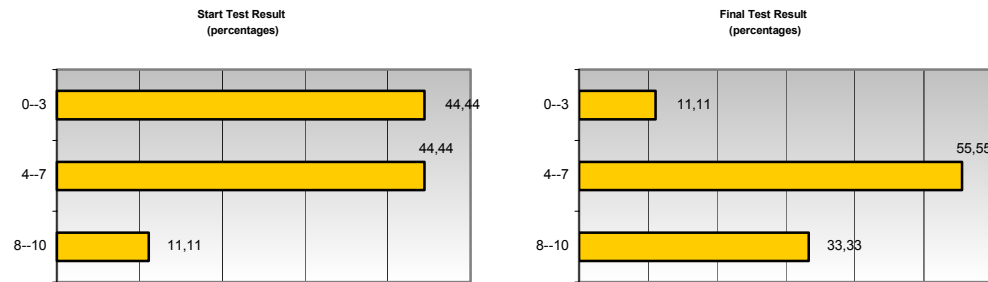
- A 69% of learners were able to combine working tasks and learning activities.
- The Business Game was very or quite simple to use for more than an 85% of the participants, and suitable in the training process for more than 78% of them. All of the students were interested in taking part in another Business Game.



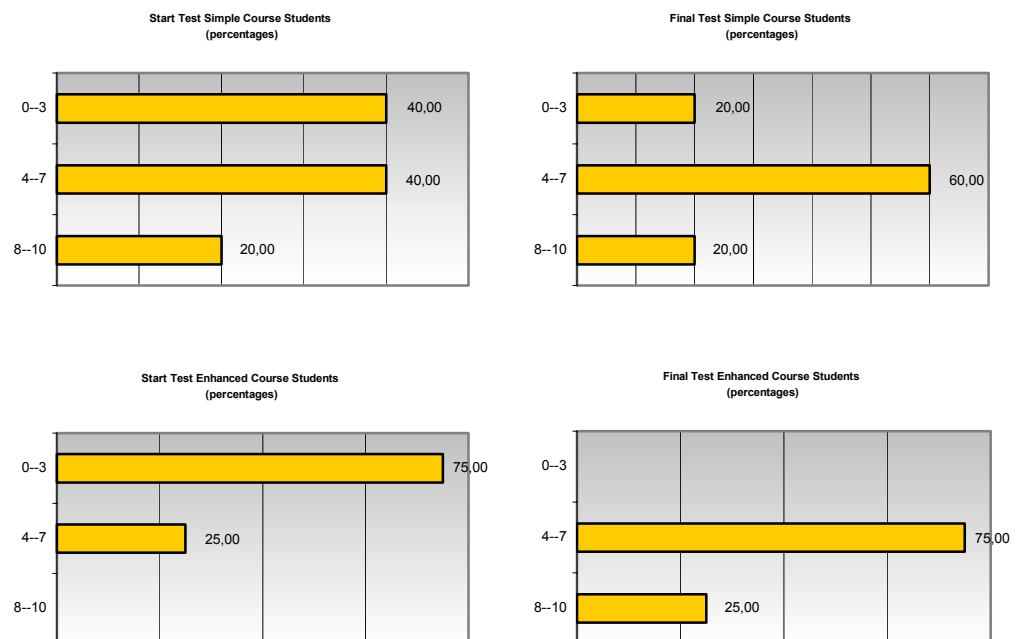
- Only around a 20% of users contacted teachers for support but most of them, the 73%, felt satisfied with teachers activities.
- Around an 84% of students are completely or quite interested in using the knowledge acquired. Supervisors confirmed this point as 71% of them think so.



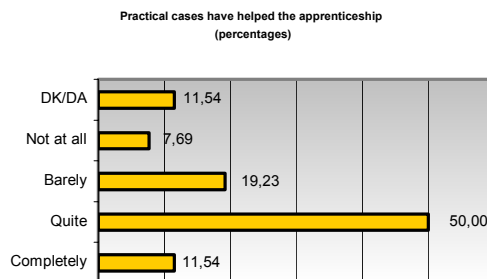
- More than an 88% of participants think that received training is suitable to their needs. In this sense, around a 70% of them expressed they already used to solve working problems in some way.
- Objective results showed that the level of competencies of students improved. From a starting situation of 44% of participants in low level of competencies, once the course finished, 88% of students were between the medium and high level of competences.



- While with the classic course we have an improvement of 20% from low level competencies to medium level of competencies, with the intelligent course (the course able to exploit the ABITS plug-in to customise the training experience) we have an improvement of 75% from low level of competencies to medium/high level of competencies.



- The 62% of learners recognized the CBR (Case Base Reasoning) valence in apprenticeship and asked for the introduction of more practical cases.



- A 61% of students think that the experience was profitable for them.

5. Exploitation and Dissemination

The fifth objective of InTraServ was...

... to sketch and evaluate a sustainable business model around the proposed solution ...the model will exploit the ASP (Application Service Provisioning) model.

Moreover, the sixth (and last) objective was...

... to disseminate the know-how resulting from the trial through the European Community.

This chapter deals with exploitation and dissemination issues.

5.1 InTraServ Exploitation

The most important elements of InTraServ innovation arises from the association of different and numerous aspects, such as:

- the peculiar mix of the offered product;
- the learning method it develops;
- the “channel” through which such product is offered, namely the e-Learning;
- the modularity of the offered product.

The offering of InTraServ will be able to exploit an Application Service Provider (ASP) methodology. The **distribution channels** through which the product will be transferred towards the final buyer are substantially three: on-line selling, direct selling and indirect channel (through a vendor).

In order to use InTraServ, customers will be able to exploit three different **offerings**: customised intelligent training, real case solving system, simulation instruments. Users can subscribe to the whole solution, to a single or to a couple of different approaches. A pay per use policy will be also used. Such policy will be different basing on the selected training approach.

- In the *first approach* (customised intelligent training) learner can select the interested topics and let the system arrange a personalised course about them. The pay per use pricing policy can refer to single learning objects (LO) used. Paid LOs will be not re-feed for a limited period of time.
- In the *second approach* (real case solving system) learner can use the system to solve daily working problems. Problems are faced by the system using a CBR methodology. The pay per use pricing policy can refer to solutions really accessed by the user.
- In the *third approach* (simulation instruments) users have the possibility to exploit a business game useful to practice about learnt topics. In this case, the pay per use pricing policy can simply refer to each access to the service.

Concerning the **communication policies**, all the communication efforts will be oriented, first of all, towards the construction of a certain level of attention of the targeted market around the new didactical tools (software) for the managerial training. Secondly, we will aim at the creation of a specific interest to the offer of the product connected to our platform, provided that it is endowed with unique features with respect to competitors. Very important tools in this phase will be the direct marketing, the e-mail marketing, the event organisation, the advertising; and the Web site.

5.2 InTraServ Dissemination

In order to disseminate the know-how resulting from InTraServ through the European Community, several dissemination activities were undertaken. Dissemination activities included the **participation to events and fairs** related to learning and training topics in order to present InTraServ demos and start to create a preliminary market awareness. The following list includes events where InTraServ participated:



Frankfurt Book Fair 2002. 9-14 October 2002, Frankfurt, Germany. InTraServ was presented in the EU stand.



On-Line Educa Berlin 2002. 27-29 November 2002, Berlin, Germany. InTraServ was presented in the Proacte stand.



World Education Market 2003. 20-23 May 2003, Lisbon, Portugal. InTraServ was presented in the 9ICTA stand.

Two **scientific papers** about InTraServ have been published in journals and conferences proceedings:

- N. Capuano, M. Gaeta, L. Pappacena. **An e-Learning Platform for SME Manager Upgrade and its Evolution Toward a Distributed Training Environment.** 2nd International LeGE-WG Workshop “e-Learning and Grid Technologies: a fundamental challenge for Europe”, Paris, France, 2003.
- N. Capuano, M. Gaeta, A. Micarelli. **IWT: Una Piattaforma Innovativa per la Didattica Intelligente su Web.** AI*IA Notizie, year XVI, no. 1, p. 57-61, March 2003.

Dissemination activities included the **participation in clusters of EC projects** addressing training for SMEs in order to share with other projects public InTraServ deliverables. The following table lists Concertation Meetings and K2 Events where InTraServ representatives were sent:

- Education and Training Concertation Meeting, 11-12 March 2002, Luxembourg;
- Education and Training Concertation Meeting, 29-30 January 2003, Luxembourg;
- Participation to the K2 Event, 17-18 July 2002, Madrid.

In order to provide information related to InTraServ progresses and intermediate results, a project **Web Site** was realised and made available under the www.intraserv.org domain.

The screenshot displays the InTraServ website interface. At the top left is the InTraServ logo, and at the top right is the Information Society Technologies logo. Below the logos is a navigation menu with items: Introduction, Objectives, Participants, Workplan, Organisation, Archive, and Members. The main content area contains the following text:

Introduction InTraServ is an EC funded project under the 5th Framework Programme - Information Society Technologies (contract IST-2000-29377). The main project objective is to try and evaluate an innovative Web-based intelligent training solution for manager upgrading in real SME environments' operating in different fields.

Objectives The proposed solution is based on a training platform obtained as integration of the results of several previous research projects carried out by CRMPA. It includes several state-of-the-art technologies such as: metadata and ontologies for knowledge manipulation, fuzzy learner modelling and case based reasoning. Within such environment, a learner can choose between three different training approaches.

Participants

Workplan

Organisation

- ▶ The learner can select a particular set of topics from an ontology of covered arguments and let the system arrange a personalised self-adaptive course about such topics (the personalisation is based on user profiling).

Archive

- ▶ The learner can use the system to solve daily working problems. Problems are faced by the system using a case based reasoning (CBR) methodology i.e. comparing the current problem (case) with similar solved problems in a case base and ranking all found solutions.

Members

- ▶ The learner can exercise about learnt topic using a set of embedded working scenario simulations (business games) that allow concrete experiences through experimentation (learning by discovery).

Basing on such characteristics, the InTraServ project will introduce in small and medium European enterprises a complete on-the-job intelligent training system geared toward managers upgrading and able to tailor courses upon user needs and inferred user profiles (just-in-time on-the-job personalised training).

Four **courses** covering several aspects of the managerial training will be made available in three languages (Italian, English, Spanish): Business Decision, Marketing, Marketing Management, Marketing Research and Management Control. The first one will be made available during the project duration while the others will be completed after its end during the exploitation of the product.

Within the InTraServ platform, moreover, a set of **business games** addressing the business decision process through a "what... if" approach will be integrated. In particular, two business games will be made available: a Business Game for Strategic Decisions and a Business Game on Management Control. Also in this case, the first one will be made available during the project duration while the second one will be completed after its end.

Using the InTraServ solution, it will be possible for a manager to take personalized training between working tasks, to evaluate the formal knowledge acquired and to transform it in practical knowledge by experimenting what learnt in simulated situations exploiting InTraServ business games. When, finally, the manager will master such knowledge, he can apply it inside the organization. Moreover, using InTraServ, a manager can be supported during his decision making process by exploiting the CBR real case solver component.

The platform will be made available exploiting an Application Service Provision methodology (ASP) i.e. the platform will be reachable from clients remotely, over the Internet. This will offer customer access to InTraServ without making up-front investments in buying the application and the required servers or in hiring new specialized staff. In this way, moreover, the service can be managed, supported and extended by the technology provider from a central location rather than by each customer at his own site.

Project duration is 18 months. It started the 1st December 2001.

Centro di Ricerca in Matematica Pura ed Applicata
CRMPA
Questions about InTraServ can be sent to: info@ist.intraserv.org
Last Update: 04-02-03.

An InTraServ related article introducing the InTraServ project was published on the Italian newspaper Corriere del Mezzogiorno (annex to Corriere della Sera for the South Italy) on Friday 29 November 2002.

Iniziativa dei matematici dell'università sotto l'egida dell'Unione europea

Fisciano crea il prof virtuale

Un progetto dell'ateneo alla fiera «Online Educa» di Berlino

SALERNO — «Online Educa», in programma a Berlino da questo fine settimana, è uno degli appuntamenti internazionali più importanti nel panorama dell'e-learning, l'insegnamento applicato alle nuove tecnologie. Una vetrina alla quale partecipa anche l'Unione europea con la presentazione di cinque progetti innovativi europei. Di cui uno italiano. Anzi dell'università di Salerno, realizzato dal Crups (centro ricerche di matematica pura e applicata) dell'ateneo di Fisciano. Il progetto è denominato «IntraServ» e rappresenta la creazione di una classe virtuale, con professori altrettanto virtuali ma «intelligenti», che individuano il metodo formativo ed il tipo di studio da assegnare ai manager di piccole e medie imprese che intendono essere formati.

■ A pagina 7
Nazione



Progetto e-learning dell'università di Salerno

DIALOGHI IN RETE

MACRY-MIELI

«Bossi sbaglia, l'Unità non è stata un regalo del Nord»



■ A pagina 11

6. Conclusions and Future Work

InTraServ arranged a Web-based intelligent training solution allowing SME managers to undertake personalised training between working tasks and experimented it in 7 real SME environments.

A total of 28 learners and their supervisors were interviewed to determine the extent to which the tool and contents were appropriate for participants. The platform was fully approved by potential users and the e-learning method and course content were useful and practical for SME managers to meet their training needs without spending too much time away from the company.

Feedback on the training was very positive with 96 percent of the users saying that the experience was profitable for them. Supervisors said they detected time saving and thought that the profitability of the training was clear.

Innovative features were well received by learners that recognized the CBR (Case Base Reasoning) valence in apprenticeship while the Business Game resulted in an interesting experience for the greatest part of them. The intelligent functions of the system, moreover, raised of a great percentage the managers learning performances.

By the end of the year InTraServ plan to produce an additional business game on management control and three new courses on marketing management, marketing research and management control, all of which will be available in Spanish, Italian and English. The commercial launch of InTraServ as a service is forecasted for the beginning of 2004 in Italy and (probably) in Spain following the exploitation plan defined during the project execution.

It is important to note, moreover, that the InTraServ underlying training platform is now available as a product under the **IWT** brand and is currently distributed by MoMA (www.momanet.it), a CRMPA spin-off company. InTraServ will be distributed by MoMA as a version of IWT customised for SME manager training. Another version of IWT customised for university level learning is now available and already used at the universities of Salerno, Roma3 and Molise.

Scientific work about InTraServ and the underlying e-learning platform IWT are in progress. The InTraServ architecture is well structured and suitable for extensions with new services and easily customisable for new training contexts and domains. Nevertheless, it is quite monolithic: it doesn't allow the distribution of training content on different servers, the cooperation of different installations of the system, the possibility to combine training resources offered by different providers, etc.

For this and more reasons, in the framework another project named **Diogene** (www.diogene.org), we are completely re-thinking the InTraServ architecture by applying a distributed computing paradigm based on Web Services. This will allow the distribution of training content on different servers, the integration with the forthcoming Semantic Web, the cooperation of different installations of the system, the possibility to create a training offer by combining resources offered by different providers, etc. In this sense it will be a step toward a GRID architecture³.



³ See N. Capuano, M. Gaeta, L. Pappacena. An e-Learning Platform for SME Manager Upgrade and its Evolution Toward a Distributed Training Environment. 2nd International LeGE-WG Workshop "e-Learning and Grid Technologies: a fundamental challenge for Europe", Paris, France, 2003.

7. Contact Details

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