
Adjusting Basic Maritime Training in an E-Learning Environment

Orestis Schinas¹
Eleftherios Thalassinos²

Abstract

This paper aims to disseminate the results and the findings of two projects, partially funded by the European Commission, one on computer based training and another on e-learning. Both projects have been focused on training employees of the wider marine and maritime community. Different approaches have been used for attacking specific needs and several methodologies have been employed.

Both projects are described and presented to the academic community as well as to professionals. Their results and findings are thoroughly discussed. The importance of distance working in modern societies and its intertwined role in relation with the development e-learning are also discussed from the point of view of the wider maritime industry.

Keywords: E-learning, employees training

JEL Classification: A20, A29

Introduction

The increasing interest over e-learning and distance working is expressed through several policy documents and materialized through many actions and programmes of the public and private sector. However, the expressed interest and support of the European Commission offers new opportunities and provokes discussions regarding the educational and methodological approach, as well as the technical means used.

E-learning becomes more important as technology matures and people get more familiarized with remote and distance working, learning and consuming. The market of corporate e-learning is expected to rise dramatically in the coming years, and a benchmark of \$23bn is expected for 2004, while it was only \$1.7bn in 1999. Corporate e-learning becomes a necessity and companies shift to new organizational schemes, apply new management techniques and seek for ways to implement distance learning techniques for their staff. Despite the fact that almost all sectors invest heavily in the young professionals, aiming for the *crème de la crème*, the

¹ Project Manager for the TRIAINA and EQUADIL projects – Contacting Author:
schinaso@asme.org

² Professor, Dept. Chairman, University of Piraeus, Karaoli and Dimitriou 40, 13582, Piraeus, Greece,
tel. +30210-4142525, e-mail: thalassi@unipi.gr, thalassinos@aia.gr

maritime and transport sector generally, seems more reluctant to adopt and apply the new techniques, while extended need for professionalism onboard and ashore emerges. Furthermore there is still an educational or a training gap between the ideal young candidate for the industry and the one 'produced' by the system.

As a matter of fact, Europe is currently lagging behind North America and Japan in this field. In 2004 Europe will represent \$4bn of the total market, while North America will get the lion's share with \$15bn. This is a worrying point for policymakers and the market, as the main asset of Europe is its robust scientific and cultural heritage, educational tradition and the concern for the well being of all citizens.

The issue of education is crucial in marine operations, such as navigation, watch keeping, maintenance, and communication for reasons of safety of life and property as well as of environmental protection. International and specialized bodies, such as the International Maritime Organization (IMO), have identified as a cause of accidents and disasters erroneous procedures of the management ashore as well as communication gaps between people working and operating ashore and onboard. To attack such problems, codes such as STCW and ISM have been introduced and adopted additionally to the renewal of MARPOL and SOLAS sections.

The new requirements demanded fresh managerial approaches in the shore operations and therefore the existing work force should go through training, while the new entrants should have acquired these skills before graduation. The changing environment shocked the industry and training became a very interesting, lucrative and important business.

While training is relatively easy for people working ashore, it is not simple for people working onboard or at remote spaces, such as offices away from the home base. Furthermore there are language barriers and educational gaps. For example the use of English as main communication language engulfs many dangers when native and non-native speakers are involved and they have a different educational background. Usually crews are from Russia, Ukraine, India, Greece, Philippines and other countries where English is not an official language necessary or it is spoken with different accents and syntax, while officers at shore may command the language at a totally different level. The educational background is also different; thus communication may contain many mistakes and errors, sometimes fatal.

At this point it is interesting to highlight some training demand and supply attributes in the maritime industry. A shipping (or a related to) company seeks mainly for employees and officers who demonstrate self confidence and independent thinking, as well as determination, willingness and ability to adopt to changes of the environment and of the technology. By analyzing further the demand side, the employees have to be able to demonstrate communication and cooperation abilities as well as to possess a solid theoretical background that will enable innovativeness and adaptation. From a 'technical' point of view it is necessary to discuss the viability of conventional training and educational procedures in the modern business environment. Instructors, educators, trainers and professors at various levels complain about the ineffectiveness of the procedure, often attributed to lack of interest or inadequate attendance or even technicalities, such as time- and space-limitations.

Almost everybody discusses the necessity of reforms; students suggest a 'mental' and 'experience-based' process rather than segmented knowledge-transfer from instructors. As education and training is closely linked to professional development student suggest a shift towards more practical and real-life issues.

Nevertheless some points shall be taken seriously into account; the first one deals with the theoretical background. Experience teaches that if only a professional possesses a solid theoretical (academic) background can demonstrate innovativeness and adaptability to changing conditions. Thus a solid theoretical background is more than necessary regardless if this is more focused on economics, engineering or any other discipline. That related to intelligence and rationality. The second one deals with the mental attributes of the professionals. If only someone has experienced teamwork and multi-cultural exposure as well as has learned to bridge communication gaps may demonstrate the same qualities at work. A supply-side analysis would discuss the training, educational and pedagogical methods that meet effective learning and active student involvement. There is a quest for self-directed study that will actually lead to life-long learning. In some cases the answer lies on problem-based learning (PBL) or case-studies. This will also be discussed in a latter section.

Although much research has been conducted for communication, in general as well as professional skills onboard, studies on the ship-shore communication have been relatively limited and focused on specific safety issues. In addition, very seldom the importance of distance learning techniques and means has been pointed, and no such provision has even been included in any official document to the best of the authors' knowledge. Modern technologies, such as computer networks and more specifically, Internet, can provide solutions where communication costs are low, while CD-ROMs and even DVDs can assist when communication is impossible or costly.

Another point of interest is the rate of change of skills necessary onboard and ashore. Few years ago a small number of technicians and engineers had a deep understanding and command of fields such as automations and social or institutional rules of working and occupation. As technology becomes more complex, decision-making and support turn out to be more difficult and demanding in terms of skills and schooling background.

Under these circumstances and identified needs, researchers of the University of Piraeus along with other partners, have submitted proposals for partial funding of pilot projects to the European Commission (EC), under the umbrella of the Leonardo da Vinci Programme (LDV). The Commission has granted money for two projects the project EQUADIL, which delivered two educational CD-ROMs, and the project TRIAINA, that established a virtual training center.

Aim of the current document is not to evaluate the policy goals and actions taken by States and bodies of the European Union, but to discuss the experiences, the results and the findings of two projects, partially funded under the LDV framework. The findings and the results of both projects are considered as very interesting for bridging the contemporary gaps in education and possibly in the communication among various team members ashore and onboard. Another interesting point the

paper aims to discuss is the methodological approach, as it is a very difficult task to extract sound methodology for educating people of different backgrounds and level of training.

The EQUADIL project

According to the proposal the EQUADIL team had the following tasks and objectives:

1. to develop and implement two educational CD-ROMs, one about industrial automation strongly focused on Programmable Logical Controllers (PLC) and another about hygiene and safety at workplace
2. to train the trainers of the two industrial partners
3. to implement an integrated vocational training system

Despite the administrative problems faced, all goals have been achieved. The project was initially designed with duration of 27 months and was actually limited to almost 10 months. The deliverables of the EQUADIL project can be broken down in two as following:

1. the educational material along with the CD-ROMs and the deliverable with the requirements for such computer based training (CBT), and
2. the training and familiarization of industrial trainers with CBT educational material

It is also very important to note that the training material has been evolved with the assistance of employees, who have used it in a latter stage of implementation, according to the training plans of each company respectively.

The main goal of the project was the promotion of self-learning methods in workplaces, especially through distance learning and continuous training, and more specifically the goals can be run down as following:

- 1) Preparation of the educational material
- 2) Outline of computing needs and installation of the equipment
- 3) Training of industrial employees with the use of modern technology at work
- 4) Training of young employees in hygiene and safety at workplaces, as well as in environmental sensitivity
- 5) Presentation of new labor relationships (focus on industrial sectors)
- 6) Education of trainers in issues relative to computer networks, multimedia technology and the WWW, as a mean of sustainable support of distance learning
- 7) Dissemination of experiences gained in several EU countries

In addition to the above the team also decided to evaluate the whole effort. Initially it was planned to prepare an evaluation plan, which was abandoned, as the sample of the trainees was rather small for such an effort. EQUADIL referred to trainers and not to employees directly.

In the demonstrator's sites, employees with poor access to modern technologies and contemporary safety practices received direct benefit as training was straight and immediate, including training for the use of computers and internet. Further-

more the project aimed to meet the objective of the combination of vocational programmes with research and development. Universities and vocational training centers (VTC) met the industry, and exchanged ideas and techniques towards a mutual beneficiary gaining of experience from each other.

This project was designed to assist in removing three groups of barriers identified by the EC: institutional, individual (dispositional / motivational) and technological (actual) towards the creation of a 'learning society'. Basic skills students, who have not hitherto had did not have access to the Internet, were being provided with such access, and new sets of skills were provided for tutors working with groups of workers. Employees, who were normally excluded from taking up training opportunities due to their lack of basic skills or low qualifications, were encouraged through training in modern industrial technologies, to take up basic skills and concepts at work, which would then allow them to participate in more advanced and specialized training programmes in the future. Additionally, this group of employees normally excluded from internal promotion opportunities and from transferring to other employment outside the current workplace was provided with greater opportunities - both through the general improvement of basic skills and through access to IT training that provided access to the range of information about opportunities available through the World Wide Web.

As a matter of fact the 'magic' involved in the Internet and web applications have been used as a gateway for self-learning and knowledge acquisition. Finally the gained experience from the project points out that employees need a very a good trigger in order to get involved to schooling. Most of them have not undergone proper schooling in their early youth and some of them have even left school. The experience of dealing with these people when preparing the videos for the material stressed that every educational material has to attract and catch the interest of the potential audience. This may sound simple and obvious but at least from the experience of almost all partners, most projects fail just because the audience lacks interest. In this case, the employees were willing to 'examine' the final product and to 'listen to' somebody who knows about all these things they created under the guidance of a 'third party', i.e. the EQUADIL team.

The cooperation of the University with the VTCs and the industry was fruitful, as several needs of the workforce have been identified. Some of them are outlined here:

- Training of workers (foremen) in industrial automation principles.
- Training of newcomers in hygiene and safety precautions in work.
- Support of training with multimedia content designed especially for inexperienced users.
- Provision of on-site multimedia training courses to workers.

Though the needs are focused on industrial workers, there is a very close connection to the needs of the employees of maritime companies and mariners. As the industrial partner was a major shipbuilding corporation in Greece, the needs identified for the shore personnel and technicians are the same for the mariners onboard. Though more focused on shore operations, mariners can get the essence,

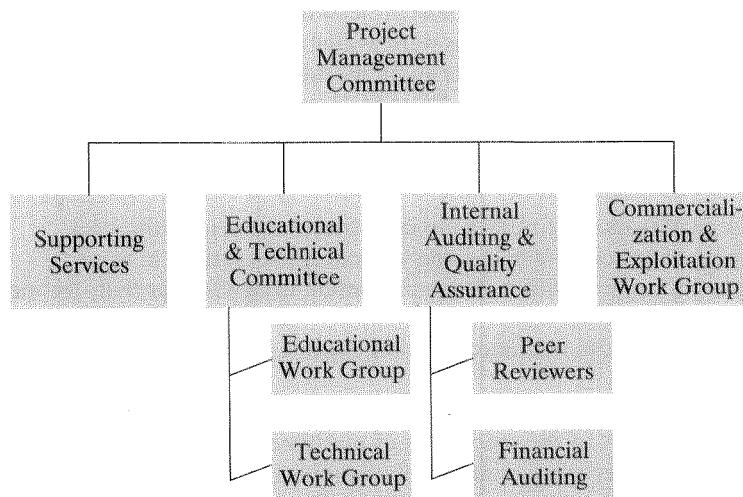
as the same applies for operations onboard. Furthermore, as technical inspections become more demanding, mariners are expected to spend more time at yards, so it is necessary for them to understand the working environment and habits of the rest employees.

In order to meet the above needs, the EQUADIL team created and developed two educational sets, one on PLCs and another on hygiene and safety, both containing a CD-Rom and a booklet. The results from the application of the educational packages (software and printed material) in the training procedure and from demonstration to selected group of employees, showed a higher concentration of trainees to the training procedure and a positive attitude to use the training software. The reasons for this improvement were:

- Careful definition of the training context
- Appropriate formulation of the educational material compatible to the background, and experiences of the training target (trainers and –through them– industrial workers).
- Active participation of industrial workers in the production of the educational videos.

Even in the case where the material covered a wider range at a more abstract level (SCADA-PLC), the interactivity of the software and the plethora of the visual supporting aids (e.g. video & animations) formed an effective toolbox for the trainers. This toolbox could be used to a set of training seminars adjusted to the specific needs and knowledge of the audience.

A crucial parameter for the success of the project was its management and monitoring. It is not really necessary to get into details, so here is only presented the managerial scheme.



There was a necessity for the project team to follow the previous scheme. The educational and training committee was the core team of action. The representatives of the Universities, the VTCs and of the software developers worked together for the preparation of the educational material, as well as for the first deliverable regarding the requirements. The group could be divided in two workgroups, one focused on the material and the other on the multimedia. At the same time there was another group of people working on the administrative and clerical issues, the ones that had nothing to do with the results, but with the contractual obligations of the team. In this group it was also necessary to notice a small group of people from the VTCs and the industrial partners, who have examined the products before finalization. They were the ones discussing and testing the drafts in real-world conditions.

As the project was a rather small and limited one, the organizations could not devote many resources, especially experts, so a small and ad hoc group of 'emergency assistant' had been shaped. That team assisted in practice only twice: once with the administrative issues at the very beginning and during the dissemination activity at the end of August. Finally a commercialization group had been formed according to the directions and goals of LDV and due to the fact that there was finally some interest for commercialization.

As few people were involved there were no clear position and task appointments. Every partner had appointed somebody as responsible for the scientific part and somebody else for the clerical. The VTCs had also the special task of communicating with the industrial partners. The whole effort had been concerted in a rather sufficient and successful way, considering the time limitations and the unexpected delays from the University of Piraeus.

The material has been sent to lots of unions and industries in the wider area of Attika, Syros, Halkis and Cyprus. These are the only places with heavy industries and interest. A rough estimation provides the belief that almost all workers can have an access to the material if only the Unions and the industries set it available for use.

The feedback from the VTCs and the industry was more than encouraging for the effort and delighting. The messages were received as results of specific questionnaires and can be analyzed as follows:

- Both CBT products can be used as educational material with a complimentary character for the training needs of a company but not as tools for self-learning.
- By using the CBT product the educational capabilities are enhanced, when compared with conventional means.
- The majority of the participants (almost 80%) encounter difficulties in getting into the logic of CBT material and even worst in exploiting its capabilities as trainers, because they have not full command of basic computing skills.
- Both products are considered as very successful results because:
 - Their structure is simple and solid.
 - They are provided in the Greek version, which is a very seldom for the Greek vocational community and especially for shipyards and heavy industry.

- The CD-ROM of Hygiene and Safety contains video recordings with actual erroneous techniques and practices, highlighting a right-wrong educational message. This right-wrong technique is considered as the most appropriate for the Greek industry.
- As basic disadvantage of the material is the lack of speak age.
- The material can be used for the enhancement of the core abilities of employees working currently in the CAD/CAM machines, in welding and machinery shops, etc.

The most innovative product, which has also attracted the interest for commercialization, is the CBT on hygiene and safety. The CBT material on SCADA is considered as academic. Industries usually hire somebody mastering that field rather than educating somebody. On the other hand the CBT on hygiene and safety can be applied in many cases. The 'right-wrong' approach and the 'real case' videos are considered as very innovative and interesting.

The TRIAINA project

The TRIAINA project was one of the very first attempts, if not the first one, of the European academia to approach young and emerging professionals of the maritime sector with the help of modern e-learning technologies. The project aimed to the creation of a virtual center of initial professional training in the maritime field, and it has been partially financed by the LDV Programme.

As expressed above, the main goal of the TRIAINA project has been the development of the virtual educational center. Having in mind the peculiarities of the maritime sector and the limitations in budgets and time, as the contracts were finalized in late October 2000, the TRIAINA team organized a curriculum of three modules. The first module was about modern IT and their application in everyday maritime operations. There was a strong focus on the contemporary business context in Europe, while students were encouraged to make their own research in international literature. In the second module managerial issues were discussed, such as fleet management, etc. This module aimed mainly to brush up knowledge gained at any specialized shipping school and to point out the key issues. Finally there was a third module regarding environmental issues. The protection of the environment consisted of a main policy objective of the European Union, expressed by various officials and in every policy document, and only deep knowledge and understanding by every young European can lead to the successful combination of environmental protection and efficient economic activity.

According to the proposal the project team had the tasks to develop a sound methodology and provide training for young professionals through established networks. Due to time limitations as well as to the academic annual schedules of the partners the training procedure is still on going and is agreed to last for at least three more months. Regarding the issue of methodology the team decided to approach the educational needs through three different styles of presentation and teaching. As far as it concerns the software solution, the team claimed that the application was efficient and capable enough to provide the prototype basis for further development.

The results of the projects will be presented in a European conference and published in an academic journal covering geographically at least the whole Europe. The material and the site will be also free for several more months. In conclusion the project was a successful one and it is believed that the partners will collaborate in the future within the framework of other e-learning programmes.

The main initial objective was the development of a virtual educational center focused on the needs of young professionals of the maritime and marine industry. This goal has been achieved, as there is a site, hosted by the University of Piraeus, and students have attended a three-module course. Training to the students was provided for more than two months and there is an agreement to keep on till the end of October for several reasons.

Other objectives were the creation of a network access, the development of a methodology, the training of the students and the dissemination of the results. Given the time limitations all these objectives were accomplished as well, and may be considered as steps towards the fulfillment of the general task, which was the development of the software platform, the preparation of the educational material, the training and the internal evaluation of the whole effort.

The deliverable of this effort can be seen as set of four different products: the three educational modules and the software platform. A very interesting point is that the three modules are completely different from an educational point of view. As three different Universities were involved the products have been extremely different.

Initially, when the general layout of the software platform was discussed in the kick-off meeting in Piraeus, the partners approached the core of the modules from a traditional point of view. The concept was the presentation of an academic text enriched with vivid images, on-line multiple choice exercises, and general bibliographic reference. However this was not the proper approach to modern e-learning needs and even worst for youngster bored of conventional educational procedures. The trends in the contemporary business and vocational training are e-learning and distance working, so the question of the future is information management. The students are exposed to a magnificent large amount of information, so they have to be able to pick up proper data, transform them into information and create knowledge out of it. That changes completely the educational approach, as texts have to provide chains of data leading to information, rather than developing a problem and its solution or a theory and its proof. In addition, the expanded capabilities of modern technology can improve the 'rate of data' provided by adding many images and video streams.

After many discussions and philosophical debates about the 'proper' mixture of texts, images and assessment in a module, it was decided to create three modules of different characteristics, but based on the principles described in relevant publications, such as *Making Learning Visible* and other booklets of CEDEFOP. The result was quite impressive; the first module on modern telematics, IT and maritime business was organized and composed by the University of Piraeus and the Romanian IPA, was based mainly on the traditional procedure. The educational procedure was split in units and lessons and assessment was followed. The texts

were short, full of data, providing actual information about the subject matter. The next assessment was however not the expected one; the answers did not lay in the text, but the student had to give some thinking before answering every question. There was not necessary only one correct response, but it could be a set of choices, making replying more sophisticated than 'gambling'. Furthermore it was decided that only few images and icons would be included in the text. The information should be clear and clean of 'noisy' images, which many times mislead students and misguide them from the actual point of the discussion. A much expanded list of references was provided and especially as URLs in the Internet, so the student could get the latest information. As this approach seemed to be very impersonal and automated, it was decided to include two assignments in the module.

The students had to prepare two research essays of no more than 2000 words. The first assignment should be about the use of Internet, mobile phones, WAP and relevant technology in their country (region or city). The essay should provide clear evidence of the level of penetration of the above-mentioned technology and focus mainly on critical analysis of statistics. A projection of the future trends was expected to conclude the document. The aim of the assignment was to assist student identify the level of maturity and use of this technology in their local markets. The second assignment ought to be on the modernization or familiarization of their respective institutions and/or companies with relevant technology. The analysis must include the reasons of selecting specific technology, cost aspects, as well as the expected benefits of the organizations. The goal of the second assignment was the development of a plan or a procedure for the implementation of modern techniques and technologies in their everyday business.

If students of the same region or city were attending the class, they could contact the tutor so they might get the permission to collaborate or to prepare the assignment for another region or city. Such problems have also been resolved through the 'message board' communication facility. The students could use any available source; however they had to provide full bibliography including the URLs of the Internet sites, and they were strongly encouraged to look for sources in the various projects founded by the European Commission, the US Transport Research Board, the ITT and other international bodies. Both assignments were of equal weight in the final grade of the module. All assignments should be written in English (or Greek or German) and should be of electronic format.

The second module was dealing the issue of maritime business and the approach selected by the University of Antwerp and the Cypriot Frederic Institute of Technology, was very much a mathematical one. The module consisted of three large exercises, where the students should run optimization routines downloaded freely from the Internet. The point of this approach was that all the knowledge gained from the conventional schooling up to now is not irrelevant to everyday decision making, and the tools for such procedures can be found either in academic books and databases or even in specialized sites and virtual stores. The idea behind it was that the typical representative of the target group is a young professional aware of the academic tools and methodologies, yet not really skilled and experienced to use this knowledge for taking decisions in every day business conditions. This

problem-based-learning (PBL) approach was widely discussed among instructors and trainers. Although PBL is considered as a very prominent pedagogical method the feedback from the trainees was rather discouraging; the organizational demands of such an approach intensified the workload to the instructor and demanded preparedness from the students.

This approach revealed two characteristics of the potential attendee. The student should be willing to start working with the exercises, as their formation and solution was not obvious. The other was that only students of higher level would examine the results and translate them into decision options. Tutors of mathematics and operations research were aware of both characteristics, as this was also the case in conventional training. E-learning provides directed calculation and numerical capabilities but on the other hand demands more attention from the students. Comparing the approach of the first and the second module, it should be noted that the first one guided the students to a specific goal and target, while the second one lied with the personal initiative for self-development and studying.

The University of Cardiff and the University of Piraeus prepared the third module on environmental issues. The approach of the module was a compromising one between the first two ones. The idea was to provide basic text and images to draw the attention of the student for further reading. Comparatively to the first module the texts were very short and they contained many educational animations. The questions aimed to the understanding of basic principles rather than creating information out of data.

Behind these three approaches lies the different philosophy of education in the UK and the Continent. There is no need to analyze the academic trends in the UK and the Continent, but it is profound that students get dissimilar options towards the final goal of the training or education procedure.

The Greek SME Info project developed the software platform with a quite impressive record in educational software. The platform is Internet based and provides all necessary features for on-line registry, monitoring of the students' progress and communication. Message boards and groups of interests were hosted allowing exchange of ideas and shorten out educational details. The platform can be considered as very interesting prototype for further commercial development. Apart from 'last mile connection' problems, no other difficulties have been envisaged.

Finally the Romanian and Cypriot partner provided the training. Both of them responded positively and evaluated internally the whole effort. It was necessary to have them as evaluators; as such training centers will also be interested in such techniques in the near future.

According to the proposal the following main objectives were targeted:

- development of a common and open vocational space
- networking and cooperation
- embedding professional skills in training
- improvement of training

These targets have been achieved, as the product was an Internet based application, free to everybody eligible to enroll. The application can be characterized as a

successful prototype for a platform of commercial use and the capabilities as well as the capacity of the system were limited only by the natural constraints of tutors and trainers. The development of such an application was the result of successful cooperation of academic institutions, vocational centers and IT experts.

Nevertheless the TRIAINA team emphasized the importance of different educational approaches and the quality of the 'product' as such. The most difficult task was to mix professional skills with everyday business needs and knowledge from different academic backgrounds. It shall be reminded that applications addressing young professionals in Europe have to be capable to survive academic diversity and educational approaches. That was not so easy as not all the tutors were aware of the actual differences between systems and their results.

Young graduates as well as tutors and trainers specialized in these fields of vocational training were considered as beneficiaries of the product. It is rather obvious, why graduates were considered as beneficiaries. Tutors are working in new conditions and understand the future of e-learning environment. Furthermore, those who are also working as project managers in colleges are benefiting from the dissemination of information.

In reference to the context of the educational module, the students got familiar with modern IT and its application in everyday maritime business. This is considered as a very important 'add-value' skill, as the future of this business lies partially in the seamless and smooth exchange of information between parties involved. Furthermore the students got the feeling of 'translating' academic knowledge and techniques, such as those of operations research, into everyday decision making. This module is considered as necessary for bridging the gap between school and the working environment. Finally, the third module alerted students on basic environmental issues, as intertwined with policy principles and their effect on operations. In other words, the modules aim to bridge gaps between theory and praxis, and this is considered as the most important skill of student attending this curriculum.

Apart from the quality of the educational modules, which is considered as high and more than adequate, the students acquired skills for further e-learning and distance working.

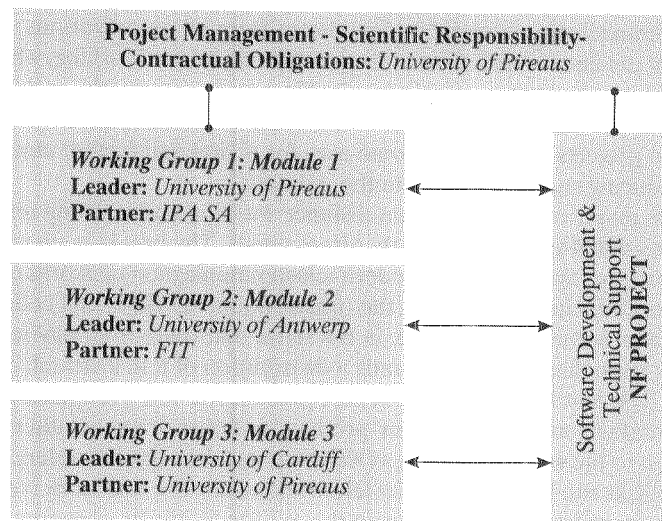
The interaction between scholars and vocational trainers was considered as the most important impact. Policy makers have identified in the past that there is a gap between the provided skills in the academic institutions and the skills required from the market. The communication of scholars with trainers is a step towards bridging such gaps.

As happened in the case of EQUADIL, the TRIAINA team identified first some needs in the field. As stated before, the identified need is the gap between the academic knowledge and the contemporary business context in maritime enterprises. Young professionals hold usually a good academic background in engineering, economics, business and policy issues, but due to the complexity of the business and involved parameters, it is rather difficult to become productive. Commonly a couple of years of real-world experience are necessary before reaching an adequate level of productivity within business. This phenomenon is universal and an old one, so it has also been perceived as a business or industry characteristics.

Furthermore there is a strong wind of change in the industry and it is necessary to implement new techniques and technology. As the European space widens, young professionals shall also get a broader educational and training horizon, spreading all over the fields of the coming realities, such as modern IT, human and working relations, environmental protection, efficient decision making, etc.

As explained previously, the final product consisted of three educational modules, with different focus and educational approach. The core of the module dealt with 'change', 'efficiency' and 'environmental awareness'. It is accepted that an e-learning module cannot replace conventional training in that case, so the goal should be to link reality with theory and the academic background and to expose students to the forces changing the business context. Special attention must be given to the issue of 'efficiency', therefore the second module, the one with the operations research exercises, demanded from the student to find the tool and to dedicate time and effort for the set-up and solution of the problem as well as the evaluation of the results.

From a managerial point of view, TRIAINA has been run on a totally different way than EQUADIL. There were three working groups elaborating the educational material and one partner supporting technically the others as well as developing the platform:



The structure of the project, as well as the desirable deliverable was of such a nature favoring this managerial scheme. Furthermore contractual obligations and schedule limitation forced a breakdown of the work, so all partners could contribute in a similar and analogous way.

The TRIAINA team strongly believes that there is add-value and innovative impact in the delivered product. First of all there is strong interest for the software

platform and the methodology. This software platform can be easily adjusted and serve the needs of companies, training institutions and even universities. The next step towards commercialization is only an issue of desired characteristics set by the potential customer. The issue of methodology is also very important as five institutions got an idea how to approach issues in an e-learning environment. The experimentation with the approaches gave ideas and knowledge to every partner and this has also been transferred to other scientists through the academic publication and the presentation in a conference.

In terms of innovation, the product offers a viable solution to the problem of distance learning and the strengthening of cohesion. It is very interesting to point that there is no such solution available, at least in Greece, Cyprus and Romania and such efforts pave the way for more to come.

Finally, the communication of the results with young people and the existence of an Internet site is a promising ending for such an effort.

Experience and Knowledge gained

Both projects TRIAINA and EQUADIL were not really focused on distance working, but on distance learning. However, both of them demanded distance working abilities from all involved parties including project partners, as well as relevant administrative support and guidance from all organizations. It became obvious that distance learning was a step ahead of distance working, which should be adopted for at least some employees by the companies. Lastly, as these organizations were active in the wider area of maritime business, the conclusions drawn out of these projects can provide some axes for action and further consideration, when introducing such techniques in the industry.

The first major conclusion is that distance working and learning tend to form new organizational structures, and therefore needs. The breaking up with the traditional structures and the use of modern telecommunication networks change also the behavioral habits and forms in the organization. Workers and colleagues are not 'physically' connected anymore, in the sense that there is no physical delivery of the work from desk to desk, but only a distribution of it in a virtual, dimensionless space. The lost link between physical presence at the workplace deliberates personal creativity as the worker can 'produce' at home or at any other place with a connection to the wider networks, as well as at any time he/she prefers. Nevertheless not all tasks can be performed by tele-workers nor can tele-work create virtual companies, apart from specific cases in the industries of new economy.

The second conclusion is that as distance working gains acceptance, socially and organizationally, for various reasons, distance learning has not been accepted so widely. The major difference lies in the fundamental characteristics; distance working satisfies many more social needs and demands, while distance learning is more a company choice, for cost reasons. In contrary to distance working, where employees are willing to accept it because of the avoidance of many social obstacles for several groups, for example working mothers, handicaps, experts who cannot be present at many places at the same time, distance learning demands needs and

lust for knowledge to come from the individuals.

By analyzing the facts of distance working it is easier to find ways for the proper implementation of distance learning. In EQUADIL and in TRIAINA employees, trainers, the VTC, and the young professionals reported that there is a communication gap between the tele-workers and the employees at the central offices. That sources from the difference of the working culture, as tele-workers are usually young employees and experts, who naturally will experience clashes with the rest, traditionally working people. In addition, there is a technological gap, as tele-workers handle modern, sophisticated tools with ease and many times demand tedious assistance from the people at the headquarters.

Another point of concern is that tele-workers that belong in several social groups demand to be present at the office, where decisions are taken. Groups of female employees or members of other non-traditionally dominant groups (say, ethnic minorities) consider their present as necessary for their identity. It is believed, that being present where decisions are taken, boosts the personal feeling of self-esteem and respect, while at the same time, provokes the admiration of other employees and imposes a distinct identity in the organization. This is many times combined with promotions and bonuses, or more generally with the accreditation and recognition of their work and effort for the company.

It is true that it is very difficult to acknowledge the work of somebody, who is not present at the office and it demands sophisticated approaches from the management. Nevertheless, there is a problem of getting into the corporate culture for tele-workers. Companies invest a lot of money for amplifying the esteem of their employees, for harmonizing their efforts and for the creation of an improved social environment. Tele-workers miss most of this and contribute less than they can or the company desires than the rest.

As distance working demands new organizational structures, the critical issues for the design and the proper implementation of tele-working are:

- The company itself,
- The business itself,
- The profile of tele-workers,
- Technical and organizational adequacy of the tele-working space,
- Managerial procedures for control and assessment, and
- Procedures for managerial support

The most critical question is if the company is willing and capable to introduce and implement distance working in day-to-day operations. The state of technical facilities and the level of implementation of modern technology in daily operations is a very good criterion for the capability of the company to divert in-house activities to tele-working. Furthermore the management style of the organization shall tolerate such innovative techniques and shall also really trust the capabilities and the commitment of the employees. In EQUADIL, though not a project on distance working as such, became obvious that commitment is the key for the success of such techniques, as trainers had to commit themselves in the specific task and effort, prior to any undertake of work or task within the industry.

As commitment is crucial, that is translated in managerial terms, that some people, not everybody is capable to become tele-worker. It is a matter of trust, self-discipline, self-motivation, experience and expertise; in order to minimize educational, training and support needs during the performance of their tasks. In many cases, the productivity of tele-workers depends heavily on his/her personality, while in most cases it is an issue of actual familiarization with technology. In some cases, very special people with unusual and extraordinary capabilities are more productive when working alone, than experiencing the every day business surrounding.

Expertise and capabilities were identified as key characteristics of tele-workers, leading to the conclusion, that distance working is an issue depending on the nature of the business. Most commonly operations and tasks demanding intense mental work are transferred easier to distance working status. Thus consulting, engineering design, system analysis, research, education/training are the most common activities of tele-workers. It shall be noted that distance working requires flexible managerial control and cooperation with other employees.

The most common reason for failure in distance working and training is the inadequacy of the working conditions at a remote place. Several times, the home of an employee is not the ideal working place, and that reduces productivity. Ambient, social, family conditions are some of the constraints imposed to the tele-worker, while in many cases 'last mile' connection problems create more frustration than would have been experienced if the tasks were performed at the premises of the company. In TRIAINA, students reported such problems, and this was a reason for failures or reduced attention to the subjects.

Last but not least is the existence and substance of control and assessment procedures. A tele-worker remains an employee of the company and it becomes very difficult for the company to create a web of motivations and controls fitting the flexible timetable and task-list of tele-workers. Usually managerial schemes, of concentrated and hierarchical nature are not capable of adjustments to the contemporary needs of distance working. Systems, where assessment is based on results and not on procedures or processes are more flexible for such adjustments and favor these new labor relationships. In that sense, pay per 'product' and/or deliverable, is more reasonable for tele-workers. Finally, attention must be paid also to the supportive mechanisms for tele-workers; in most cases that is a friction point between groups of employees and as distance working is based on results, the system becomes vulnerable, when support is not adequate.

E-learning was introduced in shipping several years ago, as the distant nature of ship-shore management favors such techniques and approaches. However it has been restricted to purely marine subjects, such as the understanding of lights, collision regulations, buoy age systems, signaling, etc. All subjects were strongly focused on marine issues, and almost none of them could find application on shore operations or other industry. This was a point for fragmentation in the labor market. Once an employee found himself in this industry, he could not easily shift to another one. This is an inelastic approach, merely based on the necessity for adequate mastering of skills and knowledge.

Another major group of CBT application was packages designed to test and assess the knowledge of seafarers. Titles such as fire prevention and sets of questions for several ranks of officers came up for the preparation to exams, with questionable educational merits. According to specialized maritime educational centers (MET) such simulators were valuable tools for training and experience gaining in a virtual environment, if only a qualified instructor was present.

Nevertheless most of the e-learning packages were consisting of videotapes dealing with specific and overspecialized issues, such as oil-tanker management, chapters of SOLAS, etc. Some efforts have been focused on more general subjects, for example, first aid, shipboard management. In most cases the material for distance learning was prepared by major provider of specific equipment, usually with the cooperation of a Maritime Institute, and most commonly as a top-to-down approach, where seafarers and mariners should either get the essence of rules or understand basic marine and naval engineering.

Last but not least is that STCW and explanatory documents of the Convention, are dealing the issue of simulators. The term simulator is well defined and explained, while it is necessary to train people in presence of a trainer or instructor. The presence of the instructor is not really necessary as there are simple but very educational software applications available for mariners, but STCW regulates also the training procedure towards certification of competence, thus making instructors necessary on site.

So, it is to understand why barriers have been established and why vocational training in the maritime field becomes so important. The first issue is that mariners do not get broader education and training while onboard or in service at sea. There is a cultural gap in their education, with the education of all other professionals they meet at port, at the headquarters and the ship-repair bases. Technically they shall follow the same rules and principles, but in reality they cannot easily understand each other. The next point is that such training is usually irrelevant with everyday operations ashore. Besides, in many cases there are also language barriers. Last but not least is the fact that their training is not interactive enough. Videotape is not an interactive mean, while interactive, network training onboard costs a lot in telecommunicating.

Before attempting the adjustment of conventional maritime knowledge and skills to a modern e-learning environment, it is wise to bring in mind the ultimate goals of such training:

- Safety of life and property afloat, and
- Environmental Protection

These are the major policy goals of IMO, and they are respected. Nevertheless there are no goals for shifting marine occupations closer to the needs of the general labor market, which are:

- Labor flexibility,
- Occupational health and safety, and
- Efficient economic products

The conclusions drawn out of EQUADIL and TRIAINA can really offer some guidance to those attempting the adjustment of conventional marine and maritime knowledge to the contemporary e-learning pattern. It is obvious that e-learning is in many cases synonymous to self-learning and when the target group does not possess strong academic background, then the material has to bring up fantasy and examples. It is almost the same as dealing with young children; mariners and industrial workers usually have had limited schooling and were exposed to restricted educational subject matters. It is necessary for the CBT material to catch their attention and to attract them stepwise towards specific educational goals. Therefore it is very wise to have them participating in the development procedure, as in the case of EQUADIL. The 'right-wrong' approach of several issues plus the familiar working environment engenders a feeling of friendliness and reliability.

Another major point is the discussion of several issues with the trainers. It is not obvious that during the development of several marine or maritime-related CBT the opinion of trainers is really considered. In the case of CBT in marine engineering, a sector dominant by engineers, who hold an equivalent of Masters Degree, it is very common to launch very sophisticated or over specialized simulators. In other cases, when dealing issues of naval architecture it is also very common to address the material to trainees of a higher level. So in many cases, the produced CBT is boring to some trainees of higher level, very complicated or irrelevant to their needs for others, and in all cases they miss the point of training. Consequently it is necessary to discuss the material and the approach with trainers, who can provide design guidelines.

Some CBT products, though exceptionally well designed, miss their target because they demand higher command of a PC or of the Internet by the trainees. A truly complicated subject, such as bridge simulation, may need more controls for the proper command of the exercise, but it is not really sure, that a qualified mariner may be capable to command the means, i.e. the keyboard, the mouse and/or any other device. Therefore it is necessary for the success of the product to familiarize gradually (or stepwise) the trainees with the controls. In TRIAINA, for example, students were introduced to a very simply designed first module and preceded with downloading of executable freeware software, interactive examination and on-line messaging.

It shall be reminded, once again that trainees are invited to a brand new 'world' for them, so it is necessary to use the 'magic' involved in CBT and computing in general. Colorful schemes, highlighted excerpts, advanced interactive messaging are only some ways to capture trainees at the screen.

Though it is very difficult, unless it is a pilot project, to design the CBT material along with the trainers and with the participation of trainees, it shall be managed to adjust the methodological approach to the needs of the subject matter and of the potential students. First of all not every subject can be dealt in the same manner with every other; it is impossible to convey messages of modern management techniques, say, with the same approach used for the training and preparation of certification in a subject, such as navigation. Every subject shall be dealt independently from the others and shall make use of techniques and practices

of conventional training. The other point is that where possible, trainees should focus their interest and apply what they have learned to local problems. This is the only way to link general meanings with local interest and customize the product. Therefore assignments, essays, and homework shall be customized to local needs, after a short discussion with the trainee. In this way the trainee does not feel cut from the instructor, who commonly is represented by an email address and name in the virtual message board, as in the case of TRIAINA. As all assistance and references were only available, virtually (Internet links, software download, etc.), the submission of assignments with specific local interest, strengthens also the ties between the instructor and the students.

Finally, a critical point for the successful shifting from conventional marine and maritime training to a virtual one is project management. It is necessary for the project manager to create teams dedicated for subtasks, which will develop the material in a commonly accepted way, but under the supervision or the cooperation of the IT expert. It is only a matter of budget and resources, if IT experts are included in the teams undertaking the task of the development of material, but it is necessary to use all possible technical means and features. It is also necessary to impose the use of email and other Internet based means for the partners, so they will also become more familiar with the needs, the limitations and the problems of modern technology.

The findings out of EQUADIL and TRIAINA are considered as good basis for further discussion and assistance to those preparing marine and maritime educational material in CBT. Apart from all compulsory subjects for the certification or the preparation for specific exams of mariners, it is wise, if not mandatory to expose them in subjects related to maritime business in general, bridging the cultural gap between people working ashore and those working onboard. The same applies to shore personnel, yet not in subjects required for the certification, but in subjects more general, increasing their flexibility as labor force, and limiting fragmentation of the industry.

Acknowledgements

Both EQUADIL and TRIAINA teams express their gratitude to Mr. Anastasios Varvaroussis of the European Commission. In addition both teams shall thank all employees, trainers, instructors and employers involved in the development of these CBT products.

References

- [1] Bjørnåvold, J (2000) *Making Learning Visible*, CEDEFOP, Thessaloniki, Greece
- [2] IMO (1995) *Convention(revised) on Standards of Training, Certification and Watchkeeping for Seafarers - STCW'95*, London
- [3] Morisson, W S G, (1997), *Competent Crews = Safer Ships: An aid to understanding STCW 95*, WMU Publications, Malmö, Sweden

- [4] University of Piraeus, (2000), *EQUADIL Project: Final report, submitted to the Commission of European Communities*, Piraeus, Greece
- [5] University of Piraeus, (2001), *TRLAINA Project: Final report, submitted to the Commission of European Communities*, Piraeus, Greece
- [6] Various commercial of CBT packages, such as of ShipCAM97[®], Videotel Marine International[®], PC Maritime[®], Transas Marine[®], et all.