

# Presumptions and actions affecting an e-learning adoption by the educational system

## Implementation using virtual private networks

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### English Abstract

In this paper we present a model of e-learning suitable for teacher training sessions. The main purpose of our work is to define the components of the educational system which influences the successful adoption of e-learning in the field of education. We also present the factors of the readiness of e-learning mentioned in the literature available and classifies them into the 3 major categories that constitute the components of every organization and consequently that of education. Finally, we present an implementation model of e-learning through the use of virtual private networks, which lends an added value to the realization of e-learning.

### Greek Abstract

Αυτό το πρόγραμμα παρουσιάζει ένα μοντέλο ηλεκτρονικής μάθησης για την εκπαίδευση των εκπαιδευτικών. Ο κύριος σκοπός αυτού του εγγράφου είναι να καθοριστούν οι συνιστώσες του εκπαιδευτικού συστήματος που επηρεάζουν την επιτυχή υιοθέτηση της ηλεκτρονικής μάθησης στον τομέα της εκπαίδευσης. Παρουσιάζονται, επίσης, οι παράγοντες της ετοιμότητας ενός οργανισμού να υιοθετήσει την ηλεκτρονική μάθηση, που αναφέρονται στην διαθέσιμη βιβλιογραφία, και τους κατηγοριοποιούμε σε 3 σημαντικές κατηγορίες που αποτελούν τις συνιστώσες κάθε οργανισμού και συνεπώς και του εκπαιδευτικού συστήματος.

### Keywords

e-learning, education, training of teachers, presumptions of e-learning adoption, virtual private networks

### Introduction

Today, enterprises and organizations and consequently education are characterized by a noticeable increase in the volume of information available and are in need for more and faster learning. Moreover, the shift of society from an era of industrialisation and information to an era of knowledge (Harun, 2002), makes organisations aware of the value of knowledge and learning for their continual development (Goldstein and Ford, 2001) and for the acquirement of a competitive advantage, which relates to innovation and fulfilment.

According to Cisco (Hall, 2000), the executive bodies of a company are increasingly realising that the future of their companies depends on the ability of their staff to take up knowledge fast and acquire the competencies which are necessary for the adaptation to a constantly changing environment. Therefore, the goal of a contemporary organization and enterprise is to become "societies of knowledge" and play an active part within the global economy of knowledge (Welle-Strand and Thune, 2003). Lester Thurow (Rosenberg, 2000a p. 6) quotes: "In the 21<sup>st</sup> century, education and competencies of human resources will constitute the primary competitive weapon", whereas according to Laurence Prusak from IBM (Rosenberg, 2000a p. 9) "The only thing that gives competitive advantage to an organisation is what it knows, how it uses that knowledge and how fast it can learn something new". In other words, organisations today are trying to develop a philosophy of constant learning in their work environment so that they can be "transformed" into economies of knowledge.

Electronic learning is considered to be an adequate method for the training of human resources of contemporary organizations and enterprises; due to the advantages it offers (Cantoni et. al., 2004; Driscoll, 2002; Kruse, 2004; Rosenberg, 2000a). Electronic learning is the answer to the needs of the modern organizations that consist of a changing and geographically dispersed workforce, for fast knowledge which is changing, reducing the cost, increasing the performance of the staff and the acquisition of a competitive spirit and the establishment of 'just-in-time' learning.

As more and more companies and organizations turn towards the implementation of e-learning for the training of their human resources and many of these attempts fail, a particular model is needed so that the various organizations which are willing to implement e-learning or have implemented such policies and want to improve them, will be able to evaluate their readiness for the development of e-learning.

The successful implementation of e-learning by an educational system should fulfil certain criteria, such as the acquisition of adequate technological infrastructure and adequate educational content of persons with the necessary skills and a developed culture which encourages learning and sharing of knowledge. Consequently, the purpose of this paper is the definition of the components of the organization which influence the successful adoption of e-learning in the field of education.

Education is affected by the changes caused by the introduction of the Information and Communication Technologies (I.C.T.). By regarding education as an organization, we are attributing to it qualities of an organization, a fact which sets the definition of the relationships between the entities composing education and the components of e-learning, to the fore. By regarding education as an organization, we are attributing to its entities (students, teachers, political actors, parents, etc) qualities and methods according to the pattern of the object oriented programming.

### Organization's components which influence the readiness as far as the adoption of e-learning is concerned.

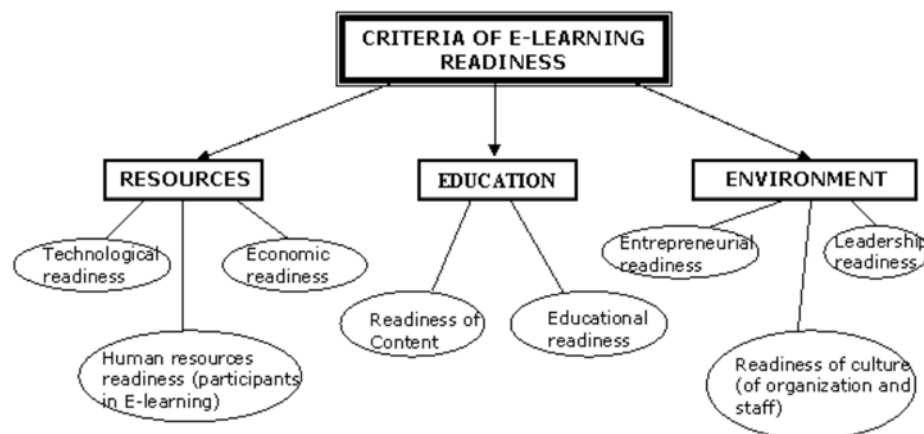
This paper concentrates on five models of e-learning readiness, as well as on the "2003 e-Learning readiness rankings", which have been published by the Economist Intelligence Unit (Economist, 2003) and searches for the interconnectivity of the various parameters suggested by these models. These five

models have been published by Rosenberg (2000b), Chapnick (2000), Broadbent (2002), Workknowledge (2004) and Borotis and Poulymenakou (2004).

Rosenberg focused on the development of continual attempts in relation to e-learning. In particular, he developed 20 key-questions which were classified in the following categories: entrepreneurial readiness, changing nature of learning and e-learning, value of teaching and information design, management of change, re-invention of educational organization, industry of e-learning and personal commitment. According to Samantha Chapnick, the readiness factors of an organization for the implementation of e-learning are the psychological readiness, the sociological readiness, the environmental readiness, the readiness of the human resources and the economic readiness. According to Brooke Broadbent, the successful implementation of e-learning in an organization requires the right people, the right place, and the right resources. Workknowledge suggests the investigation of the following thematic areas: the readiness of the staff, the readiness of administration, the economic readiness, the environmental readiness, the technological readiness and the readiness of the culture. Borotis and Poulymenakou suggest 7 factors which should be investigated by an organization before an e-learning solution is adopted. These 7 factors include the entrepreneurial readiness, the readiness of content, the technological readiness, the readiness of culture, the readiness of human resources and the economic readiness. Finally, the Economist Unit has tried to classify sixty countries according to their ability to produce, use and expand the Internet-based learning (typical and non-typical) within the work environment, the schools, the government and the whole society. On a primary level, for the needs of this attempt, the following categorization was used: government, industry, education and society. On a second level, the criteria for the evaluation of the e-learning readiness were divided into the following four areas: compatibility, potential, content, culture.

Observing that there is no analogy and sometimes correlation among the factors suggested by the above models, although they refer to many common elements such as technology, culture, existing knowledge and skills in relation to the use of the computer, capital resources and investments, we are making an attempt to correlate the factors of e-learning readiness mentioned in the literature and to classify them into 3 major categories that constitute the components of every organization. The 3 categories suggested, are as follows (picture 1):

- **Resources:** it includes the technological readiness, which investigates the access to the Internet or/and the intranet provided, the available technological systems and the way they are used as far as e-learning is concerned, the economic readiness, which examines the willingness of the organization to invest in e-learning and the readiness of the human resources, examining the knowledge and the skills possessed by the ones involved in e-learning.
- **Education:** it includes the readiness of content, which examines the availability of the educational content, its form, its characteristics, the degree of its reuse and its adequacy for the enhancement of personalized teaching; it also includes the educational readiness, which examines the ability of an organization to organize, analyze, design, implement and evaluate an educational program.
- **Environment:** it includes the entrepreneurial readiness, which examines the structure and the practices of the organization that affect e-learning, the readiness of culture, which examines the organization's as well as the staff's behaviour and attitudes in relation to e-learning, and the leadership's readiness which examines the support provided by the administration.



Picture 1. Criteria of readiness

## Teachers' training and e-learning

The improvement of educational provision in every country is greatly dependent on the efficiency of teachers' education. This efficiency in turn, depends on the knowledge and skills obtained during their education on a first level, on the accumulation of their professional experience, its practical application and its interaction with the educational context on a second level, and on the potential offered to the teacher during his/her professional career to adapt to the new developments so that they are able to be constantly updated, improved and modernized.

Up to this day, there has not been (or when there is one, it is not sufficient) a teacher training system, able to offer the teachers the chance to renew their knowledge, to improve their professional skills and to modernize their teaching methods in line with the new scientific and constantly changing social factors.

It is therefore, important to establish a system of teacher training procedures that covers the existing need, in an organized, qualitative, scientifically consistent and continual as well as flexible way. We regard the e-learning process as an essential tool towards the aim of teacher training, to the extent of course that the above-mentioned preconditions and principles are fulfilled.

Electronic learning is the proper method for the education of human resources, due to the advantages that it offers (Cantoni et. al., 2004; Driscoll, 2002; Kruse, 2004; Rosenberg, 2000a), which may be the easy and fast access to knowledge, cost reduction, the improvement of the trainees' performance and the potential

for just-in-time learning, for example. The contemporary trend points toward its establishment for teacher education, something which is made obvious by the integration of e-learning in the framework of the Lisbon principles for education (European Committee and European Council, March, 2000), as well as in the objectives for education toward 2010.

For the successful implementation of e-learning in education, an application model should be established, satisfying certain criteria in the framework of the preconditions required for the adoption of e-learning. These criteria should allow their self-evaluation through the application procedure and should be referring to the adequate technological facilities, the proper educational content and its lining with teaching and psycho-pedagogic principles, its support by human resources possessing the necessary skills and finally, the development of a proper culture by the country's educational policy actors, which will support its use.

Our proposal is classifying the preconditions of the e-learning adoption in the educational system, into three components which are the resources, the education and the context of its implementation. Within each of the components, a group of actions aiming at the fulfilment of these preconditions is suggested.

## Analysis of the categories adopted for e-learning

In this part we analyze the categories and factors related to the adoption of e-learning in the educational process.

### Resources

The resources possessed by an organization and consequently by an educational system are directly related to its potentials and its entrepreneurial procedures and are related to its ability to adopt and implement e-learning and the components of the category of resources are the available technological facilities, the financial revenues supplied for it, as well as the human resources involved in the process.

These components are described in more detail below.

### Technological readiness

The implementation of e-learning by an organization requires a vast amount of questions to be set, relating to the kind of systems used by the trainees in order to participate in the educational process, either taking place inside the work environment or at home, as well as to the access to the e-learning technological systems. Some indicative examples are the following: What is the transmission speed of the trainees' computers? Do they support multi-media applications? Which factors can restrict the access to part or whole of e-learning programs? Are the most recent editions of Windows and Web browsers installed in the trainees' computers? Do the trainees' work panels have the necessary adjustments and the necessary plug-ins? Do all the trainees have a colour screen, sound card and graphics card? Do they have the appropriate memory and RAM? Does the organization have a Learning Management System (LMS) or Learning Content Management System (LCMS) and how does it make use of it?

In particular, one of the most essential elements that should be acquired by an organization intending to adopt e-learning, is the establishment of a particular technological infrastructure. Typical of the above, are Tom Kelly's words (Vice President, Worldwide Training, Cisco Systems, Rosenberg, 2000a p. 151), quoting: "In the Internet, the content may be the king, but the infrastructure is the God". The trainees are required to have their own modern computer, supporting multi-media applications and having the appropriate hardware (e.g., graphics card, sound card) and software, as well as an appropriate Web browser (Chapnick, 2000; Driscoll, 2002; Munzer, 2002; Workknowledge, 2004).

Moreover, the use of an e-learning platform or a Learning Management System – LMS or Learning Content Management System – LCMS determines the organization's readiness in relation to e-learning (Brockbank, 2003; Cisco Systems Inc., 2002; Driscoll, 2002). It is also worth mentioning that an LMS or an LCMS should work in transparency with the Human Resources information systems, the software for the management of the *παρατετακόνσχέσεων*, the call centre applications, the automatic sales software and other systems which the organizations use for their functioning and which help in the monitoring of performance (Driscoll, 2002; Rosenberg, 2000a). Special attention should indeed, be given to the fact that the completion of a learning platform such as the LMS, through another enterprise platform can lead to the reduction of other entrepreneurial procedures (Rosenberg, 2000a). Therefore, the capacity requires careful management.

The access is considered to be the key for e-learning (Rosenberg, 2000a). The organisation should offer the staff the opportunity to be able to have access to the company's Internet and/or the intranet whenever, and wherever they are (in the office, in the street, at home), so that they will be able to obtain the information required for the improvement of their performance whenever they need it. Moreover, the capability of access to the Web, wherever and whenever, is especially needed by the contemporary organizations, the workforce of which is geographically dispersed, or are required to travel constantly due to the nature of their work. In addition, the access supplied should be reliable, and the transmission speed should be appropriate for the educational content included in the e-learning application (Anderson, 2002; Driscoll, 2002; Rosenberg, 2000a).

### Economic readiness

The degree of the administration's willingness to support an e-learning initiative and of its commitment to the investment in e-learning, also play a crucial role for the successful adoption of e-learning. The development of an e-learning programme is known to presume the investment of a quite large capital. Moreover, many organizations, in their effort to reduce the cost, usually reduce the costs which relate to education, whereas managers are often heard to state "I truly believe in E-learning but the needs of the company come first" (Rosenberg, 2000a). For an e-learning solution in a given organization to be effective, this practice should not be followed, but the organization should instead be willing to devote a large amount of capital for e-learning and be able to recognize the long-term benefits, financial or not, that it has to offer. Besides, the cost for the E-Learning development can be three times or more, higher than the one needed for the traditional way of learning. The profit however arising from the distribution, as well as the benefits of e-learning are so important, that in many cases the primary investment in e-learning can be compensated during the very first year (Rosenberg, 2000a). In addition, an ROI (Return Of Investment) model is necessary both for the estimation of the cost and the anticipated benefits so that the managers can be persuaded to invest in e-learning solutions (Phillips, 2003). A good way indeed, to persuade them is the obvious coupling of the initiative with the competitive advantage of the company and the quantification of

its results and its translation into economic terms (Geisman, 2001).

### **Readiness of human resources**

For the successful implementation of e-learning in an organization, the staff should be able to work easily and cosily with Web technology since according to Tucker, Pigou and Zaugg (2002), students with restricted experience on computers are four times more likely to withdraw from the e-learning educational process than the students which work with them. The trainee should feel comfortable enough with technology in order to be able to focus on the educational content of the educational process and act effectively with the interactive elements of the e-learning programme (Minton, 2000). The necessary prerequisite for the trainees' skills in relation to the use of the computer include typing, using the mouse, linking to the Internet, using the browser, browsing a Web site and especially non-linear programs, management of pop-up windows and use of tools, such as chat rooms for the interplay among the trainees. The evaluation of the relevant skills of the trainees should not be the result of speculations about their level, but it should be based on a process of data collection by interviewing a representative sample of them or/and their heads (Driscoll, 2002).

In addition, according to Driscoll (2002), the tutors should be responsible for the teaching of asynchronous and synchronous e-learning programs. They should also, participate in the evaluation of the educational process as well as in the design of the educational content. Moreover, those persons involved in the development of the e-learning program should have relevant knowledge and experience. In particular, if the e-learning programme is decided to be promoted inside the organisation, then the persons involved are needed to demonstrate some experience on the e-learning design and delivery and to be familiar with an instructional systems development model (e.g., ADDIE), which is necessary in order to lead the whole process through the stage of analysis, design, implementation and evaluation (Driscoll, 2002).

The necessary human resources should also be provided for. On the other hand, if some parts of the program or the whole of it, are decided to be assigned to some external body, then the organization should also provide for some experienced persons, able to select the appropriate provider and product among the variety of choices available in the market, as well as to manage the providers effectively in order to avoid delays, inconsistencies and low quality products (Rosenberg, 2000b).

Finally, the question of whether the organization possesses adequate knowledge in relation to the instalment, preservation and managing of the basic e-learning systems, such as the LMS (Learning Management System) and the LCMS (Learning Content Management System), is considered to be of outmost importance for an organization's readiness for the adoption of e-learning (Borotis and Poulymenakou, 2004).

### **Education**

Clearly, e-learning should not be seen only through the technology and information perspective, but instead, the educational theories and principles should also be taken into account during its consideration. Therefore, the potential of an organization in relation to the acquisition and development of the educational content is of crucial importance for its ability to adopt and implement the e-learning successfully. Moreover, the maturing of the educational processes (analysis and definition of educational needs, educational design and implementation, evaluation of the educational program) are in line with the maturing of the e-learning innovation. Besides, both the gain of experience as regards the above issues in relation to e-learning and the recognition of their value constitute key factors for the adoption of the innovation (Cowley et.al, 2002).

### **Readiness of content**

In the case of e-learning, the teaching provider is not directly related to the trainee but the cyber net intervenes between them (Hamid, 2002). As a consequence, the provider cannot control, change and adapt the learning environment. Since the educational content is of crucial importance, one of the first issues to be taken into consideration during an organization's attempt to implement e-learning is the availability of it. The educational content can either be developed internally in the organization or be detected in the company's documents, in internal or/and external libraries, in the Internet or in the market ("off-the-shelf"). The organization's ability to evaluate the available educational content (Rosenberg, 2000b) and to know its providers and their characteristics constitute indeed, positive elements regarding the educational content. In addition, the establishment of a strategic cooperation between the organization and the providers of the educational content increases its readiness in relation to it.

Referring to e-learning content does not mean that the trainees are presented with a volume of texts, Word or PowerPoint documents. An essential element of e-learning is the teaching process, based on communication and interaction. Therefore, a variety of multi-media should be used, such as audio, video, as well as simulations which are necessary most of the times (Driscoll, 2002). Likewise, during the designing of the educational content, the teaching principles and theories should be taken into account (Driscoll, 2002; Lee and Owens, 2000).

In many cases of e-learning, the needs of each trainee are differentiated and therefore they should be given an opportunity for personalized teaching, through the provision of the educational content that responds to each one's needs. By personalizing the educational content according to the needs of every trainee, they have a greater control on educational process and more possibilities to understand the educational content (Cantoni et.al, 2004). Organizing the educational content into separate and reusable learning subjects, that is into smaller tokens of teaching or information which can stand alone and be meaningful for the trainee, is rendered to be necessary for the accomplishment of the personalized education (Rosenberg, 2000a). The reusable subjects of learning, which should be compatible with known industrial patterns (e.g., SCORM) (Driscoll, 2002; Rosenberg, 2000a), can intermingle and be combined for the development of other subjects as well as for the accomplishment of different purposes each time (Govindasamy, 2002). However, apart from the learning needs of each trainee, the educational content should respond and adapt to the various learning styles (Cantoni et. al., 2004).

Moreover, it is essential to enrich the educational content with patterns of meta-data which describe each subject and facilitate the identification of the beneficiaries, the piloting and the structuring. The use of meta-data for the representation of the learning subjects may contribute both to the reuse of the educational content as well as to the searching and finding of these subjects (O' Brien, and Hall, 2004). According to Singh (2000) the meta-data may include details such as name, date of creation, relevant skill, edition, last date of transformation and so on, that make the search easier.

## Educational Readiness

The knowledge and experience that exists in the organization in relation to the planning, implementation and evaluation of an educational program plays an important role for its readiness to adopt e-learning (Borotis and Poulymenakou, 2004). The development of an effective educational programme should be based on a certain teaching systems development model, such as ADDIE (Driscoll, 2002).

The identification of both the existing personal knowledge and skills that every trainee possesses, as well as each trainee's educational needs and learning styles are particularly crucial for the effective adoption and implementation of e-learning. This is due to the fact that the identification of the gap between the staff's existing skills and the required ones for their effective performance, establishes the base for the development of the appropriate educational program (DeSimone and Harris, 1998).

For this purpose, job descriptions for each separate work position should be in place (Borotis and Poulymenakou, 2004; Lee and Owens, 2000; Goldstein and Ford, 2001), as well as a record of the job positions having been occupied by each member of the staff, the educational activities (training lessons, seminars) they have participated in and the degree of their effective completion. That is, job descriptions, career plans (paths) and the preservation of the skill profiles for each trainee are necessary elements for the definition of the educational needs. In addition, the use of Kirkpatrick's model (1994) for the evaluation of educational programs by the organization, denotes a high degree of readiness for the adoption of e-learning. Finally, whether the organization has already implemented or not any program and the kind of this program (asynchronous self-pace e-learning, asynchronous or synchronous virtual classroom) also define the readiness of the organization.

As a conclusion, the education factor should be given particular emphasis because this component includes the availability of the educational content, its structure and the psycho-pedagogical, teaching and cognitive characteristics, its life-cycle as well as the ability of the system to organise, analyse, design, implement and evaluate an educational programme. In the category of education the following actions are included:

- The development of syllabuses and educational material which will be provided in digital form to the teachers
- The development of a system for the reception and provision of the educational material those concerned
- The development of supporting mechanisms through support groups as well as the arrangement of a restricted number of meetings between the trainers and the trainees
- The development of an evaluation-accreditation system
- The development of support mechanisms for the management, evaluation and maintenance of the system.

Through the system, a list of courses will be also available, accompanied by the syllabus and the requirements which relate to the knowledge and skills that should be acquired by the trainee.

The teacher will also be able to get any relevant information about the available subjects. After the teacher has selected the subject/subjects, he will be provided with the appropriate educational material. During his study, the teacher will be able to have access to help-desk services which include among others, the multimedia support (sound and vision). The implementation requires a process of authentication of teachers as well as the evaluation of the training procedures, the provision of support to the teacher and the teaching material.

The teachers also should be able to have a few group meetings with the trainer. After completing the training, the teachers will be submitted to a systematized accreditation process. The provision of participation motives as well as the form they will have should also be examined.

## Environment

E-learning constitutes an innovation, the successful adoption of which requires the appropriate environment and adequate structure. The support provided by the administration contributes a lot to the development of the appropriate environment, facilitating change (Beeson and Davis, 2000; Carlson, 1999; Prescott and Conger, 1995; Rosenberg, 2000a). Moreover, according to Carlson (1999), Dray (1994) and Hanson (undated), the difficulty of managing the organizational change brought about by an innovation, depends on the members of the organization themselves, who are required not only to develop new competencies and knowledge but a new way of "looking" at and dealing with situations, too.

## Entrepreneurial Readiness

An additional factor that predetermines the organization's readiness to adopt e-learning is the enterprise itself. Particularly, the organizations that decide to adopt and implement e-learning have to consider it as a primary part of their strategy. In this way, we can suppose that a given organization possesses a high degree of readiness for the adoption of e-learning when this is fully in line with its entrepreneurial aims (Chapnick, 2000; Economist, 2003; Rosenberg, 2000a; Borotis and Poulymenakou, 2004).

Moreover, an organisation's readiness depends on its external environment, too. Quite often, various political and legal obstacles arise, discouraging and prohibiting the development of e-learning programs (Chapnick, 2000). Influence on the readiness for the adoption of e-learning by an organisation is also exerted by the kinds of reliance it may have, such as the one exerted on a subsidiary company which cannot decide on its own about the educational processes, but it has to apply certain policies that relate to and are prescribed by the mother company. All the above, increase significantly the readiness of an organization in relation to e-learning.

Moreover, the educational decisions of an organization should be taken only by the organization's Education Department and not by the Information Science Department or the Human Resource management Department, so that it is considered to be ready for the adoption and successful implementation of e-learning (ASTD, 2004). In addition, the dominance of a common definition, a common perspective on the meaning of e-learning and its benefits for the organization are of crucial importance for the effective adoption of e-learning by an organization. Finally, the existence of both a change management plan (Rosenberg, 2000a; Rosenberg, 2000b) and a communication plan (Rosenberg, 2000a) as integral parts of the organization's strategy significantly increase an organization's readiness for the adoption of e-learning.

## Readiness of Culture

The establishment of an appropriate culture is very important for the successful adoption of e-learning by an organization. Its acceptance by the staff also constitutes a matter of high importance for its effectiveness and due to the fact that according to Onepine (2004), people's actions in an organisation are not always owned by them but are influenced by the culture of the organisation they belong to, a culture that supports e-learning and learning in general is absolutely necessary. According to Peter Love and Jimmy Huang (2004), the learning environment is one the most important elements of a learning organization. The culture refers to common hypotheses, attitudes, values, and rules, actions as well as technical and linguistic devices (Onepine, 2004). Culture is developing naturally and it often reflects the values of those who have "built" the organization, and of the senior managers who preserve it and who institute the innovations, while it can represent (fully or partly) the culture of the society wherein the organization functions (Onepine, 2004).

Therefore, the attitudes and the behaviours that prevail in an organization should permit e-learning development. e-learning, as well as any other form of learning, should be part of the everyday working activities of each member of the staff (Rosenberg, 2000a). In other words, an organization that is willing to implement it, should permit and encourage free information and knowledge flow into the organization or give incentives (e.g., financial) to the staff or reward in some way those who follow this practice. According to Rosenberg (2000a) there may not be a better way to develop a learning culture than to develop a teaching culture that cultivates peer teaching as an obligation recognized by every employee. Moreover e-learning should be recognized as an added-value element of the organization; it should be considered namely, as a part of the production process and not as a waste of time. The belief that learning and working are two separate issues and that work is productive whereas learning is not, that learning takes place only inside the classroom and that learning and education are identical, should be put aside. On the contrary, e-learning should be dealt with as a part of the enterprise's strategy and be in line with its entrepreneurial aims (Chapnick, 2000; Economist, 2003; Rosenberg, 2000a; Borotis and Poulymenakou, 2004).

In addition, the senior managers of the enterprise should not restrict or forbid the staff's access to the network just because some of them visit recreation and sports Web sites during work time. On the contrary, employees should be encouraged to devote some time every day to the searching of information through the company's Internet or/and intranet. The existence of a Knowledge Management System or/and some Enterprise Content Management System – ECMS may also encourage the adoption and use of e-learning. In addition, a forum should be available to the employees in order to give them the opportunity to participate in conversations, since they can contribute to the establishment of learning communities that are necessary for the development of a learning culture (Rosenberg, 2000a). Finally, some theorists, such as Senge (1990) and Garvin (2000), suggest that a learning organization requires an environment where experimenting with new approaches is encouraged and mistakes are not considered as failure.

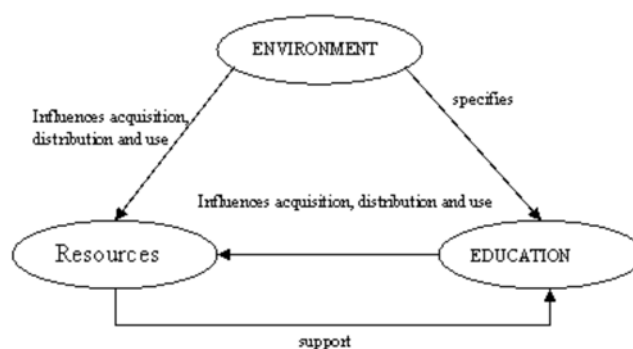
## Readiness of leadership

Leadership is undoubtedly the primary force underlying all successful incentives (Minton, 2000). It's true that, as Rosenberg (2000a) believes, an organization's culture and its leaders are reflections of each other. That is, the development of a culture that embraces e-learning reveals the existence of support for this culture by the senior management. Consequently, without appropriate leadership which will offer obvious and constant support for e-learning, the acceptance of this innovation will be slow if not impossible. In other words, unless support is provided by the senior management, there is no chance of developing the impetus and crucial mass which are necessary for the transformation of the organization into one that accepts e-learning and learning in general, as a natural part of its everyday work (Rosenberg, 2000a).

Based on the belief that the individuals are the main trainees of an organisation, it is obvious that each person's activities are vital for a learning organisation (Love and Huang, 2004). The staff's beliefs and behaviours should change in a way that will permit the successful implementation of e-learning in the organization. The provision of help to the staff should lie in the area of the administration's responsibility so that the changes which take place in the organization through e-learning are finally accepted. The managers who have a better understanding of their organization's culture should lead the process of change since their leadership will ensure the commitment of the working staff in this process (Nesan and Holt, 1999). So, the administration is expected to recognize, reward and enhance the participation in e-learning, while the managers should give free time to their employees in order to be able to engage in their training (Tucker et.al, 2002). This attempt aiming at the acceptance of the changes by the employees and at altering their attitude towards e-learning should start before the development of e-learning and be preserved during and after its development and its implementation.

The administration should, therefore, make sure that they have created an appropriate environment for its adoption. For this purpose, the persons involved are required to keep always in mind that training is not addressed to children but to adults who constitute the organisation's human resource. This is due to the fact that the adult trainees already "carry" some learning experience which can either function as a motive or as a hindrance for their training (Wilson, 1999). Therefore, the administration should make sure that a learning environment which increases the learning value for the trainees is in place.

According to Minton (2000), a successful administrator should at the same time be an effective communicator and a good listener, an experienced businessman, ready and willing to learn new things and improve himself, a good collaborator, supportive, realistic and flexible.



**Picture 2.** Correlation of the organization's components which compose the suggested model of e-learning readiness

## The use of visual networks for the implementation of e-learning

The development of the Information and Communication Technology (I.C.T.) in the recent years has resulted in the design of tools for the implementation of large scale and real time procedures. As a consequence, the Enterprise Resource Planning (E.R.P.) Systems are now available and networks have been established for the electronic exchange of data EDI (Electronic Data Interchange) whereas security protocols are used for the safety of extranets and intranets.

Nevertheless, there is a problem of "cooperation" and of absorption of I.C.T. by the organizations which is due to the fact that the new technology companies are offering ready solutions whereas the organizations willing to use the I.C.T. require solutions that are adapted to their own needs, in a low cost, while on the other hand, they are not often aware of the progress in I.C.T. Another problem is the great lack of homogeneity that exists in the information systems, known as "spaghetti" problem, due to the lack of homogeneity that is characteristic of this dish!

Therefore, each organization department can have its own information system, resulting in the different departments' inability to communicate and exchange information. This problem may not be evident in small local networks but is larger when the educational policy designers for example, decide to implement a large scale project requiring knowledge management tools. Another important problem is the cost of maintenance by the distinct companies which provide hardware and software for the different systems of the organization. All the above are pleading towards the development of a system which will be homogenizing the different parts of the organization and will be easily expanded, whereas it will have the capacity to connect remote areas in a large scale. Greece is facing many of the above problems and in particular (Daflos & Mantas, 2005):

- It has a great number of remote areas
- There is a lack of broad network connections in the remote areas, a fact that leads to the conclusion that whichever solution is implemented, it should encompass the following components:
- It should be connected to central hubs without the use of costly lines
- The education programmes (regarded as training programmes) should be accessible through a simple browser
- There should be a low cost for the network facilities
- It should provide telematic and e-mail services to the remote areas.

The EDUCOM (Educational Community) solution described can provide the solutions related to the resources and education. It is a technical solution which can incorporate the technological facilities and the readiness while it also contributes to a considerable cost reduction. It encompasses modern network services and advanced technologies in order to provide secure access to stored educational material as well as visual participation by the education actors.

The system is mainly designed for large scale networks and is of low cost. Its platform homogenizes communication by means of using different protocols while it supports synchronous and asynchronous forms of communication, multimedia support and real streaming video (Daflos & Mantas, 2005).

EDUCOM is a "guide" for the implementation of allocated environments which supply high security levels during the access to low cost educational material. Its architecture consists of three levels aiming at its independency from the various providers. These levels are:

- The Network Layer
- The Services Layer
- The Application Layer

### Description of levels

#### The Network level

This level defines the links between the remote parts as well as with the topology of the distributed environments. This level is important since the future improvement of the system should be taken into consideration and it should solve the problem caused by the lack of broadband network links in remote areas, which need telematic services. Through the use of broadband internet links in remote areas, two or more nodes of the central system can be connected, resulting in the online cooperation among a number of nodes. The best solution would be moreover, the use of broadband ADSL / SDSL links towards internet because the cost would be 1/10 of the one with engaged lines.

#### The Services level

This level will define the technologies and the protocols which will be used for the data exchange as well as the security mechanisms.

This level should provide connection to a private network through the internet facilities, telematic services and different modes of data exchange. For the above reasons, this level should encompass the following two technologies.

The VPN (Virtual Private Network) technology and the Streaming media Services technology. The VPNs are private networks that use the internet infrastructure in order to be connected, they are of low cost, they offer high security and they do not require special lines for their connection (Daflos & Mantas, 2005).

The above two technologies can support e-learning and video services, the secure listing of persons that have been trained, portal services for online education as well as safe access to trainers' and trainees' registers.

### The Application level

On this level there are development tools aiming at solving the problem of variation among the different computer systems while at the same time it adds a second level of security. For this purpose the applications on this level should be based on web-based platforms, and this is due to the fact that these applications function with the use of browser only. Its cost is also reduced because their maintenance depends on a central server.

### Conclusions

The readiness for the engagement in e-learning is an issue which all organizations wishing to adopt and use e-learning innovation should focus on, so that they are able to accomplish the desirable results, reducing at the same time the risk of failure. Investigating the organization's readiness as far as e-learning is concerned, addresses both the organizations that wish to include it in their educational methods, and the ones that have already implemented e-learning and are either willing to expand its use or are in search of the reasons that have resulted in less effective applications.

In this paper we have tried to correlate the factors which are present in the various models of the literature and which refer to an organization's readiness for adoption of e-learning and relate them directly to the organisation, demonstrating that they constitute parts of its components. In this way, we may reach to the conclusion that the successful implementation of e-learning is closely related to its resources, its educational processes and its context.

As depicted in picture 2, there is a kind of interdependence among these components. In particular, the acquisition, distribution and effective use of the organization's resources depend on the prevalent culture as well as on the policies applied, in other words on its context. Moreover, the context may encourage or discourage training and specifies the educational procedures, which are supported by the organization's resources (financial, technological, and human). Finally, the changes brought about in the organization's educational processes influence the acquisition, distribution and effective use of the resources.

We can observe that the context is on "top" of the correlation, meaning that maybe the first things to be estimated by an organisation wishing to adopt e-learning are its culture, its structure, its characteristics, the policies applied and the role of its administration. In order to be able to reach safely to this conclusion though, further investigation and study is needed as far as the correlation and the interdependencies among the various factors of the organization's readiness for the adoption of e-learning are concerned.

This model for e-learning has been adopted because it groups all the parameters that affect e-learning in three large categories which are easy to be integrated afterwards in the implementation process through the use of private visual networks. Moreover, our categorization systematizes all the components in three categories only, which enable a more effective implementation of e-learning in a system.

In this presentation, education is regarded, according to the new trend, as a system consisting of interactive entities which include the political leadership, the educational content (curriculum, etc), the teachers, the students and the social partners. As far as the teachers in Greece are concerned in particular, our proposal provides an added value because it promotes the implementation of e-learning in an easy way, due to the peculiarities of the country described above.

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