Critical Success Factors of E-learning Programs: An exploratory study in the Brazilian context

Résumé

Un certain nombre d'organisations ont fortement investi dans l'implantation de programme de e-learning. Et, en dépit des nombreuses incertitudes que ceci implique, une partie des processus d'enseignement et d'apprentissage se sont déplacés vers l'Internet. Ces incertitudes sont source de nombreuses difficultés pour les dirigeants, qui doivent, et ceci est un véritable défi, se focaliser sur les facteurs essentiels et appropriés qui assurent le succès de programmes. Mais que peuvent-être ces facteurs? Cet article vise à répondre à cette question en identifiant les facteurs critiques de succès des programmes de e-learning, et plus spécifiquement dans le contexte brésilien. Ainsi, neuf entretiens semi-structurés auprès d'experts et deux études de cas ont été réalisés. Les résultats montrent à l'existence de cinq facteurs critiques de succès, à savoir (1) la formation et l'expérience des équipes des programme d'e-learning; (2) les caractéristiques et le comportement des étudiants; (3) le modèle pédagogique; (4) la technologie, et plus particulièrement l'infrastructure technologiques et le logiciel employé; et enfin (5) l'établissement des alliances stratégiques.

Abstract

Organizations have been making heavy investments in the implementation of e-learning programs. In fact, despite the many uncertainties that this involves, part of the teaching and learning processes are moving towards the Internet. These uncertainties bring about difficulties for managers, who face the challenge of keeping the focus on essential and relevant aspects that will assure programs success. But what would these factors be? This article aims at answering this question by identifying the critical success factors of e-learning programs, more specifically in the Brazilian context. With this objective, nine semi-structured interviews with experts were held and two case studies were carried out. Results point to the existence of five critical success factors, namely (1) the training and experience of e-learning program teams, (2) the knowledge and concern with the students' characteristics and behaviour, (3) the learning model, (4) the technology – especially technological infrastructure and software used – and (5) the establishment of strategic alliances.

Key-words:
E-learning, distance learning, virtual learning environments, Internet, critical success factors.

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Introduction[1]

The heavy investments in e-learning made by companies and teaching institutions (Salas *et al*., 2002; Alavi and Leidner, 2001; Clarke and Hermens, 2001) reflect a favorable context for the development of an electronic market of learning on the Internet (Hämäläinen, M., Whinston, and Vishik, 1996). There are many factors pointing to this: the demand for continued education, increased costs of conventional education, convergence of digital technologies, the expansion of the Internet, the development of e-commerce infrastructure, the rapid obsolescence of knowledge and information, among others (Salas *et al*, 2002; Clarke and Hermens, 2001; Hämäläinen, Whinston, and Vishik, 1996).

However, research on this subject is still insufficient (Alavi and Leidner, 2001; Salas *et al*., 2002) and companies and teaching institutions acting in this field still have many unanswered questions. Despite its evident importance, defining and working on the technological aspects of the process is not enough. It is necessary to analyse a series of other elements related to communication, pedagogical project, instructors, technical support team, security and so on. The challenge for managers also increases, as there are few experts in the subject. Wrong decisions may jeopardize the success of a program under development, and among the several choices that must be made while establishing a strategy, it is important to keep the focus on the critical success factors (CSF).

But what are the CSF in e-learning? What problems could they cause? This article is intended as one more step towards obtaining the answers to these questions as it aims at identifying the critical success factors in e-learning programs. The results are meant as a contribution in this direction, also working as subsidies for managers of companies and teaching institutions in the planning and management of e-learning programs.

The article is organized as follows. In the next section, some concepts of the basis of this research are briefly discussed, followed by highlights of the method used (section 2). In section 3, an analysis of the results obtained is given. Conclusions and limitations are dealt with in section 4.

1. Learning through the Internet and its critical success factors

The use of Internet technologies for distance teaching and learning has been object of attention in the literature of late. However, since the research is new and fragmented, there is a

> "[…] lack of standardized terminology to describe DL [Distance Learning]. The words distributed, distance, online, Internet or Web-based are often used interchangeably to describe training, education, learning, or instruction. […] In addition, the terms e-learning and cyberlearning are appearing with increasing frequency in the literature" (Salas *et al.,* 2002, p.137).

These different terminologies are, in essence, the reflection of the multidisciplinary character of e-learning programs. Distance learning via the Internet involves different fields of knowledge and each deals with the phenomenon according to different theoretical bases. It's also important that "currently, there is no theory or model that predicts learning in a distance environment" (Salas *et al*., 2002, p.139).

Nevertheless, "one can define DL as a learning that is media based, remote, or asynchronous and supported by some instructional system" (Bourdeau and Bates apud Salas *et al*., 2002, p.137). In the case of e-learning, an instructional system based on Internet technologies. E-learning can be thoughts also as a Web-based virtual learning environment, as used in Piccoli, Ahmad and Ives (2001). "Virtual learning environments (VLEs) are defined as computer-based environments that are relatively open systems, allowing interactions and encounters with others participants and providing access to a wide rage of resources" (Wilson apud Piccoli, Ahmad and Ives, 2001, p.403).

A framework proposed by Piccoli, Ahmad and Ives (2001) shows some dimensions of VLE effectiveness. It also gives an idea about the number of variables that can affect the Web-based VLE outcomes, and so, the e-learning outcomes. These variables are related to two dimensions. The human dimension predicts that aspects related to the students (e. g., maturity, motivation, technology comfort) and to instructors (e. g., technology control and attitudes, teaching styles, self-efficacy) affect the VLE effectiveness. The design dimension predicts that aspects related to learning model, technology, learner control, content and interaction can also the VLE effectiveness.

However, several types of research in this area are undeniably necessary (Piccoli, Ahmad and Ives, 2001; Alavi and Leidner, 2001; Salas *et al*., 2002). There are still many aspects requiring better understanding and the important points and the critical success factors are not entirely known yet, so needing to be further explored (Salas *et al*., 2002).

Papp (2000), for example, points out that there are seven CSF in e-learning programs of educational institutions, namely, (1) the establishment of security criteria for organizations to guarantee their intellectual property of the courses, (2) the analysis of the pedagogical approach and the corroboration of the possibility of adapting courses to a virtual environment, (3) the consideration of the necessary time for the development of courses, (4) the adaptation of contents in order to maximize both the use of available technologies and the student's learning, (5) the

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preparation to deal with unexpected problems, (6) the decision between using specific software or building one's own Internet learning environment and (7) the continuous evaluation of the course performance. However, there are some significant limitations to Papp's work (2000), as these factors were determined from his perception after the development of three courses for distance learning, specifically for an American university.

It is also worthwhile mentioning that while the term 'critical success factors' used in this article was first proposed by Rockart (1979), its meaning here is rather different from his original idea. Although the model developed by Rockart (1979) is focused on the information needs of a companies' chief executive, further studies indicate that this method may offer many benefits if used on other managerial levels (Furlan, Ivo and Amaral, 1994).

2. Research Method

The research method is based on two case studies (Yin, 1994) and nine semi-structured interviews with e-learning experts in Brazil (Figure 1). It has an exploratory nature and uses qualitative data essentially (Mason, 1996).
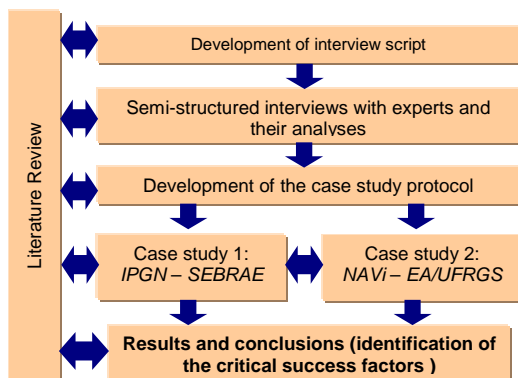

Figure 1 – Research design

Based on the literature review, a script was devise to be used for semi-structured interviews. Three experts, who checked its relevance and clarity, revised the interview script. Displaying basically two profiles, nine interviewees were selected according to their knowledge and commitment to e-learning projects:

(1) Five reputable professors with accredited research and publications in the area, also involved with the management of e-learning projects.

(2) Four managerial level professionals who adopted e-learning for team training, offering courses or services to other organizations. These professionals work in a large telecommunications company, a company that offers e-learning services, a university that offers undergraduate programs via the Internet and a sizeable institution that does personnel training.

The interviews were held between August and December 2001 and they were all recorded and transcribed. The data was analyzed through content analysis. More specifically, through thematic analysis and considering more important the thematic units the respondents had cited that more (Bardin, 1977). In order to identify the CSF, the attempt has been made to verify the elements (thematic units) considered to be the most important ones for e-learning programs and those that could lead to significant problems.

Aiming at higher result reliability, two analyses (test and retest) were carried out and then compared, in a process Krippendorff (1980) defined as 'stability'. A third analysis was performed where the answers were found to be diverging. More detailed results of the interviews analyses are presented in Testa and Freitas (2002a).

A protocol contained seven main dimensions of analysis for the case studies was defined from the interview results. The first case study was made in the IPGN - *Iniciando um Pequeno Grande Negócio* (Starting a Small Big Business), an e-learning program of SEBRAE (Brazilian Micro and Small Business Support Service) – a non-profit Brazilian civil society, run privately that provides technical support for the development of small to medium sized companies. It promotes programs, including several kinds of courses, to stimulate entrepreneurship and the strengthening of small businesses. In the case of the IPGN, data collection was carried out between December 2001 and February 2002, using the techniques of documentation, semi-structured interviews and direct observation, by triangulation (Yin, 1994).

The second case study was carried out in the NAVi - *Núcleo de Aprendizagem Virtual* (Virtual Learning Center), the e-learning program of the *Escola de Administração (EA) da Universidade Federal do RGS* – UFRGS (Business Administration School of the Federal University of Rio Grande do Sul), in Porto Alegre – Brazil. Data collection at the NAVi – EA/UFRGS occurred in a similar way to the one described for the IPGN case, with added participating observation. The collection also occurred between December 2001 and February 2002 (except the observation, which had started a year before). More detailed results of the case studies are described in Testa and Freitas (2002b).

3. Identifying the critical success factors of e-learning programs

The analysis of the research data indicates that there are five critical success factors in e-learning programs, related to (1) the qualification and experience of the e-learning program teams, (2) the knowledge and concern with the student's characteristics and behavior, (3) the learning model, (4) the technology – especially the technological infra-structure and software used and, (5) the establishment of strategic alliances. Each one of these CSF is presented below, highlighting interviewees' per-

ception of each factor and the most relevant aspects identified in the case studies of the IPGN – SEBRAE and of the NAVi – UFRGS.

3.1. CSF 1 – Team experience and background

The people involved with e-learning programs (managers, computer technicians, educators, instructors, etc.) must have previous experience or specific education in the area.

This first CSF derives from the fact that there are some important peculiarities in learning via the Internet that are hardly ever taken into account by people without experience or specific background in this area. These peculiarities are small things, actually details, but which can produce significant impact on the results. For example, a synchronous interaction in a course requires special language and approach. A common mistake observed is the attempt to use the same strategies of conventional learning in courses through Internet.

Particularly important is the background of the instructors. From their experience some interviewees state that there are many unprepared instructors working in distance learning courses. For example, some interviewees have indicated the passive attitude of these instructors in the face of the virtual learning environment. Others have criticized the inadequate search for solutions to decrease their workload, which, in e-learning can be substantially larger than in ordinary courses, depending on the level of interaction.

These findings agree with the propositions of Piccoli, Ahmad and Ives (2001) that teaching styles and availability of instructors can affect the effectiveness of VLEs. Arbaugh (2001) also found that instructors' classroom behaviors "are significantly associated to student learning and satisfaction in Web-based MBA courses". Therefore, proper training of instructors is an aspect of utmost relevance, since the role of the virtual instructor is particularly complex and different from that of the conventional teacher (Coppola, Hiltz and Rotter, 2002).

In the case study developed at NAVi – UFRGS, distinct problems related to the lack of experience or training of its members were identified. None of the NAVi members had any previous experience or training in e-learning and even so they did not attend any specific course or training. Their instruction was informal and happened through their own initiative. However, this was not enough and made it even more difficult to establish an e-learning program. Although NAVi had latterly developed courses which were well rated by the students, the process to achieve this result was certainly needlessly difficult and tiring due to the team's lack of experience.

3.2. CSF 2 – The student: behavior and characteristics

E-learning programs must know their students in order to develop actions aimed at fulfilling their needs, helping them to adapt to the virtual learning environments and to acquire self-discipline, and preventing them from feeling isolated or left aside.

This factor is related to students' characteristics and behavior which exert a strong influence on the effectiveness of an Web-based course (Piccoli, Ahmad and Ives (2001; Salas *et al.*, 2002). That is why interviewees pointed out that it is necessary to know the needs and aspirations of the target public of e-learning programs, in order to better elaborate course strategies.

A very important aspect of this factor is the need to evaluate student's motivation and self-discipline to attend on-line courses - witches are also aspects cited by Piccoli, Ahmad and Ives (2001) and Salas *et al.* (2002). Since the Internet courses are usually more flexible than traditional ones, with few pre-scheduled study hours, students must be very disciplined to fulfil their duties without losing heart or even giving up the course. The student must often forego certain habits and leisure activities, being with friends, family and so on. This situation becomes worse with the absence of classmates as these are conceived in conventional terms, where they are a factor of motivation. That is why it is necessary to verify if the students are really inclined to incorporate a more individually oriented pedagogical profile, directed towards self-study.

A feeling of isolation is one of the main reasons why students give up Internet courses. Establishing a strategy of interaction and motivation via course instructors or teachers is one possible solution for this kind of problem. Besides, research has proved that virtual learning environments tend to be more successful whenever there is cooperation among students, and whenever their motivation and efforts are positively linked to learning (Hiltz apud Alavi and Leidner, 2001). Developing attractive and lively instructional material and respecting students' diverse learning levels, without requiring more than what can actually be given are other solutions for this problem.

Another problem with e-learning is the cultural shift students. Their transition from a conventional learning environment to a virtual one may cause them some trouble, as Interviewee N.3 explains:

> In our case, the difficulty we faced in the development and implementation of courses [...] was not giving sufficient value to students' psycho pedagogic circumstances. We simply started by imposing things, without realizing that there must be some time for students to adapt to a thoroughly new environment. The online student does not exist; you have to create him. So we created online acclimatization programs. From this experience onwards, the output of groups changed completely [...]. This acclimatization process also works as an adaptation to a novelty, and this novelty is not

only related to technological resources. The less significant novelty is the technological one, the most significant is the psycho pedagogic one. It is an adaptation to another physical space, a new way of socializing and relating to others, the virtual community. This adaptation demands acclimatization programs [...]. It makes a huge difference for the student in terms of quality and conditions.

The case of IPGN illustrates well the importance of this CSF. Based on the information available on the IPGN website, SEBRAE expected people to rate themselves as being able or unable to take the course. This situation brought about serious problems and it was one of the main reasons for leaving the course. Consequently, lack of time was the main difficulty faced by the students taking part in the IPGN, since the demand for self-discipline to complete the entire program was greater than the specific interest of the participant in concluding the program. The following statement – written in an evaluation document of the IPGN - provides a good picture of the situation:

The required discipline to reach the end of the program leads to demotivation. Other possibilities of using time impose themselves as external demands or responsibilities. [...] The disciplining factor of committing one's self to a schedule has found no substitute in the program. On the contrary, the possibility of access at any time (therefore at no special time), in a supposedly easy way, becomes a considerable challenge in terms of self-discipline and organization (FATO, 2001, p.13).

3.3. CSF 3 - Learning model

E-learning programs must define a particular learning model, preferential based on interaction and cooperation, giving special attention to the instructional design and respecting cultural factors related to the students.

This was the most frequently mentioned CSF in the research, especially in relation to the need of defining a pedagogical project to guide the activities of e-learning courses and programs, according to a particular learning model (e.g., objectivist, constructivist). It agree with the proposition of Leidner and Jarvenpaa (1995, p.266) that the effectiveness of information technology in contributing to learning is "a function of how well technology supports a particular model of learning and the appropriateness of the model to a particular learning situation".

The instructional design is a relevant aspect, mainly when it involves the adaptation of conventional class materials to the virtual learning environment. When developing materials, the fact that this is a whole new experience for the student must be taken into account. Besides, not all students are used to the Internet, and many of them become quickly bored with reading, which

makes graphical design even more important. Another aspect related to this CSF refers to the development of courses which take the student's cultural background into account. This can become even more complicated on the Internet, since students are usually geographically dispersed.

The interaction and cooperation among instructors and students is once again brought forth. This would inclusively be an important evaluation criterion for the learning models of e-learning programs:

The interaction between teachers and students is one of the most important criteria when deciding if a learning model is good or not. The more interactive the relation [...] teacher-student and student-student is, the stronger the possibility of communicating in all senses, and the better the pedagogical model will be. It's a very good criterion for you to adapt to the pedagogical model. But it's worth saying that the best pedagogical model is a clear one, even if it's a model that I wouldn't agree on, […] at least we are doing this, we are not doing it because 'I think that...', something without proper reflection (Interviewee N. 4).

In the IPGN case, it's worthwhile pointing out the issue of adapting the context of the course to the local culture. The IPGN course is standardized all over Brazil, despite the huge cultural differences among regions: it has the same contents, the same modules, and the same exercises. Thus, the solution to keep the course from seeming alien to the students was to hire instructors from many Brazilian regions, who would know the local reality of owners of small to medium sized businesses.

3.4. CSF 4 – Technology evaluation

The e-learning programs must know how to evaluate the technological infrastructure and softwares which make up the virtual learning environment. Too much focus on the technological aspects should be avoided.

The first aspect of this factor concerns the evaluation or definition of the technological infrastructure, i.e., it concerns the identification of the potential technological capacity of a program in order to know which resources are available and, among them, which ones can be used and which ones should not. For instance, it is important to know how to evaluate Internet transmission capacity, checking access speed to estimate the likely amount of time that students will need to access the Web pages and do their tasks, or also to check the possibility of adding graphics, videoconferences and other features.

A second important aspect is the definition of the softwares that will make up the virtual learning environment on the Internet. There is specific software for e-learning, besides generic Internet applications which could also be used (for instance, for the sake of interactions a chat room or a more efficient discussion forum may be purchased). On the whole, the opinion of interviewees is that

the specific software applications, currently available in the market and developed for courses on the Internet, do not present good learning environments. An interviewee, for instance, pointed out that, behind the concept of a specific software application, there are always pedagogical principles. Depending on what is intended for development, these can be inadequate:

> My experience tells me that we can do better without specific software, they are still rough environments. From a technological point of view, they are avant-garde; from the point of view of fulfilling pedagogical demands, thereby providing us with what we need for online education, they are close to nothing. Actually, they are very close to being the technological avant-garde of pedagogical retrogress. This is to say that today you have very sophisticated tools to teach just like you did 30 years ago (Interviewee N. 3).

According to interviewees, an often recurring mistake is the excessive focus on technological possibilities, a tendency to employ all the technological resources available in the market even when they are not necessary. Thus, the planning of some Internet courses has technology - and not a pedagogical project - as its guideline. It must be made clear that technological resources must be purchased only after a pedagogical project is available and technological needs are identified. This strategy mistake was observed, for example, at NAVi – UFRGS. Most of the activities – including the instructional design – were defined after equipments were purchased, which became a limiting factor of what could be done. Besides, each new course proposal or each change required a feasibility evaluation, to check if the proposal in question could be supported by the equipment already available.

3.5. CSF 5 – Creation and management of strategic alliances

E-learning programs must evaluate their competences and seek complementation through the construction of strategic alliances.

It has been mentioned that the activities involved in an e-learning project are of different kinds. They involve technological, pedagogical, design and communication aspects, among others. Organizations that have the competence to develop all the necessary activities in-house and establish a program or even a course of their own are very rare. A public Brazilian university, for instance, will probably face some problems in obtaining the necessary technology and hiring people to operate with this technology, or even to give support to the students. An organization that intends to train its employees will probably not have all the teachers or instructors needed to offer a course, not even the specialized personnel to change a conventional course into a Web-based one.

For all these reasons, being capable of establishing and managing good strategic alliances has become a funda-

mental aspect. Indeed, it is clear that there is a great movement in this direction by organizations developing e-learning (Clarke and Hermes, 2001). The alliances may be of different forms and intensity and have different goals, but only a few organizations can do without them.

The partnership system for the development of the technical part of the IPGN course, for example, was mentioned as a very important choice for the success of the program. In the opinion of one of the people responsible for the program, without this alliance, within the same period and with the same budget it would not be possible to develop a course of similar quality.

On the other hand, the NAVi chose to perform all of its activities internally. This decision had some positive and negative consequences. One good point was the team's development of knowledge and autonomy. However, the negative points seem to be stronger. The difficulties of technical nature, for instance, tended to draw the attention and consequently the focus away from the main objectives of the Center. Much more time was spent in developing tools and building sites than in thinking about methodological questions and content of courses. Besides, there have been delays in the development of courses and some resources were not made available. Students' support during the courses was also insufficient. Furthermore, the amount of time needed to develop a course of fair quality was excessively long.

4. Conclusions

The identified critical success factors are elements whose materialization depends on actions by the organizations themselves. Even the aspects pertaining to the students can be further worked on if the people responsible for the e-learning programs are willing to do so. If the five factors identified do not receive due attention, it is likely that serious problems will follow. For this reason, Table 1 presents some questions derived from the CSF, which managers may wish to develop to reflect on and evaluate their e-learning programs.

The questions listed in Table 1 are just examples; many others could be posed. The intention here is to help the organizations that intend to act in this field, whether by offering courses externally to a specific target group or in-house, when training their employees. We want to make it easier for organizations to plan and establish their strategies for the implementation of distance learning courses, since they will then be able to focus their efforts on more important factors. For companies already acting in this field, this paper intends to be a contribution for a possible internal evaluation on the performance and management of the program.

As a suggestion for future research, we propose the identification of the actions or strategies that may be adopted by the organizations in order to assure that the identified CSF will be properly worked on. The confirmation of the

results obtained through other corroborative research is another possibility of validating (or not) these results.

As a conclusion, the authors would like to call attention to the fact that this research has got some limitations, the most important of which are: the impossibility of generalizing results, which are mostly related to the reality of e-learning programs used in Brazil; the limitation in the

reliability of the results of' content analysis of the interviews, for it was carried out by one single interviewer; the fact that most of the inferences here were made on the basis of other people's perception (they are, therefore, subject to a series of influences that evade the scope and control of the research).

Table 1 - Questions for reflection and evaluation of an e-learning program

CFS 1 *Experience and background of team*	- Are there people capable of performing the necessary activities? What are the team's strong and weak points? – How experienced is the team? Is it possible that some relevant aspect is not being properly taken into consideration? Is there any possibility of an error in the proposed planning? – What are the competences that the team lacks? How could these competences be acquired? Are there good courses or training that might help?
CFS 2 *The student: behaviors and characteristics*	- What kind of people are the courses aiming at? What are their characteristics? – Are the students taking courses on the Internet for the first time? In case of an affirmative answer, how can the adaptation to this new process of teaching-learning be made easier? – How demanding are the courses offered? Are the students willing to face this level of requirements? - What is the feeling between the students who are taking the course? Do they feel as part of a group or isolated while doing a task?
CFS 3 *Learning model*	– Is there a clear pedagogical project? Is the team aware of this project, especially the teachers (or instructors) and people responsible for the instructional design? - Is there an awareness of the role of interaction and cooperation in the teaching and learning activities? Are the features designed to stimulate interaction and cooperation adequate? – Are the different learning styles respected? Do the courses offered respect the main cultural aspects of the students?
CFS 4 *Technology evaluation*	- Which technological infrastructure is available? And the students, how do they connect to the Internet? What's the average transmission speed from the course server to the final user? – Which kind of features should not be used due to the limitations in the technology available (for example videoconference, audio conference, etc.)? - Which are the advantages and disadvantages, for the kinds of courses intended to be offered, of the specific e-learning software applications as compared to the development of one's own Internet environment? Are there people capable of developing this environment?
CFS 5 *Creation and management of strategic alliances*	– Which are the competences of the organization? Which competences are necessary for the development of the desired e-learning program? Is it possible (and advantageous) to develop internally a missing competence? – Which are the potential strategic partners to complement the missing competences? - What kind of strategic alliance could be established in order to increase competitivity?

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