

# M-LEARNING ADOPTION IN BRAZIL

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## ABSTRACT

This paper presents an exploratory study about the adoption of m-learning practices in Brazil, especially regarding its application in organizations. The research results show that m-learning has been experimentally adopted in the academic setting, and that applications in companies are rare. Its development is faced with several challenges, including resistance to new technologies and learning practices, technical and economic challenges for its use, as well as pedagogical and social/contextual issues.

## KEYWORDS

Mobile Learning Adoption – M-learning in organizations - Brazilian context

## 1. INTRODUCTION

The development and application of Mobile and Wireless Information and Communication Technologies (MWICT), is notable in Brazil. There are approximately 102 million cell phones in the country (ITWEB, 2007). The speed of dissemination of this technology has seen no precedents and surpasses by far the current access to personal computers. It is in this context that this article discusses the concept of mobile learning (Sharples, 2000; Trifonova, 2003; Koschimbahr, 2005; Naismith et al., 2004), understood here as referring to those learning processes that take place necessarily with the support of MWICT use, involving the mobility of human actors who may be physically/geographically distant from other actors, as well as from physical, formal education spaces, such as classrooms, training and skills-building venues or work places.

The growing use of MWICTs opens new possibilities for teaching and learning processes, mainly in the field of continuing education of mobile workers (Kristoffersen and Ljungberg, 2000). Koschimbahr (2005) indicates that the ICTs currently adopted for the automation of activities of mobile workers can also be used in on-job learning. Edwards (2005, p. 50) states that m-learning contributes to informal and in-process learning, as opposed to traditional training activities in formal education settings, which are often inefficient, as they cannot ensure that “the right person is on the right course, at the right time”. This way, mobile workers can spend more time where they need to be – on the field, seeing clients, doing business, without

substantially affecting their need to devote time to updating their knowledge and continuing training. According to Sharples (2000) mobile technologies can help to promote lifelong learning – individualized, learner-centred, situated, collaborative/cooperative and ubiquitous learning.

However, we must also consider the dubious character of the technology (Ciborra, 2002), since, if on the one hand, MWICTs allow new learning processes and/or practices to take place, on the other hand, it has already been verified that the use of those technologies can also have negative effects, such as: information overload; increased complexity of interactions at different places and moments, breakdown of the boundaries between personal and professional life affecting life quality, etc. (Sorensen and Gibson, 2003). It is also necessary to question how much workers can effectively learn with mobility or if the so-called “m-learning” can actually end up restricted to a merely informational level. There are, thus, still many questions to be asked regarding this issue.

The study presented in this article corresponds to the first stage of a research project currently being undertaken by an interdisciplinary and inter-institutional team of researchers in the areas of Management, Education and Computer Science, whose overall objective is to identify the main elements involved in the process of adopting m-learning in organizational contexts in Brazil. As it is a new theme, especially in the Brazilian context, an exploratory study was carried out in the first stage of the project, aimed at identifying pioneering initiatives and practices involving m-learning in the country.

The method initially adopted to do that was Internet-based documental research. After having identified the instances of m-learning applications in Brazil, the researchers contacted the actors involved in those projects, starting the process of data collection by telephone, personal or e-mail interviews, in order to learn more about the applications made and to find out what were the main challenges posed to m-learning practices in the Brazilian context.

Below the theoretical framework of the research project is presented, followed by the methodological details of the exploratory study. Then, the research results are presented and discussed, concluding with the final considerations of the article.

## **2. M-LEARNING**

The concept of m-learning adopted in the study converges with the idea of pervasive learning (Thomas, 2005) as ever-present education, expanding the concepts of collaborative learning, constructivism, environments rich in information for learning, self-organized, adaptive, multimodal learning. We define Mobile learning as a learning process that occurs in a situation involving the mobility of the actors, at distance from a stationary learning space (classroom, training room) or workplace, and supported by the use of mobile and wireless technology - i.e. mobile devices (such as mobile phones, PDAs, notebooks) connected to a wireless network.

Hence, the research project that this exploratory study is a part of, aims to test the assumption that MWICTs offer new possibilities for the development of individual competences, going beyond the possibilities offered by current e-learning activities. That is based on the view that those competences, i.e., the capacity to act effectively in specific types of situations, based on knowledge, skills and attitudes, are developed in action and situated within a context (Perrenoud, 1997). Thus, particularly in the case of mobile workers, they need to set into action several cognitive resources while actually in the course of performing professional activities. In that dynamic context it is necessary to access information, interact, and collaborate in order to learn and solve problems, in face of uncertainty. Therefore, competencies are developed not only in formal teaching and learning environments, but especially in the situated context where they are needed. That justifies testing the proposition that MWICTs can give a more effective contribution to the development of individual competences than the tools currently available through e-learning.

In order for m-learning to effectively offer new learning possibilities, a set of complex factors must be considered. First, the conceptions of learning must themselves be re-examined. According to Hardless, Lundin and Nuldén (2001), in order to develop the skills of nomadic workers, it is necessary to have an educational model based on an interactionist epistemological conception. Considering the design of m-learning solutions in the technological field, an analysis must be made of which ranges of services will be offered to enable learning, and also of the technologies that will be explored in order to provide those services. The criteria of usability, accessibility, mobility, collaboration/cooperation and location awareness

must also be considered (Trifonova, 2003; Ogata and Yano, 2004). At the same time, the limitations of currently available MWICTs, ranging from the ergonomic limitations of devices to the lack of standardization in telecommunications systems, must be taken into account.

As learners use MWICTs in a mobile context, a range of new issues arise, considering the several different dimensions of mobility, which go beyond physical mobility, such as temporal mobility (Kakihara and Sorensen, 2002). The use of MWICTs, for instance, can increase the so-called polychronicity, i.e., the fact of having to deal with several tasks simultaneously. There is also contextual mobility - the use of MWICTs for m-learning can occur in different contexts, not only physical, but also social. Those contexts include different cultural formations, situations and moods, degrees of proximity and mutual recognition among people, as well as other factors.

Thus, the context that surrounds a mobile learner is defined dynamically; it emerges from the activities that the actor performs, in a social context, involving motivations, and planned and unplanned actions. What is considered "normal" or adequate to be done in a specific context (including learning) is socially negotiated (Dourish, 2004). Therefore, it is important to understand what the challenges are for the adoption of m-learning in each physical-social-economic-cultural context, in this case, the Brazilian context.

### **3. RESEARCH METHODOLOGY**

This was an exploratory research study (Collis and Hussey, 2005). The research technique adopted initially was documental research (Bauer and Gaskell, 2000), using documents found through search tools on the Internet. It took place in January-March 2007. A set of keywords related to m-learning was used and only Brazilian web pages were accessed, as the study focused on m-learning exclusively in Brazil.

Based on this rather extensive search (for example, the expression "m-learning" alone got approximately 900 results, which were explored one by one), it was possible to find projects, papers, articles and websites that disseminated initiatives, research studies, applications and solutions in m-learning. That material was then analyzed, attempting to identify the key-persons who would be able to provide information about references and experiences and answer the questions in the study.

Overall, 31 relevant m-learning references, projects or initiatives were identified, most of them in academic/university environments, with only very few cases of projects or applications in companies. After that, the actors involved in those initiatives were contacted (one person from each). Besides those 31 persons, two academic experts in e-learning and MWICT development, recognized for their broad perspective of those areas, were contacted and asked to answer the questions in the study.

The first contact with the target persons of the study (33) was made via e-mail, with a presentation of the research project, the team and the objectives, and a request to arrange a telephone or personal interview with them. As return to the first e-mail was low, a new message was sent, opening the possibility to answer the study's questions (5 open questions) via e-mail. On the whole, 15 out of the 33 persons contacted answered the questions, 6 of them via telephone interviews, one via personal interview and 8 via e-mail. The interviewees belong to different regions in Brazil: most of them (11) from the southwest (the most industrialized region), mainly from the cities of Rio de Janeiro and São Paulo, followed by respondents from the south (3) and northeast (1).

One limitation of the study was the fact that the e-mail answers were much more succinct in terms of content than those given in the personal or telephone interviews. To compensate for that limitation, an analysis was made of the documents related to the projects or initiatives in which the e-mail interviewees were involved. Another limitation is the fact that there may be m-learning references, projects or initiatives not yet "published" on the Web, or which have not been listed in a way that would allow them to be located through the keywords used in the research. In face of those facts, the researchers are open to contacts with companies, institutions and other actors who may wish to include their projects in the list identified. Since these are emerging technologies and practices, this study has no intention of being conclusive. Ideally, it should expand longitudinally, following the evolution of m-learning in Brazil.

## 4. RESEARCH RESULTS

**Results of the documental research** – Out of the 31 cases located, we verified that most of them (17) were cases of m-learning applications in the academy, most of them in higher education institutions. The bibliographical references that describe those cases are not listed in this article due to space limitations, but they can be accessed by contacting the authors. They include:

- The proposition of a framework for the development of educational applications for m-learning (1 case);
- Adaptation of e-learning software for use in mobile devices (PDAs and cell phones) with reports of practical application experiences (2);
- Report of PDA use (1) and use of a mobile portal (1) in disciplines in undergraduate programs;
- M-learning software projects to be used by hearing (1) and visually (1) impaired individuals;
- Creation of a Virtual Learning Environment specific for m-learning (5);
- Discussion of the possibilities of m-learning in the healthcare sector (1); and scenarios for m-learning (2)
- Creation of different tools (software) for m-learning (2)

Considering the references and projects found in the academy, half of them (8) present models, frameworks or software prototypes without real applications or that they present a generic discussion on m-learning. Among the cases where there is development and testing of m-learning solutions in real contexts, the applications generally involve the use of few functions and resources; none of them indicates the adoption of routine m-learning practices actually incorporated in the teaching practices. That reveals the emerging stage of m-learning in the Brazilian academy.

Another possible conclusion is that most of the references and projects found in the academy have a technological perspective. Only a few of them are concerned with pedagogical or management issues, or with the social aspects related to the adoption of m-learning technologies and practices.

Out of the 31 cases or references found, 10 were concerned with offering software solutions for m-learning, and 1 of those companies was identified as an intensive user of m-learning in its own corporate training activities (Intel, case described below). Six out of the 10 software provider companies did not respond to the research questions.

Considering the adoption of m-learning practices by companies or non-academic organizations, only rare cases were found, which are described below.

- Santos et al. (2002) describe the use of software and mobile devices in games and field exercises by the Brazilian Navy Marine Corps. A System of Exercise Evaluation was adapted in a WAP protocol to be accessed via cell phone.
- Neves (2005) reports the case of Telemig Celular (a regional mobile telephony company), which used WAP and SMS technology to create a forum to discuss problems and exchange ideas, accessed by the company's employees.
- The Bradesco Foundation, which belongs to Bradesco Bank, one of Brazil's biggest banks, is devoted to providing free education through schools attended by approximately 100,000 students in Brazil. The foundation has been using mobile technologies in its education projects for young people and adults, including the use of Pocket PCs and Wi-Fi networks in the classroom. Although those m-learning initiatives are not targeted at corporate training, this case is interesting from the perspective of an organization using m-learning in its socially responsibility activities.
- Intel Brasil, within the scope of action of Intel Corporate University at a global level, offers corporate training to the Brazilian subsidiary's employees, using mobile devices such as notebooks, tablet PCs, PDAs and smartphones. The company virtually abolished the use of desktops, so its employees use notebooks (some use smartphones) as their basic work tools. Using that equipment, employees can take m-learning courses on different themes and fields. The courses are based on multimedia presentations and flash animations. With approximately 100,000 employees around the world, Intel considers it an effective training strategy.

As the data above demonstrates, most references and cases of m-learning solutions and practices in Brazil are in the academy. Cases of application in the corporate world are rare. This information is corroborated by the interviews carried out (see below). Obviously, a limitation of this study is the fact that m-learning application initiatives in the corporate world are generally less disseminated than academic projects, and there was also the fact that it was difficult to obtain any response from some of the companies contacted.

**Interviews results** – As mentioned in the methodology, based on the identification of references, projects, cases and experts on m-learning, the persons involved were contacted, and 15 interviews were done. From the 15 respondents, 2 are executives in large IT companies, 1 is an executive in a foundation, and the others (12) are professors and/or researchers, most of them working in the fields of Computer Science and Education, with 9 out of 12 academics directly involved in the development and application of m-learning technologies and/or methodologies.

The first question was: *“In your perception, what are the sectors, companies/organizations or types of professionals that can benefit from m-learning practices?”*

The majority of interviewees clearly stated that m-learning is particularly useful for “mobile” or “field” professionals in general, i.e., those who are constantly travelling or on-the-move outside the organization. Similarly, 6 out of 15 respondents believe that any sector, company or professional can, in some way, benefit from m-learning. Among the types of professional most frequently mentioned by the respondents are: professionals in the sales/commercial area, health workers, field technicians, professionals who constantly need to update their skills and knowledge, people in executive positions, management or supervision, IT professionals and administrative personnel. The following were also mentioned (1 mention): engineers, lawyers, and logistics workers. The areas of health, insurance, multinationals in general, and the public sector were mentioned as types of institutions or sectors that have potential for using m-learning, as well as companies with several branches or subsidiaries.

The second question was: *“Do you know and/or could mention any successful cases of m-learning application in companies/organizations in the Brazilian context?”*

Five out of 15 respondents were unaware of any applications of the kind, with 3 of them mentioning cases of use in courses and educational activities in higher education institutions. Two respondents mentioned cases of application in the training of health workers in hospitals. One respondent mentioned one case of m-learning application in the training of sales professionals at a multinational industry, using the same mobile devices that their sales professionals use in their work (PDAs). Another respondent mentioned an identical case (training of sales professionals, using devices adopted in other processes) in a large company in the commercial sector (wholesaler). One respondent reported being familiar with the use of MWICTs only to access the corporate Intranet to search for information on procedures and products or to interact with colleagues at the company’s headquarters. There was mention of 3 cases of application in large multinational IT companies (including the previously cited Intel case). The case of the Bradesco Foundation was also mentioned.

The third question was: *“In your perception, what is the most appropriate type of technology to enable m-learning (e.g.: cell phones, PDAs, smartphones, tablet PCs, etc.), and why?”*

There was no consensus as to the most adequate device to enable m-learning activities. Smartphones and notebooks were the most frequently mentioned devices. The argument in favour of smartphones was the combination of the different tools available in PDAs with the connectivity of cell phones. Notebooks were cited (by 3 respondents) for the fact that they do not have the screen size restrictions that PDAs, smartphones and cell phones have, and also because employees in several companies have been using notebooks for a longer time. Two more respondents mentioned light and low-priced notebooks (within the idea of the “100-dollar notebook) as the most appropriate device. Cell phones were indicated by 3 respondents for their popularity, as they are more disseminated among the Brazilian population than any of the other devices, and it is the type of device that we are, generally, most familiar with. On the other hand, some respondents argued that cell phones are the most limited devices for ergonomic reasons.

An additional comment made by 3 respondents was that, actually, the ideal device would have to be light and portable like a cell phone, PDA or a smartphone, but have the ergonomic effectiveness of a notebook. Another additional comment was that the tablet PC, although mentioned by 2 respondents, is seen by others as still an expensive, heavy and fragile device, which does not offer any specific advantages. Two respondents stated that all devices available could be adequate, depending on the objectives of the training and on the context in which they will be used. Another comment was that the tool that the organization already uses routinely in other processes (e.g., automation of the sales force) should also be used in m-learning activities.

The fourth question was: *“do you know any m-learning software or platforms? In your perspective, which features should they have?”*

Eight out of the 15 respondents said that they did not know any software solution specific for m-learning. However, several solutions were mentioned by them as adaptations of previously existing e-learning solutions,

as in the case of *Teleduc* and *AulaNet softwares*, or softwares created in specific m-learning projects at universities. The softwares most frequently cited as used in m-learning, are fundamentally those that generate presentations to be accessed through mobile devices, or tutorials, also based on presentations with some degree of “question-answer”-type interactivity, applied in short courses. Other m-learning solutions mentioned were PDA softwares, such as Hands® or AvantGo® and also collaboration tools now adapted for mobile devices such as Lotus Notes®, and Everyplace®.

Regarding the *characteristics that m-learning softwares ought to have*, there were different answers. The characteristic most frequently cited by the respondents was that m-learning softwares must consider the current limitations of mobile devices regarding their ergonomic aspects (e.g.: limited screen and keypad size) and connectivity aspects (band width, connection costs). Flexibility, simplicity, agility, parsimony (few tools, appropriate for the goals of each educational activity), low purchase and maintenance costs, possibility of online and offline work are associated features. Another valued feature is that it should be multi-platform and multi-tool (4 mentions).

Another “axis” of answers had to do with the usability of the softwares. The use of visual and audio resources, with minimal manual entering of data, and the use of games and simulations, i.e., more ludic resources, were recommended by some researchers. Interactivity and the use of mobile devices already familiar to users (e.g., MP3 players) were also among the possibilities to promote increase in users’ acceptance. It is interesting to observe that only one respondent directly mentioned the issue of the educational methodologies considered by the softwares. Another interesting result is that only one of the respondents mentioned the importance of systems that are sensitive to users’ location and context (one of the main differentials of m-learning in relation e-learning).

Finally, the last question was: “*In your perception and experience, what are the main challenges that need to be overcome for the dissemination of m-learning in the Brazilian reality, especially in the corporate context? (Considering, for instance, technological, cultural, pedagogical issues, etc.)*.”

The answers to this question revealed that multiple challenges have to be overcome for the dissemination of m-learning in Brazil. We grouped those challenges as follows (but we must consider that the categories are closely interconnected):

- *Technological and economic challenges* – according to the respondents (5), further progress has to be made in order to incorporate new technologies in m-learning, such as voice, digital TV, etc. The concern is that the systems should be increasingly user-friendly, and that the ergonomic limitations of mobile devices (e.g., screen size, data entering), mentioned by 2 respondents, should be overcome. Three respondents mentioned the technical limitations of the wireless networks, as well as the lack of standards in the devices and operational systems, and insufficient wireless infrastructure throughout the country. The issue of mobile devices and connectivity costs was also mentioned by 5 persons, and 2 respondents stated that m-learning is still not economically viable. The need to maintain a system updated speedily and the fast obsolescence of mobile devices are also challenges to be considered (1 mention each).
- *Challenges in terms of the adoption of new technologies and new learning practices* – According to the respondents (5) there is lack of culture, familiarity or habit in the use of mobile devices; 3 respondents highlighted the fact that, generally, only cell phones are used, and they are only used for talking, without exploring the other resources available (e.g., SMS or computing resources). Another 2 respondents also mentioned that there is still resistance to e-learning, which in turn affects m-learning. There was also mention of lack of “digital literacy” in the country (2 mentions) and lack of belief in the capacities of the MWICTs (1 mention).
- *Pedagogical challenges* – an interesting statement, made by 5 of the 15 respondents, is that, although MWICT still has its limitations (as discussed above), its technology is ahead of the pedagogy, i.e., the pedagogical practices concerning m-learning are still incipient. The following points also concur with that statement: the need to promote collaboration in the learning process (5 mentions); the idea that we are still learning from e-learning practices (3 mentions), and the lack of a true learning culture, a culture of learners’ autonomy, etc. It is also necessary to create interesting courses that use this type of technology (MWICT) – 2 mentions; need to train professionals in the use of those technologies (1 mention) and to consider different cognitive styles when developing m-learning activities, as well as the need for a specific pedagogical model for those practices (1 mention each).

- *Social and contextual challenges* – Another “axis” of answers (although less frequent) involves considering the context around m-learning, which involves broader social issues, including the restrictions to using mobile devices in public spaces in Brazil caused by the fear of being robbed (3 mentions), and the conditions for on-the-move learning due to lack of comfort and physical conditions to do it. Two respondents mentioned the need to change the mental and working models (from “fixed” work to “mobile”, flexible work). The issue of life quality and the possible invasion of privacy resulting from m-learning were also cited by 2 respondents. It is interesting to observe that only one respondent mentions the challenge of using m-learning as a way to promote digital inclusion in Brazil.

## 5. FINAL COMMENTS AND FUTURE RESEARCH

This research study allowed us to verify which m-learning practices are being adopted in Brazil. We have found that the cases of m-learning application in companies are rare. In the academy, a significant portion of the references present software prototypes, models and frameworks, which have not yet been applied. In the cases that tested m-learning practices and solutions in real contexts, we verified the use of few functions and resources and no routine practices. That indicates the incipient stage of development of m-learning even in the academy. It is also important to observe that most of those references and academic processes have a technological perspective. Only few of them are concerned with economic or management aspects, pedagogical issues or contextual and social elements related to the adoption of m-learning.

We have also verified, through the experience of actors involved in m-learning practices in Brazil, that there are several elements to be considered in the development of m-learning, including the possibilities of use in the educational context, adequate technologies for m-learning and the challenges inherent to those practices. Those challenges have to do with several different aspects or areas of knowledge: technological and economic challenges, challenges in terms of resistance to the adoption of new learning practices and technologies, pedagogical challenges and contextual and social challenges. In view of those results, the following topics are indicated for future studies:

- Study the few existing cases of corporate m-learning in order to understand their dynamics, goals, facilitating and hindering aspects, results, etc.;
- Study the contextual and social issues that surround m-learning in the Brazilian context;
- Develop specific educational m-learning methodologies, according to the specificity of MWICTs and the Brazilian context, and also considering the specific features of pedagogic mediation for this form of teaching-learning;
- Develop more complete softwares for m-learning, privileging an interdisciplinary and systemic perspective (views from the areas of Education, Management, Computer Science, Design, etc.) and that can be applied in empirical cases;
- Develop studies concerned with economic issues (cost-benefit) involved with m-learning practices (particularly from an organizational point of view);
- Study the use of services based on location awareness and on the consideration of each user’s profile, applied to m-learning (going beyond e-learning) in Brazil;
- Study the use of m-learning as a way of promoting digital inclusion in Brazil.

We hope that the results of this exploratory study can contribute to the work of researchers from different areas connected with m-learning, as well as to the work of professionals in the field of HRM and developers of mobile solutions and services. This study shows that there are many challenges, but also that there are several different possibilities for the development of m-learning in Brazil.

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