

Implementation of Mobile Solutions in Romania`s Education System

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In the light of the technology development nowadays, the society and more specific, the education area is facing new challenges in meeting the learners' demands. The continuously changing expectations and the ubiquity of the mobile devices in everyday life has led to the apparition of a new modern learning method, the m-learning, whose theoretical approaches will be further analysed, followed by an examination of the advantages and disadvantages for the mobile learners. This paper also investigates the implementation status of mobile solutions on the Romania`s education systems.

Keywords: mobile applications, education system, e-learning, m-learning

1 Introduction

The rapid growth of the telecommunication`s domain in the last 30 years had a great influence on the education area as well. In the recent period several alternative learning methods have arisen. In most of the countries, the technological development had a huge impact in the educational area. The learning process for students at any age has been eased by assimilation of the IT resources. Devices such as laptops, mobile phones or tablets become nowadays widely used technologies in education through the education oriented applications.

Considering the massive coverage of the smartphones market (every third person worldwide owns a smartphone summing a total of 2.71 billion smartphone users, while 52.2% of all website traffic worldwide was generated through mobile phones) [1], many educational institutions adapted their offering by providing new learning methods in their continuous effort of reaching the learners through their mobile devices [2].

The notion of mobile learning is widely used for a whole series of activities such as live lectures, broadcasts, learning materials, applications, registered presentations and others, all of these created with the purpose of offering learning content to the end-users, through life-streaming or offline via their mobile devices.

The conventional type of education is now supplemented by alternative methods of

learning. The main purpose of the e-learning and therefore of the m-learning is to transform the learning experience into an attractive, efficient and accessible one for all sort of students [3].

2 Educational Systems and Mobile Solutions

2.1 Educational Systems and E-Learning

Education represents the process of sharing wisdom, knowledge and skill from one generation to another [4]. Beside many other meaningful senses, the education can be considered the core investment in the human capital.

In the literature the main types of education are often characterized as it follows: [5]

- a) Formal education – organized/institutionalized education model, according to a given set of rules, with rigid curriculum and three parties: teacher, students and institution
- b) Informal education – learning model encountered in the everyday life, through different informal channels
- c) Non-formal education – educative process with a more flexible curriculum and methodology, outside the institutions or schools (e.g. distance education or alternative learning systems).

In the present the most conventional types of education are not entirely suitable in terms of the technological progress and society demands. The development of the information technologies and devices registered a rapid

progress in educational field, which opened the field for a more adaptable education method – the notion of *e-learning* [6].

The e-learning can be defined as a form of formal or non-formal education with established learning objectives, where the interaction between the actors is facilitated by the information and communication technology [7]. The e-learning is the most spread form of long-distance education, its evolution being in connected with the progress of information technology [8].

The e-learning concept was introduced in 1998 by Jay Cross, the founder of Internet Time Group and it soon become extremely popular [9]. The e-learning can be defined as an innovative method of providing education, training and instruction through electronic devices. An e-learning system is a planned training-learning experience, organized by an institution which provides educational resources on an electronic environment, in a logical order, in order to be assimilated by the learners in their own manner without any group constraints [10].

The components of e-learning could be defined as [11]:

1. multi-way communication amongst learners and between learners and experts;
2. hypertextual rather than linear presentation of material;
3. integrated access to resources both inside and outside the learning package;

4. multimedia forms of interaction and presentation of material.

Nowadays the educational practice implements complementary methods of teaching-learning-evaluation, specific to the information society. In the last fifteen years, the e-learning became a viable alternative to the traditional education practices, being embraced by several educational institutions [9].

A successful example of e-learning implemented into an educational institution is UOC from Barcelona (Open University of Catalonia), representing a virtual university with a large academic community of over 55,000 students [12].

2.2 Mobile-Learning

The *mobile-learning* (m-learning or the usage of mobile solutions in the learning process) is a natural prolongation, a part of the wider e-learning concept; the main difference is the higher availability and accessibility that can be reached by using the m-learning environment. It can be considered as a great factor of influence to the quality of education among the entire educational community (learners, trainers and other members) [13].

Anyway, there are several differences between the e-learning and the m-learning as there was described by Eteokleus and Laouris in table 1 [14]:

Table 1. Terminology comparison between e- and m-learning [14]

E-learning	M-learning
Computer	Mobile
Bandwidth	GPRS, G3, Bluetooth
Multimedia	Objects
Interactive	Spontaneous
Hyperlinked	Connected
Collaborative	Networked
Media-rich	Lightweight
Distance learning	Situated learning
More formal	Informal
Simulated situation	Realistic situation
Hyperlearning	Constructivism, situationism, collaborative

The early definitions of the mobile learning concept outlined the phenomenon as any usage of a mobile device that might support the learning [15]. There are a few scholars that provide definitions of m-learning, one of the most influential being Mike Sharples. He defined in 2004 the m-learning as a taking place outside the normal learning environment or learning using a mobile device. There are also opinions that the mobile learning includes beside the support for learning component, also the entire interactions that might happen between teachers, learners, environment, or anything related to learning [16]. Some authors

consider that any educational interaction that takes place through mobile technology can be considered a mobile learning experience [17]. In a simplistic approach the m-learning can be defined as „ ability to access educational resources, tools and materials at any time, from anywhere, using a mobile device [18]. The mobile learning has its beginnings around early 2000s and it appeared as an inherent requirement of technology development and of the mobile devices popularity [19]. A comprehensive framework of the mobile learning has been presented in the Development Fund Report from 2010 (table 2):

Table 2. Mobile Learning Framework - Development Fund Report [19]

Technology	IVR		MESSAGING		MOBILE WEB		APPLICATIONS
	VOICE	SMS	USSD	GPRS	BLUETOOTH	Wi-Fi	
	LOW END			FEATURE		SMART	
Mode	SYNCHRONOUS			ASYNCHRONOUS			
	FORMAL			INFORMAL			
Learning Area	Foundation Primary Secondary Tertiary	Vocational Certified Self- Improvement	Teacher Training Ongoing Education and Support	Language s Practice/I mprove Learning New	Life skills Dev elop ment Educ ation	Literacy Numeracy Tech Financial	Health Education Patient Education Practitioner Education Support
Learner	STUDENT		TEACHER	EMPLOYEE		SELF MOTIVATED	
Method	COMPLEMENTARY In addition or support to other learning activities			INDEPENDENT As a standalone way of accessing educational tools, resources or courses			
Players	Academic Community	Content Providers	Government organizations	Mobile network operators	Non- Government Organizations		Technology Vendors

2.3 Mobile Solutions Used in the Educational Systems

The mobile devices and technology benefits extended from communication and Internet access to learning and teaching and can be now considered an important tool for education preferred for its flexible and personalized approach of learning [20]. Students across the world are now using their smartphones to gain access to information useful in the educational process. The mobile learning applications market size registered a

growing rate of 6.25% from 2936 million \$ in 2014 to 3522 million \$ in 2017 and the expectancies are to reach \$4579 million by 2022 [21].

Its specific feature of providing continuous customized access conducts to limited sessions of 3-5 minutes spent in mobile learning [22].

Out of the Apple App Store, the education applications category is in top 3 most frequent categories downloaded in May 2019:

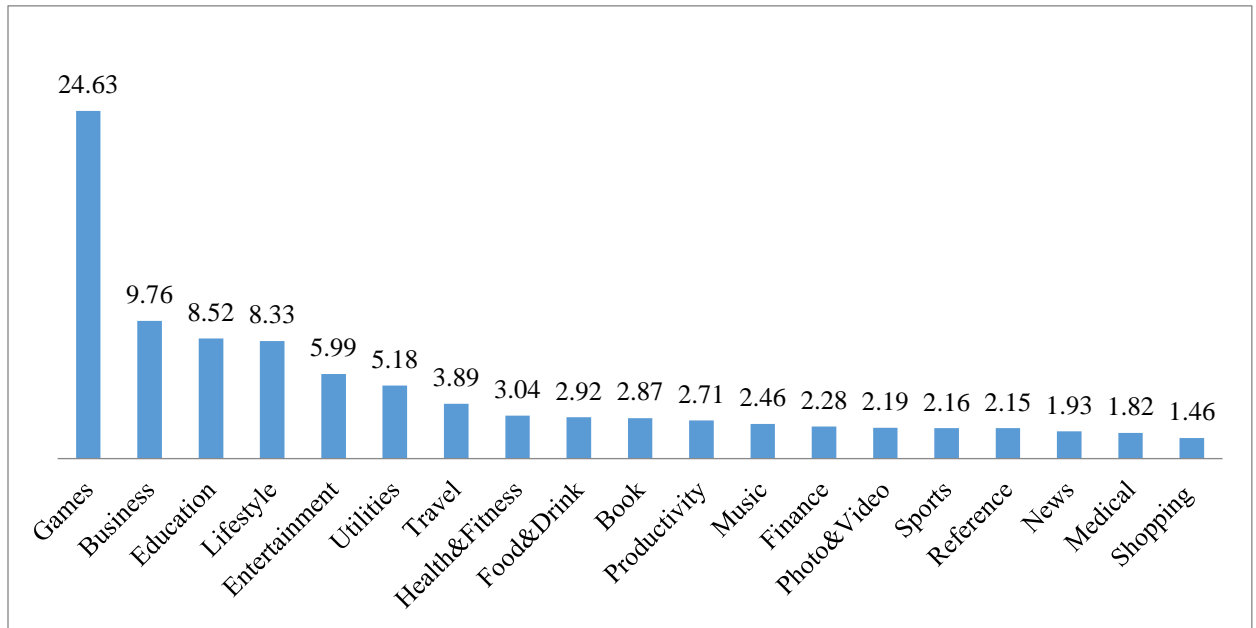


Fig 1. Most popular Apple App Store categories in May 2019, by share of available apps [23]

Given their mostly interactive character, the education applications allow permanent access to learning resources and receive updates in time, help the students to perform remote assignments, communicate or to develop new skills by creativity stimulation. Using the mobile learning provides several benefits for individuals from developing countries and not only [18]:

- Inclusive and non-discriminatory: tailored experiences according to individual needs, cultural sensitivities;
- On the Go and Real Time Learning: constant updates, real time and anywhere access to content;
- Complementary or Independent: standalone or incorporated learning method;
- Support distance and student - centred learning
- Support different students need and provide personalized learning
- Increase interaction between stakeholders
- Reduce communication barriers by using channels preferred by students


 Advantages	Disadvantages
<ul style="list-style-type: none"> - <i>Anytime and Anywhere Learning</i> (eliminates time and location constraints) - <i>Digital-First Thinking</i> (adaptation to the Millennials way of thinking and working) - <i>Dynamic Teaching Methodologies</i> (dynamic content and experiential learning) - <i>Personalisation of Learning</i> (flexibility and customized content) 	<ul style="list-style-type: none"> - <i>Increasing Reliance on Technological Tools</i> (losing touch with older skills non-tech related) - <i>Distracted Learning</i> (increased screen time per day) - <i>Multitasking Hurts Recall Of Course Material</i> (might not encourage the recall and retention of the content)

Fig 2. Advantages and disadvantages of mobile learning [19]

While the mobile learning provides indisputable advantages, there are also disadvantages encountered when it comes to using this method for learning (figure 2):

Researchers and developers nowadays should also take into consideration that the adoption of the m-learning might also register some barriers: technical aspects (battery life, lack of Flash on iPhones), lack of business model, poverty, inconveniences generated by the

small screen, developed platform that might not work on all devices [24] [25].

2.4 Implementation of Educational Mobile Solutions in Other Countries

There are already various m-learning solutions implemented in the educational system across the globe, with different features, depending from one country or region to another [18] [26] [27] [28].

Table 3. M-learning solutions implemented in the educational system across the globe

<i>Provider/Researcher</i>	<i>Mobile Solution</i>	<i>Features/ Functionalities</i>
Ayala Foundation Philippines, 2003	Text2 Teach	Complementary classroom based learning and teacher support Allows teachers to download short video to a mobile device and screen them in the classroom
Mobilink Pakistan, 2009	SMS for literacy	SMS used to help improve young women’s literacy Basic literacy program provided via 6 SMS`s per day on various topics such as religion, health and nutrition in local Urdu language
Mobitel Sri Lanka	mLearning Platform	Mobile solutions for remote vocational qualifications Combines e-learning applications with interactive video conferencing features ,slides, virtual smart boards, also SMS, email and offline messaging and targets a wider audience
Nokia South Africa, 2009	MoMaths	Mobile learning used to help boost mathematic skills for Grade 10 students Perform math homework and revision on MXit, mobile social networking platform by receiving immediate feedback on exercises
Boticki et al. 2012	Sortko	Support sorting algorithms learning
Potts, Moor and Sukittanon University of Tennessee, 2011	Mobile learning applications for the Google's Android and Apple's iOS platforms	Mobile learning applications in quiz-style ask students questions relevant to electrical engineering subjects
Elkhateeb, Shehab, El-bakry Egypt, 2019	Easy-Edu	Make the learning process easier, focus on students’ needs, and encourage communication and collaboration between students and professors and supports collaborative scenario-based learning Proper communication given the large number f students enrolled every year

For example, in Australia the education system is in constant development. The government understood the importance of IT in the educational system, so they started investing in it. For example, *St. Xavier School*

decided to use a mobile application (figure 3) that can provide all the school-related information to parents and students on curriculum, latest news, attendance, calendar and leave information [29].

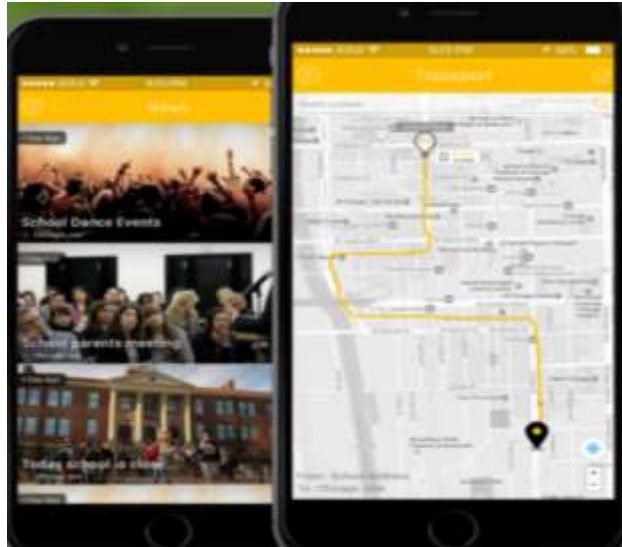


Fig. 3. *St. Xavier School* mobile application [29]

The application also has a GPS integration of school transport. The school needed the application to provide the real-time location and a reminder to the parents before the arrival of the school bus [29]. The application has the following features:

- Integrated artificial intelligence;
- Smart attendance management system;
- Localization system;
- Online interface that can help to track the progress of the each student by integrating data analytics with the student records;
- Solution for lost IDs;
- Content displayed in multiple languages;

3 Implementation of the IT Technologies in Romania's Education System

At European level, Romania occupies the last positions at most of the indicators analysed in the Education and Training Monitor, a report published in 2018 by the European Commission.

Romania remains one of the few countries that have not yet reached any of the main 2020 targets, while the GDP allocations for education, although rising, remain below the EU average. Romania's education system is facing the third highest rate of early school leaving (18.1% comparing to a EU average of 10.6%), low knowledge within the 15 years old children, the lowest EU rate of adult participation in the learning process and many other issues. [30].

In this context of poorly met indicators, more and more NGOs and private companies are getting involved in the development of the academic environment for students of all age. The adoption of new technologies in the Romanian educational environment is lower than in the business environment. New technologies are gradually being implemented in more and more educational units in the country through digital transformation projects with the involvement of large telecommunication and IT companies [31]. For instance, Telekom Romania, the largest local telecommunications group, together with Cisco and Webhit, has recently implemented such projects in 36 schools in Braşov, Tulcea, Constanţa, Iaşi, Brăila and Galaţi. Following the implementation of telepresence and interactive table solutions, over 10,000 pupils from the six counties have the opportunity to participate in interactive lessons held in other schools [31].

Mobile applications have grown a lot worldwide in the past few years, which have led to growth in mobile applications in Romania, as well lead to the emergence of different applications for all levels of education in the Romanian educational system.

These mobile applications are available for all types of students, from pre-school to university.

For example, for **young children** with age between 6-12 years old there are educational

mobile applications (figure 4) for reading stories like *Povesti*, learning geometric shapes with *Mobile Montessori Free*, learning to make puzzles with *Kids Education Puzzle*,

learning animals with *Invatam animalele* [32], and many others like *EduPlus*, *Pengu Plus* [33], etc.



Fig. 4. Educational mobile applications for children with age between 6-12 years old (*Povesti* and *Kids Education Puzzle* mobile applications) [32]

Also, for **high school students** there are different available mobile applications (figure 2) for learning like *Duolingo* which is an application for learning foreign languages, *PhotoMath* is a math application where you can just take a picture and the application can resolve your exercise, *Forest* is a mobile application that helps students stay away from the phone while learning and watches their progress, *History: Maps of World* is a helpful tool, providing maps from the past and present

in order for the students to understand how important historical events have led to changing borders over time, *Triviador Romania* is a game where you answer questions about general culture in various fields, conquering territories and attacking castles. They can test their knowledge and learn new information and many other useful things by using applications like *Dictionary.com*, *Dropbox Mobile*, *My Study Life*, *Evernote*, etc [34]



Fig. 5. Educational mobile applications for high school students (*Duolingo* and *Triviador Romania* mobile applications) [35] [36]

Also, there are available **management solutions for schools** that support the learning process. One of them is *Adservio*, which is a complex educational management platform, and its functionalities are specific to each

participant involved in the school activity. With this platform every participant involved in the school life can interact with each other very easily as displayed in figure 3. [37]

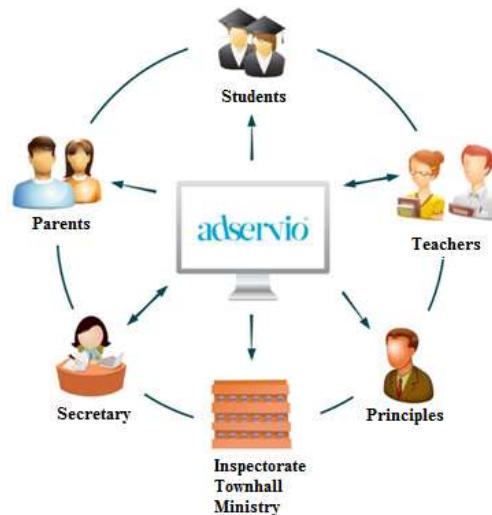


Fig. 6. Adservio management solution [37]

The main features of the **Adservio** are:

- Parents (and older students who have accounts) can see information about notes and absences, likelihood of listening, themes etc;
- Teachers can register notes and absences;
- Directors and secretaries can consult in real time school statistics about grades, environments, absences etc., can generate reports, enrolment sheets and student cards.

All users also benefit from the messaging module to ease their communication, can store unlimited files of any type in the app, upload photos and have access to the library and online library.

The main issue is that although most of the applications discussed above are available on App Store for each type of mobile phone, the educational system of Romania is not willing to invest in them. In Romania, the share between classical and digital education in Romania is 95% classic and 5% digital while the dropout rate is 18% [37]. The Romania's education system is not yet ready to invest in IT or to promote the mobile learning application to create a performant learning environment.

4. Conclusion

Technological developments as the evolving mobile devices represent an expansion of the wider term of e-learning environment. This paper investigates the definitions attributed to

the m-learning phenomena, its implication in the educational area and its benefits, the most important ones being the interactivity and extended availability. The review of literature highlighted the contribution of such modern learning methods to the quality of education, both in developing countries and modern societies. There are also limitation and barriers in the usage of the m-learning.

The paper also provides a framework of the m-learning and examples of mobile applications used all over the world, including in Romania. Future research might allow a comparison of these methods and an adaptation to our national specific and needs. In conclusion, the education system of Romania should invest more in mobile educational applications, as they can be accessed from everywhere and they are the most interactive and constructive way to attract the students towards studies and enhance their productivity, especially given the young people increased preoccupation for technology.

Mobile applications can bring crucial changes in the education environment that Romanian system can benefit of by taking the examples from other countries where the implementation of the m-learning has brought several enhancements in the quality of education and the reduced the rate of scholar abandon.

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