



Mobile Learning Driving the Development of Higher Education Through a New Vision of Teaching Methods Thanks to Educational Technology

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Abstract- Mobile learning has become one of the most influential aspects in the field of educational technology. Besides, it aims to develop and optimize education as the core requirement for human beings. Meanwhile, this research is involved within the aforementioned target which offers a new vision on teaching methods. For this reason, a statistical study of data analyzed by SPSS software will be described. Our study aims to identify the importance of mobile application, not only, as a driving force in higher education development, but also as an adequate environment created to produce skills and appropriate qualifications able to take charge of our nation's development. For this purpose, this study is based on two stages. The first stage provides the study of the attitudes of learners towards mobile learning. The second one, will be dedicated to the implementation and the design of a mobile application according to the expectations of learners. The results confirm that an efficient learning environment should be designed following the perception and the needs of the learners.

Keywords: Mobile learning, Mobile application, E-learning, Predisposition, Avoidance, Moroccan university.

I. INTRODUCTION

The education system has always been a basic element for the progress and development of all nations. In Morocco, this characteristic is quite valid [1]. The Moroccan university is a stakeholder in the higher education system [2]. It is an entity that produces and generates all the qualifications and skills that ensure the entire development process of our country [3]. Secondly, the Moroccan university has achieved a notable development of its training offer thanks to innovative initiatives which have notably resulted in a considerable extension of the infrastructures [4]. This is evidenced not only by the creation of new university campuses, but also by opening up to the international market through a number of partnerships in which the university is involved with many teachers in order to set up mobility and exchange international students and researchers [5]. Besides, The global performance of the higher education system is necessarily multidimensional since it involves the development of its human resources [6], the quality of its governance[7], the relevance of its funding and training provision [8], and the effectiveness of its pedagogical approaches[9]. Moreover, the modern Moroccan higher education system, which has been gradually built up since independence, is based on very distinct components in terms of supervision and student recruitment [10]. Thus, this higher education system is characterized, first and foremost, by its plurality in terms of the different universities [11], which represent the most important component in terms of enrollments [12]. Thus, this education is characterized by its diversity in terms of its offer of training and specialization in order to ensure its fluidity and coherence [13]. As a result, among the changes carried out by the Ministry of Higher Education in order to ensure this coherence, we mention the adoption of the new approach and architecture of the system, which has been translated by the transition from the LMD model (Bachelor, Master, Doctorate) to the "Bachelor" system [14].

Also, the higher education system has adopted a range of approaches to learning and education [15]. These methods are not limited to the interaction between the teacher and the learner, and between the student and the course content [16]. But also on the different sorts of interaction between a geographically diverse group of learners [17]. In addition, E-learning is a living example of these non-traditional learning approaches that specializes in the examination of learner interactions [18]. Besides, these methods are supported by new Internet technologies, which ensures and increases their

effectiveness and efficiency [19]. Moreover, e-learning can be defined as the set of technological resources and tools that are used to produce a variety of educational content that is easily accessible and understandable by the targeted learners [20]. This mode of learning is characterized by its ease of use [21], practicality, these e-learning modules are accessible everywhere thanks to a computer, a tablet, a smartphone or any object connected or connectable to the Internet [22]. Then, the e-learning platforms can be consulted at any time and anywhere [23]. Also, it ensures a step-by-step follow-up in order to identify the learner's assessment. Afterward, it offers a self-evaluation and continuous monitoring of knowledge [24]. Finally, e-learning is a learning process that adapts to the learner's rhythm and availability.

In order to ensure the sustainability of this e-learning process, the stakeholders in the higher education system are examining in which ways information and communication technologies (ICTs) that are connected, easily transportable, and increasingly affordable can enhance education and accelerate the implementation of a sustainable development approach [25]. Recently, mobile technologies have reached the remotest corners of the globe, offering new opportunities for teaching and learning, especially in communities where traditional educational services are rare [26]. Furthermore, mobile learning can be defined as the dissemination and transmission of training or educational materials on any mobile device (smartphone or tablet) [27]. Therefore, mobile learning allows individuals to learn virtually anywhere at any time [28]. Mobile learning is initially characterized by its diversified learning offer; teachers are always looking to teach and to instruct their students with content management and delivery solutions that are also flexible and adapted to the rhythm of learning, so learners want to be able to access to information from any device, at any time [29]. Therefore, Mobile Learning meets this need and allows learners to access information at their own pace [30]. Secondly, m-learning provides another method for the diffusion of training [31]. It can be delivered in training workshops, webinars, e-learning content, and now through small-format content accessible on a tablet or smartphone [32]. Furthermore, m-Learning is an immediately applicable learning experience, as it appears that most individuals have access to a phone or tablet [33].

On the other hand, the challenge today is to ensure the effective implementation of mobile learning at the level of the Moroccan higher education system [34]. Furthermore, this transition from e-learning to mobile learning will be ensured by adopting an adaptive approach to the expectations and needs of learners. Secondly, the use of mobile technologies is useful, and often even indispensable, in different learning contexts, thanks to the mobile aspect and the ubiquity of educational materials [35]. Moreover, this mode of learning promotes interaction, communication, and collaboration between learners, which enriches the entire learning process [36].

The main objective of this paper is to examine the predisposition and the avoidance of learners towards mobile learning. To reach this target, we study the perception and the motivation of the participants towards the use and the integration of mobile learning within their process of education. In this context, the first stage of this research involved assessing the attitudes of learners in the higher education system towards the mobile learning process. Then, we discuss the implementation of a mobile application according to the expectations of learners. To achieve this general purpose, the following questions were asked and tried to answer:

1. What is the learners' attitude towards mobile learning?
2. How can mobile learning, improve the quality of information and the educational process in general?
3. What are the participants' perceptions related to our mobile application?

II. METHODOLOGY

Due to the pervasiveness of mobile technology, mobile learning has become one of the most significant issues in the field of learning technology [37]. Meanwhile, the increase of mobile devices in our society has offered a variety of content and opportunities that enhance the effectiveness, accessibility, and efficiency of learning [38]. Moreover, this application is associated with the implementation of a variety of methods and approaches that serve to optimize and promote the motivation of learners towards the exploitation of mobile learning; particularly the requirement for an adaptive mobile application that accommodates the expectations of the learners. In order to satisfy this demand, we have developed a statistical study which we present below.

This section of the research provides information about the data collection tools, the data analysis, and the data discussion.

III. DATA COLLECTION TOOLS

To collect the data, we designed a survey consisting of 16 questions, which were distributed electronically through the Google Form tool. Subsequently, the participation was limited to the students of Abdelmalek Essaadi University in Tetouan, Morocco. Thus, to ensure a diversity in terms of attitudes towards mobile learning, we targeted participants who are studying at different levels, namely Bachelor, Master and PhD.

The questions are defined based on several sources of research works (articles, documents, experts) all according to these categories. First of all, the disposition of a mobile internet connection. Secondly, the technological support used and the operating system. Then, the importance of mobile learning. Finally, the importance of learning management systems (LMS).

The survey includes three demographic questions related to the age, gender and education level of the participants. Besides, there are two questions concerning the learner's satisfaction with the type and quality of questions included in the survey. To ensure the appropriate design and validity of the content, the survey was reviewed by a group of experts in the field of mobile learning, education sciences and telecommunications.

Out of all the participants in the study, 206 were females (46.82%), and 234 were males (53.18%) as shown in Table 1.

| Variables | | N | % | %cumulative |
|---------------|-------------------|-----|--------|-------------|
| Gender | Male | 234 | 53.18 | 53.18 |
| | Female | 206 | 46.82 | 100.00 |
| | Total | 440 | 100.00 | |
| Age | Under 20 | 158 | 35.90 | 35.90 |
| | Between 20 and 30 | 282 | 64.10 | 100.00 |
| | Total | 440 | 100.00 | |

Table1: The gender variable of the learners& the distribution of participants' age

The evaluation of the distribution of age of the learners has been done in two groups as 158 participants (35.90%) which their age is less than 20 years old, and 282 students (64.10%) their age is between 20 and 30 years old as presented in Table 2.

The distribution of participants according to their level of study as described in Table 3. Besides, 158 students are studying in the first study level with 35.90%. Besides, 194 students have a Master's degree with 44.10%. Finally, 88 participants are Ph.D students with 20%.

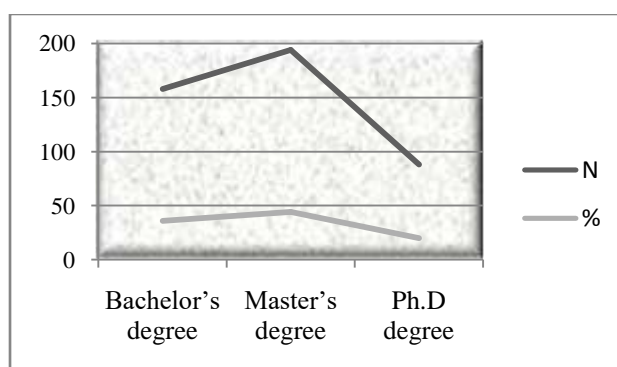


Figure 1: The study level variable of the students

IV. THE MOBILE LEARNING PROCESS

Mobile learning is a sophisticated teaching and learning process. Furthermore, it is characterized by its variety, flexibility, and effectiveness [39]. Moreover, the electronic resources employed during the mobile learning process take into consideration the mobility and the dispersion of learners, which ensures permanent access to all learning resources anywhere and at any time [40].



Figure 2: The mobile learning process

V. DATA ANALYSIS

To analyze the data, we used the Statistical Package for the Social Sciences (SPSS) software as the working tool. Besides, it is a platform that offers advanced statistical analysis, an extensive library of machine learning algorithms, text analysis, and open-source extensibility [41]. Thanks to its ease of use, flexibility, and adaptability, it provides a very detailed and simplified study in order to clearly understand the evolution and progression of the study concerned [42].

(a) For the first question, we notice that 430 students (97.73%) do have a mobile internet connection accessibility. While only 10 learners (2.27%) do not have access to it.

| Internet Accessibility | N | % |
|------------------------|-----|--------|
| Yes | 430 | 97.73 |
| No | 10 | 2.27 |
| Total | 440 | 100.00 |

Table 2 : Students' access to mobile internet

(b) In this question, we observe that most of the students used a smartphone as technological support to access to the internet. As presented in table 5, 396 learners used a smartphone as mobile support, while only 44 students use a tablet.

| The support used | N | % |
|------------------|-----|--------|
| Smartphone | 396 | 90.00 |
| Tablet | 44 | 10.00 |
| Total | 440 | 100.00 |

Table 3 : The students' technological support used

(c) Furthermore, we noticed that 334 of the participants (76%) used Android as an Operating system. While only 106 (24%) used an IOS system.

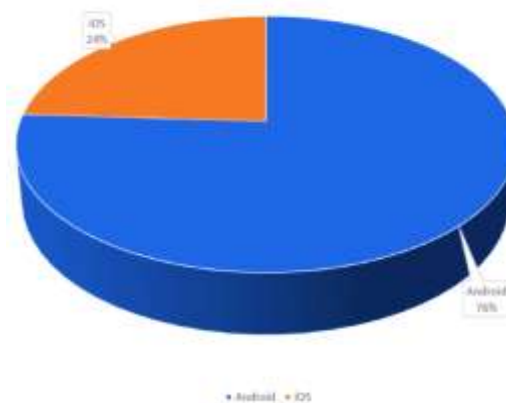


Figure 3 : Students' operating system

(d) The majority of students confirmed that they take online courses. In addition, we notice that the number of the students who take these courses increases in the three levels of study. With 72.15% of Bachelor's students, 100% of Master's and PhD's students.

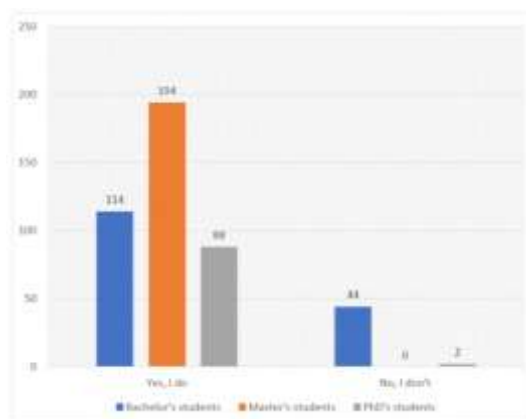


Figure 4 : Online courses

VI. DATA DISCUSSION

✚ The disposition of a mobile internet connection:

The results obtained from our statistical study indicated that the majority of the students have permanent access to a mobile internet connection via their smartphones in most cases. Besides, 90% of the participants attend and look for online courses on YouTube channels or the web. In most cases, these courses are not provided by their teachers. Thus, this need is justified by the necessity of supplementing the courses offered by their teachers.

This involves a dispersion and pedagogical disorientation, and consequently, it negatively influences the students' performance and the quality of the learning and teaching process. Therefore, the idea is to provide learners with a set of pedagogical and academic resources that aim at reinforcing their achievements and improving their skills and knowledge. And at the same time, these resources will be supervised by their teachers in order to guarantee an educational product that is in line with the perception of the teachers.

✚ The technological support used and the operating system:

After having analyzed the data acquired, we noticed diversity in the technological support used and also in the operating system adopted by the participants. Besides, the main objective is to implement and develop a mobile application that will take this diversity into account. First of all, at the level of the display characteristics and the design of the pedagogical content. Then, in terms of the availability in the App Store and the Android Store, in order to ensure permanent accessibility for all the concerned students and to offer and deliver a sophisticated educational content that is in line with the expectations of the learners.

✚ The importance of learning management systems (LMS) and mobile learning:

In order to illustrate the necessity of mobile learning, we have interviewed the students of our university to determine if they are already used to mobile applications dedicated to the higher education system. The percentage of students who answered in the negative was 100%. In addition, all learners have expressed their enthusiasm for learning management systems. Furthermore, this finding indicates the necessity and unavailability of a mobile application that supports and optimizes the learning process in the higher education field. This requires better communication between the different members of the University. Also, effective and efficient management of all educational activities carried out in the faculty.

VII. RESULT

In this part of the research, an attempt was made to develop a mobile application based on the results obtained above. However, the main target was to suggest an architecture of a mobile application that satisfies the expectations and the requirements of both learners and teachers. In the beginning, the research model was discussed, specifying the main functionalities and objectives of the mobile application and then its design. Subsequently, the implementation of the conceptual model was carried out. In the first step, the functional and non-functional requirements of the system were specified and studied, and then

the various actors of the system were determined. In the third part, we treated the UML language. In the beginning, we elaborated on the use diagram in order to specify the main functionalities of the system. Next, the class diagram was developed, which details the conceptual structure of the system. Finally, we proposed a prototype of the mobile application's home interface with its different actors

VIII. THE RESEARCH MODEL

At this stage of the research, a model of a mobile application called " My faculty " has been developed, in accordance with the standards of the Moroccan educational system. In addition, this application is designed to establish a communication link between the different components of the University (students, professors, administrators...). On the one hand, "My Faculty" presents an efficient environment that is designed to develop students' knowledge and performance, thanks to an excellent accessibility to the various educational resources. Moreover, learners can interact, communicate, learn, and test their knowledge at any time and regardless of their location. Only the availability of a mobile internet connection is required to successfully use this application.

The design process is a major factor in the implementation of any system [43]. In addition, this phase requires methods to be developed, and a model on which we can rely. For instance, we can create a representation similar to the reality in order to bring out the items that we are interested in. For this project, we opted for the design languages, MERISE, and UML Modeling.

In order to specify the various functionalities and characteristics of our system, we have combined all of these objectives in the diagram below.



Figure 5: "My Faculty" application's targets

IX. THE CONCEPTUAL MODEL'S IMPLEMENTATION

The development of the Database has been created based on Merise's design. Besides, this approach is based on the entity-association model [44]. First of all, we have developed a Data Dictionary (DD) to manage a common language [45]. Besides, each concept in the data dictionary, called an entity, and every item in the data dictionary, called attribute, is defined by a statement proposing a common language definition and its management regulations [46]. Afterwards, we carried out the conceptual data model (CDM) to define the data of the information system, to identify the connections between the data and to produce a schematic diagram [44]. The following section provides a series of functional and non-functional requirements for the system design. Also, some additional components have been included to specify the user's expectations.

a. The functional requirements:

The functional requirement reflects the expectations of each actor in the system [47]. Furthermore, any conceptual solution must first satisfy the functional needs of the system's actors in order to define the field of application and monitor the traceability of the requirements during the development phase [48]. This platform must ensure the following functional requirements:

- The management of users.
- The management of the course.
- The management of homework.
- Test management.
- The management of the notes.
- The management of the news.
- The management of the resources.
- The management of communication between users.

b. The non-functional requirements :

The non-functional requirements of the system are presented below:

- The code must be clear to allow future developments or improvements.
- The platform must provide quick access to information, and must ensure an update in real-time.
- The platform must be portable, extensible, reusable, and reliable.
- The platform should offer a flexible interface, and easy to use.
- The platform must ensure the confidentiality, integrity and consistency of the user's data.

c. The system's actors :

An actor represents the abstraction of a role performed by an external entity (user, hardware device or other system) that directly interacts with the system. The actors that interact with our system are:

- Administrator
- Teacher: drives training.
- Learner: attend the training.

X. UML LANGUAGE PROCESS

The UML is a visual language consisting of a series of diagrams, each one providing a different perspective of the project [49]. In addition, the UML provides its graphical software to be developed, how it works, how it starts and the actions that could be performed by the system.

a. The use case diagram:

The use case diagram represents the structure of the major functionality for users of the system [50]. It is the first diagram of the UML model, where the system ensures to implement the relationship between the user and the objects. The suggested use diagram for the system is presented below.

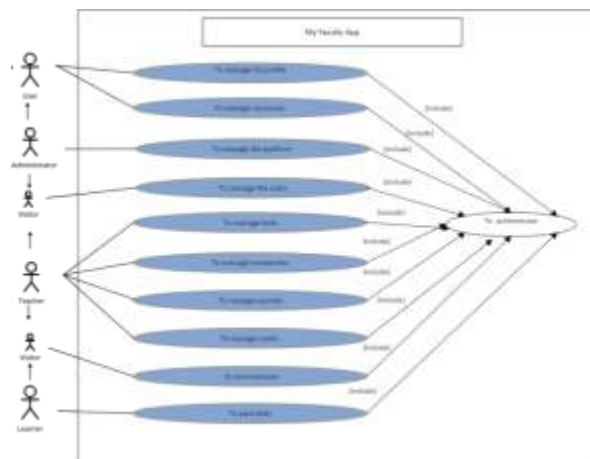


Figure 6 : The use case diagram

b. The class diagram:

The class diagram is typically considered the more significant phase in object-oriented development because it represents the conceptual architecture of the system and describes the classes that the system uses and their connections [51]. The suggested class diagram for the system is illustrated in the following figure.

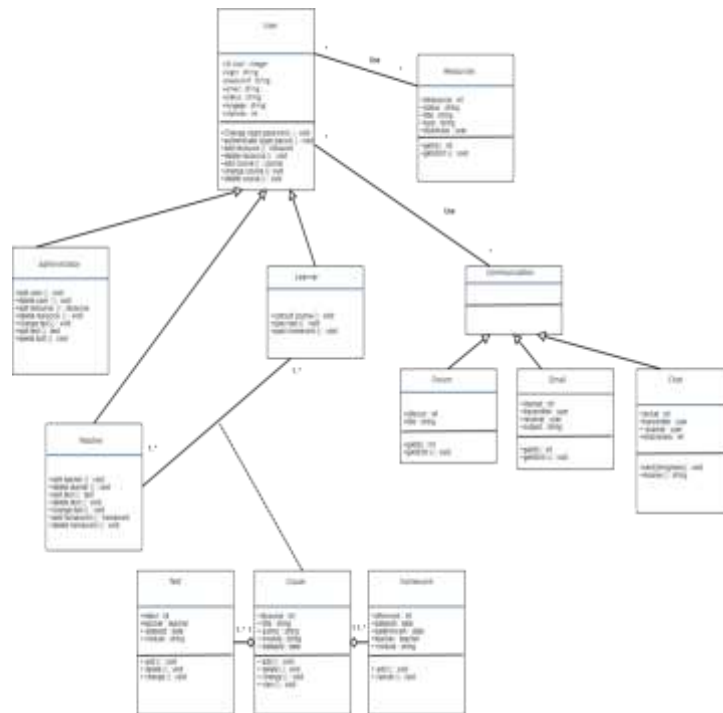


Figure 7: The class diagram

1- The application prototype

The prototype of the mobile application named "MyFaculty" consists of the following main units: My profile, my training and my progress. Moreover, the structure of the home page consists of a header (menu icon, application logo, home button icon and search function). Then a main part (the content) and a footer (the faculty logo, location, contact and settings).



Figure 8 : My faculty App prototype.

XI. DISCUSSION & RECOMMENDATIONS

The basic objective of the research developed for the benefit of the university students of the Moroccan education system was to offer a sophisticated educational tool, based on the recent mobile technological tendency, and to make its advantages available to the learners of the Moroccan higher education system. As a first step, a quantitative statistical study was carried out to determine and examine the attitude of students towards mobile learning. Secondly, the data obtained during the data collection process were

analyzed using the SPSS software, which provided us with a quite structured and well targeted analysis. Thus, after having identified the demographic characteristics of the participants, i.e. gender, age and level of the study. Besides, we examined their mobile internet access, as well as the technological support adopted to access to the different mobile services. Also, the operating systems most used by the students were defined in order to consider this diversity in the design of the system. Then, the aim was to examine the predisposition or the avoidance of the learners towards the exploitation and integration of mobile applications in their learning processes for educational and pedagogical purposes. Therefore, a series of questions were asked and subsequently examined to predict the general attitude of our university's participants towards mobile learning.

The results obtained demonstrate an almost total accessibility (90%) of all participants to a mobile internet connection through their mobile devices (smartphones or tablet...). Consequently, the analysis of the participants' reactions has oriented us towards a total acceptance regarding the implementation of a new approach based on mobile learning. On the one hand, this new approach must respect all the characteristics specified by the stakeholders of the university organization (teachers, administrators...). And on the other hand, it must adapt to the expectations of the learners in terms of cost, accessibility and functionality. Subsequently, this significant and quite positive result brought us to develop a prototype of a mobile application that reflects the needs and expectations of the higher education members.

The main purpose of the mobile application prototype developed during our research for the advantage of the learners of our university was to offer an educational complement to the formal education to effectively improve the knowledge and the skills of the students. Besides, the structure proposed by our system provides a rich and diversified exchange environment, which aims not only to promote exchanges between learners at the level of their university campus, but also to collaborate outside the activities of their classes. Moreover, the aim was to create a virtual learning space, which improves the learning process and its performance. Secondly, which delivers personalized and individualized pedagogical content based on the achievements and skills of the targeted learner. Also, this space has a guide that oriented the student towards improving his or her ranking and leaves an electronic trace at his or her disposal afterwards. And finally, this mobile tool aims to generate a well improved and better quality educational system, through the motivation of students and the encouragement of self-evaluation.

During our general discussion with all the participants, there was an optimistic motivation and perspective that reflects an extreme need for the services offered by our system. Subsequently, the participants expressed their satisfaction with our approach, which offered them a quasi-permanent contact with their teachers and co-workers. Therefore, they enthusiastically presented their interest in a space dedicated to messaging, email exchange and social networks at the mobile application suggested. The concept is to develop a mobile application adapted to the development of the model mobile applications such as Mobile D using Swift, Xcode for iOS and Android Studio or other relevant software for Android. As a result, this Feedback inspired us to integrate a various functionalities at the system level.

As a conclusion to our discussion, mobile learning is a particularly effective strategy that can provide us with a continuous improvement of our Moroccan education system. Firstly, through a variety of services and functionalities adapted to the new paradigm of learning and through the reinforcement of a mobile technology that had recently become indispensable in all our activities daily. At the field of our research, we have attempted to examine and identify the attitude of learners towards mobile learning which has been very positive and significant. On the other hand, in our forthcoming research project, we are attempting to make our mobile application available to learners both at the App store and Android Store level and to include other additional administrative services such as the demands for academic certificates, requests for attestations ... an approach that we hope will lead to the improvement and optimization of the quality and performance of higher education in Morocco.

XII. CONCLUSION

The core purpose of the mobile application that we have suggested for the university learners is not only the exploitation of the mobile technology, but also the valorization of its benefits for the students. In order to increase the level of comprehension of the students, MyFaculty is a generic exchange space where they can create and share their suggestions and issues. Moreover, MyFaculty is associated with the development goals of the higher education system and is available for users of the iOS and Android operating systems.

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