IMAGING PROJECT INTERACTIVE MOBILE ASSISTED SYSTEM AND GUIDANCE LEARNING FOR RFID TECHNOLOGY. PROJECT FUNDED WITH SUPPORT FROM THE EUROPEAN COMMISSION. PROJECT NO. 20131ES1LEO0566389

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Abstract

According to UNESCO, more than 3.6 million university students in the world study in a country that is not their own, and the number is increasing, as it is becoming more common for young people to travel to other countries for their education. As a result of this demand, universities, such as Harvard, the Massachusetts Institute of Technology and the University of Melbourne offer free online courses for their students. There are many platforms that give users the opportunity to undertake online training to learn about science and expand their knowledge. However the main drawbacks are the educational content offered related to core subjects like physics, chemistry, mathematics..., and the lack of platforms specialised on real working environments.

Eurostat published; in 2009 that 31% of the European Union (EU27) population used Internet to search information about learning, compared to 8% in 2007. E-learning has been around for a long time, but this concept is not keeping up with the needs of users, as they also seek a new system or learning methodology with which they can interact and simulate real situations and environments, and that is where iMAGING comes in. iMAGING will exploit the potential of the increase use of mobile devices (smartphones and tablets) to enable easy access to all the information, turning e-learning into m-learning (mobile learning), This will be offered to a large number of people interested in RFID technology (Radio Frequency IDentification).

iMAGING offers RFID learning in a simple, intuitive and, over all, interactive way, carrying out simulations and playing with the technology in a directed and interactive way, in order that users (students, company workers, unemployed people, etc.) gain skills and incorporate this technology into their companies.

IMAGING will support the acquisition of new skills and competences as well as the training through lifetime. Young people that are trying to enter into the labour market and also workers with difficulties to enter in the labour market are also concerned. Therefore, promoting basis and knowledge for future jobs and new opportunities is one of the rationale behind this project, where it will contribute to lifelong learning enabling users to acquire competences, adapt to new conditions and potential career shifts. The use of new technologies to sustain lifelong learning provides an extra added value in terms of training flexibility and adaptability combined with active work, satisfaction and motivation for the trainees allowing them to council work and family and social life, giving the possibility to learn anywhere at any time.

With iMAGING the user will interact, learn and achieve new knowledge in the application of the RFID technology with a new methodology in an interactive platform. The training content will be segmented into different sections; focused on generic information, interactive exercises and examples of RFID applicability in real environments and companies. All this will be available in a webapp for all kind of mobile devices (Android, iPhone, Blackberry, etc.). The learning tool will improve the business scope, in order to contribute to a Vocational and Educational Training (VET) more open and more tailored to labour market needs and society in general. The use of 5 languages, English, German, Polish, Portuguese and Spanish will help students to learn in other languages and make the learning contents more accessible to other people.

Keywords: e-learning, vet, RFID, mobile, android, iPhone, Blackberry, European, labour market, unemployment, imaging, interactive, webapp, innovation, technology, research projects.

1 INTRODUCTION

Mobile learning or m-learning is a didactic and pedagogic expression used to designate a new 'paradigm' educational based on the use of mobile technologies. Overall you can call m-learning to any form of learning through devices reduced format, autonomous power supply and small enough to monitor people anywhere and anytime.

The term m-learning or "mobile learning", has different meanings for different communities, covering a range of use scenarios including e-learning (electronic learning), educational technology and distance education, that focuses on learning with mobile devices.

As mobile devices - particularly smartphones - are proliferating, new opportunities to leverage these devices for learning have emerged. Statistics show that over 90% of students possess a mobile communication device [1]. Not all mobile devices are smartphones, but smartphone acceptance in the market is growing fast becoming a common technology in society. With the rapid adoption of smartphones, this is an ideal time to examine the current state of art exploring the application of smartphones in teaching and learning context.

Adapting Cheung and Hew's (2009) study [2] we made a state of art review to some of mobile learning projects and existing studies focused in this theme, where we found that mobile devices were used as a tool for different purposes in education including content delivery, interaction for motivation and control, guided reflection, reflective data collection, and content construction. Furthermore we have reached several users across European countries trying to understand their feedback concerning m-learning and formal learning.

Particular emphasis was given to 3 main areas (following the adaptation of Cheung and Hew's (2009) methodology):

1) Use mobile-devices as an assessment tool: following the analysis made to a focus group in different countries it was possible to observe that mobile quiz and a paper quiz have the same effectiveness (quiz score), different efficiency (completion time), and equal satisfaction. The results showed the mobile quiz is quickly completed, therefore, more efficient. No differences, however, were found in effectiveness and satisfaction between the two quiz types, although users seem more attracted to fill the quiz in the mobile, probably because it's a new gadget therefore more appealing.

2) Assessing the learning outcomes of m-learning: This research assessed the learning effectiveness via mobile devices. In the users that were putted to the test there where experimented Information and Communication Technologies (ICT) users and common users. The results indicated that experimented ICT users are more familiarized with m-learning, nevertheless it was not possible to establish a relation between experimented ICT users and the learning results. Supported by the observation it can be assumed that the usability is more comfortable for experimented ICT users, but the learning outcomes are close related to the background and experience of the users in a given learning theme\content rather than the experience in ICT or mobile devices.

3) Assessing learners' attitudes towards m-learning: In this field we try to understand the effectiveness use of mobile devices for learning. In addition, the assessment evaluated users' attitudes towards using mobile devices for learning. Following the results accomplished it was showed that m-learning is capable of promoting users' learning and retain their interest. In addition, the use of mobile devices as a way to learn was rated positively by most of the users tested.

These 3 different realities are relevant for iMAGING project, since with that information we could better adjust the instructional design to our pedagogical objectives, knowing that in terms of quiz effectiveness mobile solutions are not so relevant to the user, but in terms of practical learning and in terms of capturing learners interest those areas show better results.

Nevertheless, m-learning does have some limitations, and the analysis made to other mobile learning projects catch our attention to three major concerns with regard to implementing m-learning into an educational environment, namely:

- Accessibility: There is a need to be able to access high speed connection, meaning that, for instance, get in the train or in the bus open the device and start learning from the mobile course might not be so easy to do, because of the connection. However these inconvenient

are becoming less common in the last years with the improvement of the mobile communication networks. When there is a bad connection and the contents are no displayed in a fast and easy mode, learners are likely to do other things;

- Costs for the Learning Provider: There is a constant need to upgrade the mobile training courses to the latest technology available and guarantee to keep up with the latest trends. This is a major concern to some of the learning providers since by using m-learning solutions there is a new cost related that is the continuous update of the technology platform.
- Usability: How useful/appropriated are some of the m-learning tools? Depending of each mobile or tablet, the m-learning solutions might not be adjusted to learn. For instance, in some mobiles we cannot see the text because it is not adjusted to mobile. Can we feasibly use mobile devices as "stand alone" technology for learning?

Again, to answer some of the limitations and questions raised, we asked to a group of users from each partner country and tried to understand what are their motivations and m-learning potential use. From the results the conclusion was that the use of m-learning solutions as an educational tool can be considered to have a very positive effect on the learning experience and engage users to continually keep on learning. This means that users are keen to use m-learning solutions, and even if we consider the latest trends, for sure, future generations will look to m-learning as a conventional way of learning since they are extremely receptive to utilizing new technologies. Furthermore, with the emergence of social networking, blogging, YouTube, and other ICT gadgets that will come up in the upcoming future, users (learners) are expected to be able to use mobile technologies to connect anywhere and anytime of the day, without any barriers.

Therefore, it is known that there is a lot to come in the future to what mobile learning and technologies are concern and those developments will mainstream the use of mobiles to learn, but we cannot forget that the main goal is to learn and the technology is only the way to better achieve it. This means that the technology usability must be one of the key aspect in m-learning but the most important is always the pedagogical design and how and what contents are given to the learners.

All these aspects motivated the submission of iMAGING (Project No. 20131ES1LEO0566389) to the call Leonardo Da Vinci of the Lifelong Learning Programme funded by the support of the European Commission, this programme was designed to enable people, at any stage of their life, to take part in stimulating learning experiences, as well as developing education and training across Europe. iMAGING is an ongoing project, running in 2015 its last year of development.

2 DIDACTIC SOLUTION

To best define the appropriate didactic solution for the target group, the members of the consortium undertook a research in the four partner countries, having as an objective to identify the profile of the people who are involved in the textile industry, both in terms of knowledge acquired so far, trainings available for them and average usage of mobile devices. The findings of the research helped the partners during the development phase of the project in terms of how the different modules should have been be structured, what would be included, how they could attract the attention of the participants, based on their experience and suggestions following their participation to similar types of training, etc. To carry out the survey, the partners developed a semi-structured questionnaire, which included mostly multiple choice questions and a few open ended.

In total, 101 questionnaires were filled in from participants in all four countries. The most important skills for a professional in the sector, according to the respondents of the questionnaire are: risk and safety, environmental aspects, stock keeping/ warehousing, textile structures and general information and material processing. The results are also available in Fig. 1.

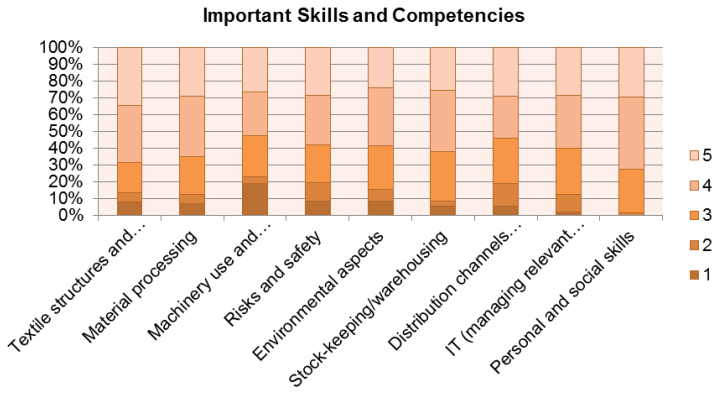

Fig. 1. Most important skills and competences. Source: Project questionnaires.

The respondents were then asked to assess their familiarity with specific topics, which had been identified as important by the partners, in accordance with the requirements of the training solution which was selected to be transferred (Fig .2). Based on their replies, the participants at the field research indicated that they are very familiar with sending and receiving emails, searching for information on the internet, searching for products or services and reading the news. Then feel moderately familiar with social networking, participating in eLearning and mobile assisted learning. Finally, they feel rather uncomfortable with encoding standards, standards on logistics, radio frequency identification, national legislation on packaging and storing and international legislation on maintenance and handling.

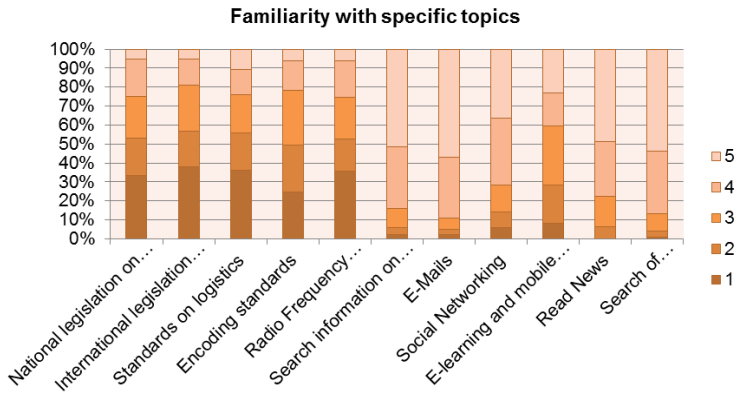

Fig. 2. Results of familiarity with specific topics. Source: Project questionnaires.

The people who are employed in the textile industry do not attend trainings very often. A bit over 50% of the respondents do not attend any training or do so very sporadically. 24% participates in trainings once a year, while 23% at least twice a year (Fig. 3). This could be attributed to the fact that the trainings provided would require them to take time off work, in which case, a mobile assisted eLearning course could be a very convenient solution for them.

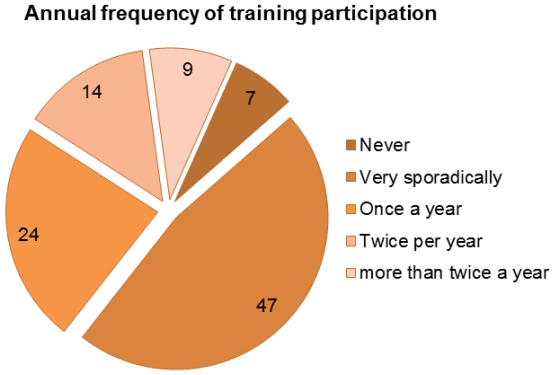

Fig. 3. Annual frequency of training participation. Source: Project questionnaires.

When asked to assess certain aspects of the training provided currently, their replies indicate that despite the fact that they consider the trainings are sufficient, they are not very well accepted by the employees/ workers and nor the managers. They assessed the quality of the trainings provided quite satisfactory, as well as the necessity. Their most preferred type of training is short to medium term courses and workshops or seminars. This could also be attributed to their time restrictions.

The overall results from the field research have validated the need for the project and its results, given that it has been evidenced that people who work in the sector could benefit significantly by attending the mobile assisted course developed under the iMAGING project, given that it combines aspects that are common to all: it is a short course, provided online, assisted by a mobile application.

The partners also undertook a research to record the extent to which mobile devices are used at the learning process. Based on the analysis of the results, it has been clear that the use of mobile learning as an educational tool can be considered to have a very positive effect on the learning experience. With the emergence of social networking, blogging, YouTube, and other ICT gadgets learners expect to be able to utilise mobile technology to connect anywhere and anytime of the day. Nevertheless, mobile learning does have some limitations as mentioned before, and the analysis made to other mobile learning projects indicated three major concerns when it comes to implementing mobile learning into an educational environment:

- Accessibility: There is a need to be able to access high speed connection, meaning that get in the train or in the bus and start learning from the mobile course might not be so easy;
- Costs for the Learning Provider: there is a constant need to upgrade the mobile training course to the latest technology and keep up to date with the latest trends;
- Usability: how useful are some of the m-learning tools? Some of them we cannot see the text because it is not adjust to mobile. Can we feasibly use mobile devices as "stand alone" technology for learning?

The didactical approach selected for the adaptation of the contents and their transfer into the mobile environment consists of five distinct steps, which are:

1. Check the needs of the target groups;
2. Inform of the course and the learning objectives;
3. Practice the course developed;
4. Test the knowledge acquired;
5. Receive feedback from the participants

Following the analysis of all the information gathered at this stage of the project, the partners decided that the contents which to be transferred and the good practices presented in terms of mobile should be adapted, based on the following assumptions:

- Sections 1: “Introduction” and 2: “Equipment”, which contain the narrative part of the overall course, are be presented in a more traditional approach. The learning outcomes from each one of the modules developed are associated with a set of simple exercises in the form of questions (multiple choice ones), to assess the knowledge gained from the successful completion of these sections. The tests corresponding to each of these two sections are sequential; in specific, the participant needs to complete successfully the test, by replying correctly to the appropriate number of questions, in order to be able to proceed to the following one. The partners have determined that 10 questions per unit presented within Sections 1 and 2 are sufficient to assess the knowledge.
- Section 3: “RFID Implementation” includes the practical approach of the RFID implementation. The partners opted for a set of exercises based on real life situations, which will provide the participants with the opportunity to identify the appropriate use of the RFID technology in actual circumstances. The assessment of the knowledge acquired within this section are, therefore, more playful and engaging for the participants. The partners determined to adopt a modular approach, for which the participants will have the opportunity to select which will be the sequence of the questions they deal with. Similarly to the approach for Sections 1 and 2, for the participants to be able to proceed to the following unit, they will need to have successfully replied to the questions, or a significant number of them.

- Finally, Section 4: “RFID Applications in the Textile Sector” provides the learners with the possibility to expand even further their knowledge, by providing examples of good practices and motivating them to search even further. Under this section no exercises are foreseen.
- The partnership have decided that each participant has the possibility to stop and resume at any time their learning process, under the condition that they register again onto the platform. This will help participants undertake each section at their own pace, without putting too much pressure on them to complete everything in one go or disappoint them if/ when they will need to retake the units again. In order for the decision points to be determined, such as how many times should a participant try for the correct answer, which is the percentage of correct answers given for a test to be considered as successful, etc. the partners took into consideration the technological implications for the development of the mobile application.

3 TECHNICAL SOLUTION

To achieve the objectives of the project, the partnership decided to base the development on some of the best development tools around, with emphasis on accessibility and future support. In this sense it was decided to base the Content Management System (CMS) on WordPress with sophisticated Learning Managament System (LMS) tools and functions, compatible with mobile devices. It was selected on the following considerations:

- The application must be available to the widest possible audience, so we must avoid technological accessibility constraints and limitations, issues that would naturally emerge due to the variety of available operating systems and their intricacies, user screen sizes, and methods of device interaction (touch screen or keyboard).
- The application should be easy to update even by the educationalist, without involving a programmer or an Information Technology (IT) developer.
- The application must be easy to maintain even after the completion of the project, so it should be based on an open, and therefore continually developed and improved CMS.
- The application must provide access to a large amount of content (including multimedia content) without having to store it on users' devices, so it must be based on web application technology. (all resources are available online).
- LMS system assumes collection of data patterns of user activities and interaction with the application, so it is possible to measure the effects of teaching.

3.1 Solution and technologies

3.1.1 HyperText Markup Language 5

HTML5 is used mainly to play multimedia content. It's a replacement for obsolete Flash, so the content can be available on mobile devices as well. The advantages are as follows:

- general accessibility
- support for mobile solutions
- openness and transparency
- security
- being modern and actively worked on
- no need to install extra software
- support for semantic markup

3.1.2 Content Management System

We are using Wordpress CMS. This allows for a number of modern features and good quality codebase (checked by hundreds of developers). Advantages include:

- friendly interface
- good compatibility with other applications

- commercial-grade, high-quality codebase
- No special knowledge is needed to manage application content.

3.1.3 Methods of interaction

The application is used just like every mobile webpage. Mobile touchscreen can be used for navigation. The following substitutes for classic navigation are being used:

- Left mouse button - short touch
- Right mouse button - long touch
- Entering characters - virtual or hardware mobile keyboard

In addition, extra device functions are supported, such as:

- Zooming of text and media - pinch and spread
- Screen rotation

These features are not necessary for using the application, but can simplify the interaction.

3.1.4 Technical features

- LMS structure: Sections, Units & Lessons
- LMS Evaluation: Quizzes before selected Sections, Units or Lessons
- Learning content as:
    - Plain/formated text (incl. HTML5)
    - Tables
    - Graphic/photo (JPG, GIF, PNG)
    - Video, animation (MP4, MOV, AVI, GIF)
    - Sounds, music (MP3, WAV)
    - Embedded iframes
- No Flash support (abandoned or not supported format for many mobile devices)
- Simple, responsible layout for different types of screens
- Access through any modern web browser

3.2 Application structure

The application is designed under the following sections:

0. Sign in
1. Home
    a. About
    b. Course
        i. Sections
        ii. Units
        iii. Lessons
        iv. Quiz
    c. Help
    d. My progress
    e. Logout

3.3 Usage information

The application features a simple graphical user interface in order to make it accessible to a wide audience, regardless of their mobile device. Application homepage is located at http://imagingproject.eu/course. It features various different types of content: text, illustrations and animations, video, audio, as well as tests and quizzes. The application is responsive, reacting to differences in device screen sizes. This allows application content to always fit the screen perfectly, regardless of its size.

The user who wants to use the application must first apply for an account. After authorisation, they get access to training content, in accordance with project methodology. The user decides about when to use the application, and how much time they need to familiarise themselves with its learning content. This way, they complete various training steps, or levels. Some would require participation in control tests that would be the prerequisite for subsequent stages.

The content is divided into four sections, each section into units, and each unit into lessons. In Fig.4 are shown some examples of screen shots of the beta version of iMAGING app.

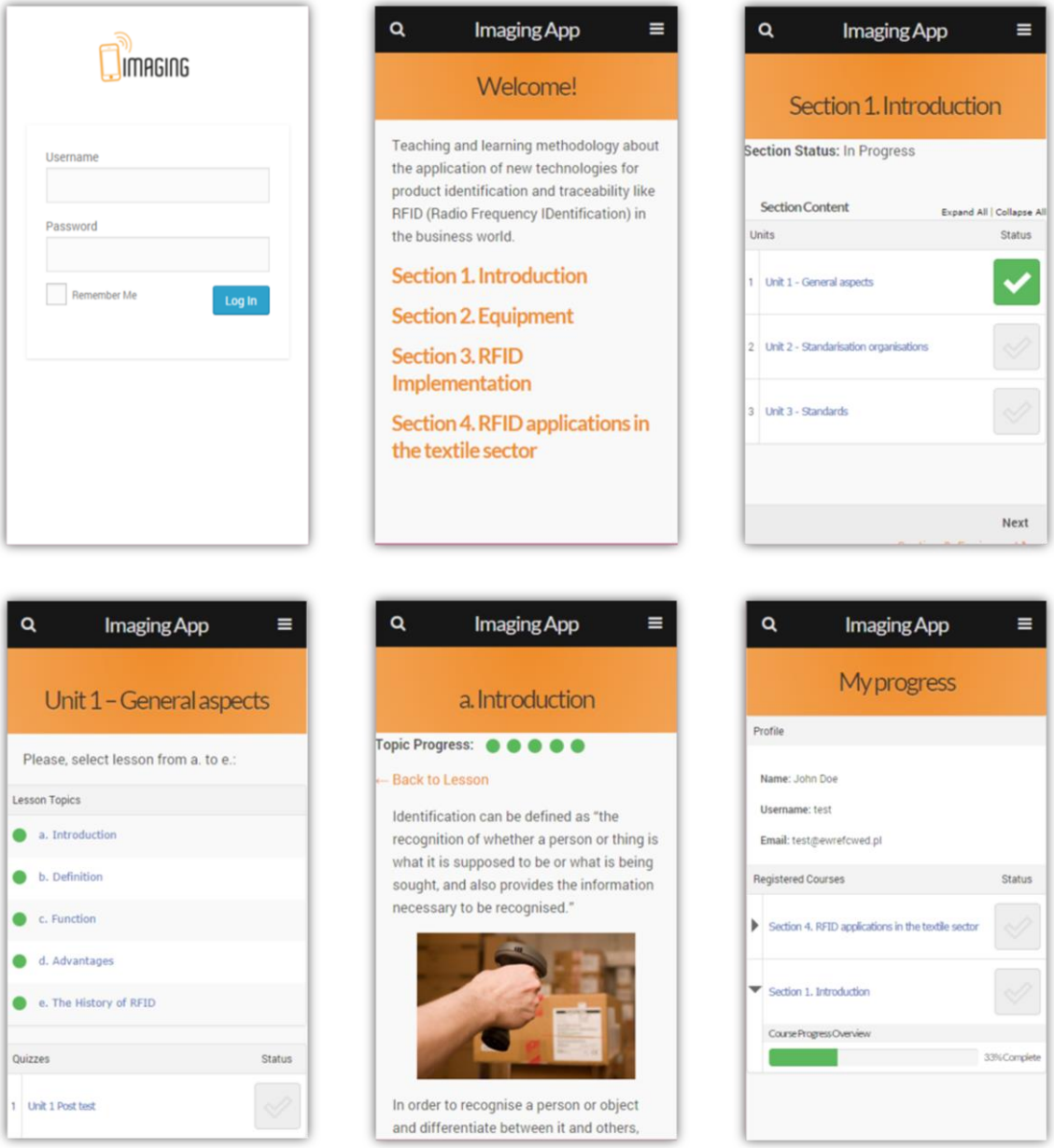

Fig.4. Screen shots of the beta version iMAGING application

4 EXPECTED RESULTS

Although the first insights about Radio Frequency IDentification technology (RFID) started in 1960, the reality is that this is a recent mainstream technology, which can be adapted across all business activities and industries, depending on costumers' needs and level of information acquisition needed. Because this is a new technology (at least applied to industry), this means that RFID technology was not part of educational programs in universities or technologic courses over the last decades and therefore many workers and technicians have training needs in this specific technology. According to a market analysis made related to RFID, we found several research activities on-going but no learning opportunities about it. When we look at the internet we found some initiatives available online, and those are mainly North American initiatives that are very much oriented to their learning needs (e.g. RFID Revolution web site).

Mobile devices are believed to offer some unique benefits to learning even when compared to some aspects traditional learning. Although of its recognized benefits, mainly flexibility, engagement and motivation, and user orientation, in Europe, the usage of m-learning is still far away for the common use that North America countries are given nowadays to this new kind of education.

According to the state-of-art made, there is no Training Programme available online via mobile application specific oriented to RFID technology in Europe. Consequently, with this project we expect to fill an educational gap, in a topic that is very relevant for the modernization and innovation in industry and with no doubt a lack in the education system across Europe that still elects formal education and training rather than new educational approaches supported by new technologies.

With iMAGING project we expect to create a web application where users (learners) can have access to RFID pedagogical contents. The pedagogical contents are very focus on the application of RFID in textiles operations with specific examples applied to this industry. Furthermore the expected results arising from the work programme establish and the joint effort of the project partnership will deliver the following outcomes:

- Design and development new learning methodology/contents for the application of new technologies of product identification (RFID technology) in textile industry.
- Implementation of an innovative and interactive system for assisted orientation and user's apprentice about the use of RFID in the textile sector, which will work in all kind of mobile devices, based on a web app platform;
- Validation of Formal, Non-Formal and Informal Learning, to assess the knowledge, skills and competences that are developed by the users/trainees during the learning immersion.

In terms of impact, with this project we are contributing to a Europe of Knowledge through the development of new learning approach (mobile application) using recent ICT technologies to support and promoting the lifelong learning and the acquisition of knowledge's and skills to enhance the competitiveness of the textile companies.

The project execution was primarily created to provide RFID learning solutions related to textile industry in the context of a course, but also contains generalized resources for those interested in mobile learning, seeking to support the creation of an information society to all, by promoting training and exchanging knowledge in the European space.

Therefore, with this project we will address a specific market learning need and at the same time we will introduce it through a new way of Learning: Mobile Learning.

5 CONCLUSIONS

Several educational experts manifest the importance of implementing new technologies during the learning process. The "E-Learning Market Trends & Forecast 2014 – 2016" by Docebo [3] mention: "The European education and training system is starting to embed digital technologies in its training methodologies, but full acceptance of the use of these technologies in learning still appears to be far off. Governmental surveys show that 70% of teachers in the EU recognize the importance of training in ICT-supported pedagogies, but their role in the development of a fully digitalized school is still weak. According to the European Commission, only around 30% of students in the EU are in digitally supported schools and as many as 35% of students are in schools which exhibit both weak policy and weak support for digital technology". Mobile Learning is a experimenting a positive evolution with a market growth rate for Mobile Learning in Western Europe of 9.0% and it is estimated that revenues

will reach $885.1 million by 2017 [4]. In addition to this, the implementation of m-learning systems in companies is becoming more popular as 47% of organizations are now using mobile devices to support formal learning and many others are planning to implement them during the next 2 years [5].

M-Learning offers advantages comparing with traditional learning methods which are less flexible. Mobile devices like smartphones and tablets have invaded our lives and seem they will stay among us for a long time. Almost every single person has a smartphone nowadays which give them the possibility to access anytime and anywhere to online contents, e-mails, music, social networks, news, and more recently learning contents. Mobile learning has become a reality and the benefits are known.

Self-time-management, flexibility, interactive learning contents, learn by doing, council work and family life, etc. are some of the most important advantages that mobile learning bring us. In addition to this, the fact that iMAGING offers RFID technology learning for managers, company workers, unemployed people, highly-educated students, offers an additional difference among other initiatives solutions in the market. This is because there are many platforms that give the opportunity to undertake online training to learn about science and expand their knowledge and skills. But this concept is not keeping up with the needs of users, as they also seek a new system or learning methodology with which they can interact and simulate real situations and environments and that is where iMAGING comes in. iMAGING exploits the potential of new devices to enable users to gain easy access to all the information.

Finally, iMAGING uses a new learning methodology in an interactive web based application where users will access to the learning contents through their mobile phone or tablet at any time in any place. This fact makes all the learning contents available for all kind of mobile devices with independence of their operating mobile system (iOS, Android, etc.).

REFERENCES

[1] Pennsylvania State University; Faculty Advisory Committee on Academic Computing (FACAC) survey 2012. Teaching and Learning with technology.

[2] Cheung, W. S., & Hew, K. F. (2009). A review of research methodologies used in studies on mobile handheld devices in K-12 and higher education settings. Australasian Journal of Educational Technology, 25(2), p. 153-183.

[3] Docebo S.p.A. (2014). E-Learning Market Trends & Forecast 2014 - 2016 Report; p. 37.

[4] Sam S. Adkins; Ambient Insight (2013). Ambient Insight's 2012-2017 Worldwide Mobile Learning Market Forecast: Premium Edition, p. 58.

[5] Towards Maturity (2013). Mobile Learning at Work, Practical perspectives to help implement mobile technologies effectively, p. 4.