

Using the Method for engineering learning systems MISA to design new Mobile Educational Systems

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Abstract—educational systems have several difficulties related to inadequate learning pedagogies, lack of learners' motivation, and especially the evolution of their social habits in an opposite way of that of learning systems. Mobile learning integrates mobile technologies and wireless networks in the current learning processes. It offers great opportunities for improving learning systems. Indeed, it introduces new challenging activities and ensures continuity between learners' daily lives and their training and learning. This article focuses on pedagogical issues of mobile learning and proposes the use of the Method for Engineering Learning Systems MISA to design a mobile educational system. Our work aims to identify basic elements, key characteristics and dimensions for developing the appropriate content for mobility. These elements will be used for customization of the MISA method. Indeed, MISA phases are governed by multiple operating principles which ensure greater consistency and flexibility. Taking into account the specifications of Mobile learning in the development of these principles, we can adapt MISA to design a mobile learning system.

Keywords—E-Learning, Connectivism, Learning activities, MISA, Mobile Learning, Pedagogical scenarios

I. INTRODUCTION

THE Internet today is a window into its users' perceptions, their ideas and their way of life [1]. This is enhanced by the development of wireless networks and mobile devices. These technologies are influencing our social habits. Learning systems can only follow these changes to better support learners, their needs and their preferences. This is possible today with mobile learning or learning through mobile devices. Mobile Learning is a new paradigm that has been the subject

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of countless research projects during the past decade. The first work performed was completely techno centered. It focused on the use of new mobile technologies and the users' attitudes towards these technologies, where after it focused on the application of existing learning theories (e.g. theory of activity). Currently, we are more interested in teaching and learning problems of mobile learning in order to formalize this paradigm by new models and methods.

For this purpose, we have chosen to apply the Method for Engineering Learning Systems (MISA) to a mobile learning context. The choice of this method is due to its flexibility and ability to design different learning systems enabled by its various principles. MISA defines multiple operating principles governing the management of instructional design process, namely progression principles, customization principles, general orientation principles and axes coordination principles. Each principle specifies different groups of subjects dealing with pedagogical approaches, scenarios and learning activities, modes and media delivery, etc. Adapting MISA to the design of a mobile learning system returns to customizing these principles by adding topics dedicated to mobility.

In this sense, our work aims to analyze the mobile learning paradigm to highlight the main features and key characteristics of a suitable content for mobile terminals. Furthermore, it explores opportunities offered by this new concept and dimensions to consider when developing a mobile learning system. This done, we will present our vision of adapting the MISA method by exploiting the elements already defined. These specifications will be integrated through the operating principles of the MISA method to adapt it to our mobile environment.

II. MOBILE LEARNING

The improvement of educational systems had always been at the heart of the concerns of researchers, educators and content developers. These systems must continually meet the students' needs which are depending on contexts, disciplines and especially market requirements. They must also be in harmony with the evolution of social life, allow continuity to learners' real lives and integrate real world problems.

New mobile technologies and wireless network invade our daily lives and their use in daily tasks become common today. These technologies are used to organize our tasks, do some

researches on the move, watch podcasts and videos in a waiting room, take notes, collect different data types and share them instantly, etc. They are also integrated unconsciously and in a random manner in the learning process giving rise to the concept of mobile learning.

Along this section, we clarify the mobile learning concept and the rationale for mobile technologies integration in educational systems, otherwise we will explain why mobile learning is becoming a necessity to our education. Then we will delimit this paradigm through highlighting its key characteristics.

A. *Defining Mobile Learning*

Mobile learning is defined as "the use of mobile devices that can connect to the Internet for educational contexts" [5]. Despite its clarity, this definition raises many questions as we seek to identify the main characteristics of mobile learning. Indeed, this paradigm is not only based on the use of new technologies, but also reveals new features and dimensions for consideration. Wang, Wiesemes and Gibbons associate three qualifications with this definition to delimit the mobile learning concept: mobility, the use of mobile devices, and communication exchange among participating communities [5].

Highlighting these qualifications presents mobile learning as a way of learning imposed by and for the satisfaction of the learners' increased need for mobility in the 21st century. This covers their continuous movement between different environments and across multiple subjects and disciplinary contexts. Mobile learning provides specific educational content via mobile devices. These devices extend learning beyond formal educational settings, through personal experiences at the workplace, while traveling, or in the waiting room of a doctor to take just a few examples. They allow more interaction and promote learners' communicative nature. They also meet their need for exchange and collaboration thus building understanding among participating communities.

B. *Rational for Mobile Learning*

The mobile phone has become the first media in the world with 4 billion subscriptions (Ahonen, 2010) [21]. A report by Wireless Intelligence in 2010 accounted for 547.5 million subscribers in Africa [6]. The use of mobile devices in principle varies between emails consultation, social networks and web research. Predictions state that by 2020 the majority of Internet users will connect via mobile technology [21]. Added to this the growing need for lifelong learning and knowledge acquisition at the appropriate times; mobile technologies prove to be an effective solution to our knowledge society. Predictions have also been made regarding Long Term Evolution (LTE) 4G-engaged devices sales, to rise by 202.5% to 275 million units in 2013 compared to 2012 [2].

The rationale for mobile learning, according to Tapscot, is that 21st century learners have "grown up digital" and that they "expect it." [5].

In 2001, Marc Prensky noted: "our students have changed

radically. Today's students are no longer the same people for whom our educational system was designed". These "digital natives" are exposed to new technologies and feel more engaged and motivated while using them in the learning process. Our students not only want mobile learning, but they need it. [23]

Today's young people adopt mobile technologies for different tasks in their daily lives. Mobile devices allow them among other to share ideas on micro blogs, seek instant information on forums, take notes and configure notifications for important appointments.

On its part, the evolution of automatic summarization tools can facilitate the content delivery through mobile devices. [4] highlights the role of these tools for managing the vast available online literature. The process of summarization reduces the complexity and length of the original documents, providing the visibility of the subject matter and key ideas of the work. Some tools quality is comparable to that of the human extracts [4].

Studies on the perception of students and educators and their readiness to use mobile learning have been conducted [7] [22]. Contrary to what one might expect, the results show that these two main actors of the learning process are not conservative toward mobile learning. Rather, they are willing to explore and try new technologies.

Mobile technologies allow today's youth to determine what they want to learn and develop their own learning objectives using their own devices. They give them the opportunity to train their learning communities and use the methods and means that suit them best. The current changes are such that learners are no more than consumers of knowledge. Teachers in turn, must increasingly focus on contextual knowledge, problem solving skills and creative processes [19]. In this context, the mobile learning introduces new learning situations that promote these competencies.

Educators who have used mobile learning have confirmed the importance of bringing new technologies to the classroom. These technologies increase motivation, engagement and students' concentration. They also help to introduce new activities and diversify the existing ones.

C. *Connectivist Approach*

With the advent of Web 2.0 and the move towards Web 3.0, education must follow these technological advances and evolve in parallel. This is only possible if learning systems readjust existing pedagogical approaches and integrate new approaches appropriate to current needs and requirements.

George Siemens (2004) point out that some traditional learning theories: such as Behaviorism, cognitivism and constructivism have limitations because these theories were developed in a time when technology had not impacted learning to the degree it does today [24]. These theories were developed when knowledge was growing more slowly. Nowadays, knowledge is growing at a dramatically greater rate.

Education 3.0 is a connectivist approach to teaching and

learning where educators, learners, networks, connections, media, resources and tools no longer constitute a single entity. This new emerging entity has the potential to meet the needs of individual learners, teachers and even society [1]. Connectivism is a learning theory which is contextualized in a digital era characterized by the influence of technology in the field of education [24].

For the inventors of this approach, George Siemens and Stephen Downes, "The existing learning models no longer reflect the reality that we live in our digital society. We are developing new knowledge constantly while exchanging, sharing and critiquing through social networks and blogs. This state of generalized connection is a learning process in itself, which is difficult to satisfy by linear pathways and unilateral transfer of knowledge and memorization from a set of limited and predetermined corpus of data" [16].

Connectivist approach is based on five components: communication, collaboration, motivation, creativity and integration. Siemens defined the following principles of connectivism [24]:

- Learning and knowledge rest in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections is needed to facilitate continual learning.
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

The principles of mobile learning and its specificities match largely the components and the main principles of this approach through the features offered by mobile technologies insofar as they allow instant communication between different information resources. This ensures a greater exchange of ideas and resources through community, creativity in new learning activities introduced such as mobile tagging, geolocation, multimedia, etc.

D. Mobile Learning Key Characteristics

New technologies often sold as "revolutionary" are used to do the same old activities. [5]. A review of the use of mobile devices in the majority of mobile learning projects confirms this statement. Therefore we do not really enjoy the potential of mobility. The latter provides continuity in the learning experience through different contexts and allows the design of new learning situations adapted to learners' daily life. It is necessary then to determine the main characteristics of mobile

learning that distinguish it from other learning formats in order to realize its potential.

Based on a literature review of the work dealing with mobile learning and findings concerning the obtained results, we have identified a set of specifications for a mobile learning system. It is a learning style that provides content suitable for limited features of mobile devices, for the mobile context of learners and their need for speed and relevance in obtaining information.

The mobile learning system is:

- **Informal, contextual, situated and authentic**; since mobile technologies extend learning in more stimulating environments than classrooms and allow learners to investigate real problems in which they are involved. They also facilitate obtaining relevant information in context to make connections between formal knowledge and personal experience. Experience shows that young people learn more effectively in such conditions [14].
- **Immediate, appropriate, just in time, everywhere and anytime**: the learner can view a simulation of the photoelectric effect in a physics course or do an online search of a painting during a visit to a museum. The data are obtained when and where necessary as required by the learner.
- **Personalized**: Mobile learning promotes effective learning. And it lies to its ability to recognize diversity, difference and individuality in the way it is developed, provided and supported. It takes into account the context and history of each learner [12].
- **Personal, individualistic, and learner centered**: young people have special relationships with their mobile devices creating an environment that reflects the identity of the owner, his lifestyle and his interests. The extension of these technologies for learning context develops this environment even more and makes it more personal and complete. "It's not what you know, it's the device you know" says Nicola Louise who argues that learners have more confidence in using their own technology which has great impact on the learning process [9].
- **Complementary**: Mobile tools are considered an extension to other learning tools [17]. Furthermore, only certain types of content and activities are appropriate for these devices. A series of studies of mobile learning indicate that these tools are used effectively to stimulate interest in the first delivery of content to increase motivation and monitor learning. [17].
- **Collaborative**: This feature is often highlighted in the learning process. Social interactions between learners and between learners and educators are very important. Mobile learners can benefit from a high level of collaboration by establishing rich connections with other people and resources through mobile

devices. This high level of networking creates interactive environments socially shared so that students can easily contact pairs, teachers and other experts and also share information around the world [25].

The technical limitations of mobile devices make the educational content:

- **Short, simple and interactive:** learners should be able to benefit from their small fragments of time for learning. Viewing conference videos, making a quiz or posting a question in a forum during a trip by train are examples of possible activities with mobile devices. We can notice that the mobile learning projects using SMS and Podcasts have been the most successful.
- **Targeted and specific:** mobility must guide and support students and teachers in new learning situations where and when this is necessary. The content must be adapted to the context, providing information on the location and locus of interest according to the learners' preferences [17].

Finally the application or service developed for mobile learning should be:

- **Attractive and easy to use:** It should possess a pleasing visual design, a suitable interaction style and a certain agreeableness to give pleasure to interact [13]. It must have something 'sticky' to encourage students to return. [10].

III. ADAPTING MISA METHOD FOR A MOBILE ENVIRONMENT

The first experiments and implemented Mobile Learning projects have been successful. The results showed that learners are ready to integrate these technologies in their learning process. Indeed, functionalities of mobile devices allow, among others, making profits on learners' free time, motivate them and keep them updated.

Some of these experiments were not based on a theoretical method and was implemented in a random way, while other experimentations reused old Frameworks and theories.

Indeed, the main limitation of mobile learning is the lack of teaching strategies and methods by which it can be integrated into the formal learning process. A UNESCO report notes that this paradigm has been long considered an extension of e-learning which has diverted researchers to create a new pedagogy for mobile learning. [10]. In addition, the majority of researches are based on student feedback about the use of mobile technologies and their interaction and attitude towards the Mobile Learning approach [11]. We must now abandon the reuse of existing theories and the focus on the use of new technologies. It is necessary to develop design methods for the learning process to fit the use of mobile learning and promote learners' mentoring. Rather, we must consider the methodological and didactic issues to develop appropriate pedagogical models.

From the following, we will detail our vision for the

formalization of mobile learning. We will present both the requirements to be met in order to obtain an effective conceptual model of mobile learning and mobile tools associated with each of them. This will determine the maturity of mobile learning through its ability to meet these requirements.

A. Considerations in designing a mobile learning system

To design mobile learning situations, we must ask what teaching strategies work best for which technological tools. We should also highlight what distinguishes mobile learning as the fact that it is based on the mobility of learners across time, space and content and that is centered on the context. [15].

Mobile learning is learning which must adopt a specific pedagogical approach taking into account the components of the learning process (Table 1).

Fellenz and Seaman (1989) believe that the discussion and sharing allow students to "respond to the ideas, to experiences and to their teachers' and peers' reasons and knowledge and allow them to think and feel differently" [26]. These two features were introduced with web 2.0.

Mobile learning promotes the potential of Web 2.0 in terms of exchange and collaboration (Table 2).

According to [26], we can talk about effective teaching when the teacher can combine the development of a strong program with a perfect education for a successful learning experience. It is essential to reach reciprocity between the teacher and his students. This means that the student must be seen as an active participant in the teaching and learning process. Effective teaching is teaching that encourages teachers to be proactive and flexible in their teaching to better meet the needs of students.

On the other hand, among the necessary conditions for an optimal learning, students must [26]:

- Want to learn about studying;
- See the relevance of the subject to be studied to participate in decisions relating to their learning;
- Feel motivated;
- Understand the relationship between pedagogy and the learning experience;

Also, the educational task must:

- Be specific with a reasonable scale;
- To be feasible given the abilities and interests of the students;
- Involve students actively;
- Be a challenge for students and seem relevant to them;

Mobile learning allows introducing new approaches to learning and improving the existing. Indeed, it allows us to get closer to an effective education insofar as mobile technologies increase students' motivation and engagement, and enable designing new relevant activities from real world problems.

Mobile learning as mentioned above encourages the introduction of cooperative learning. Johnson and Johnson (1989) noted that through cooperative learning, as opposed to competitive and individualized learning, students perform better, are even more motivated, have interpersonal and

fruitful relations, develop favorable attitudes toward their teacher and what they are studying, have better self-concept and better psychological health and have better skills.

Also, mobile learning system allows introducing the connectivist approach to education systems and promoting existing approaches across multiple teaching activities enabled by mobile technologies (table 3).

Mobile learning must be designed as an extension to other learning formats. The main activity being done in-class or online, mobile devices can be used to enliven, enrich and add variety to traditional courses. Several mobile features help meet this characteristic. It cites podcasts, Reminders, Mobile blogging, etc.

Table I Associated Mobile Tools to a Learning Process components

Components	Mobile Tools
To inform/ to find out: resources to consult	Multimedia (Podcasting, Photos), Mobile RSS, Mobile social networks, SMS, etc.
To interact: Communication and collaboration tools	Mobile photo/ video/ Voice, Blogging, SMS, Flux RSS, Social Networks, Forums, etc.
To motivate and activate: Organization tools	To do lists, Notes, Calendars, Reminders, SMS, etc.
To produce: evaluation	Mobile assessment quizzes, Mobile recording tools, Mobile wikis, etc.

Table II Associated mobile tools to web 2.0 exchange types

Exchange types	Mobile tools
One to one	SMS/MMS, E-mails, Mobile blogging, etc.
One to Many and Many to One	Mobiles Forums, Mobile Community Networks, Podcasting, Mobile Micro blogging
Many to Many	

Mobile learning should be designed to promote learners' skills in terms of communication and collaboration.

Mobile learning must take into account the criteria for effective learning:

- **Learner-centered:** Built on the skills and knowledge of learners, allowing them to reason from their own experience.
- **Knowledge centered:** The program is built on a solid foundation of knowledge validated, taught effectively and with an inventive use of concepts and methods.
- **Evaluation centered:** The evaluation should be adapted to the ability of learners, offering diagnostic and formative guidance built on success.
- **Community centered:** Successful learners form a supportive community, sharing knowledge and help less gifted students.

During the implementation of a mobile learning system, the learning experience should be divided into a sequence of activities and for each activity specify the following. [14]:

- The location of the activity: classroom, lab, internal or external.
- Adaptive technology and available technology.
- The content: text, diagrams, videos, etc.
- The amount of data to be manipulated.
- The necessary timing schedule of the activity.
- The technical requirements of the activity.

We have designed a scheme (Fig. 1) to describe the process of a standard learning activity with the use of mobile technologies. We have detailed the different steps in order to identify those that can be implemented on mobile devices. The main activity being done in-class or online, we have associated a set of appropriate mobile tools to other activities.

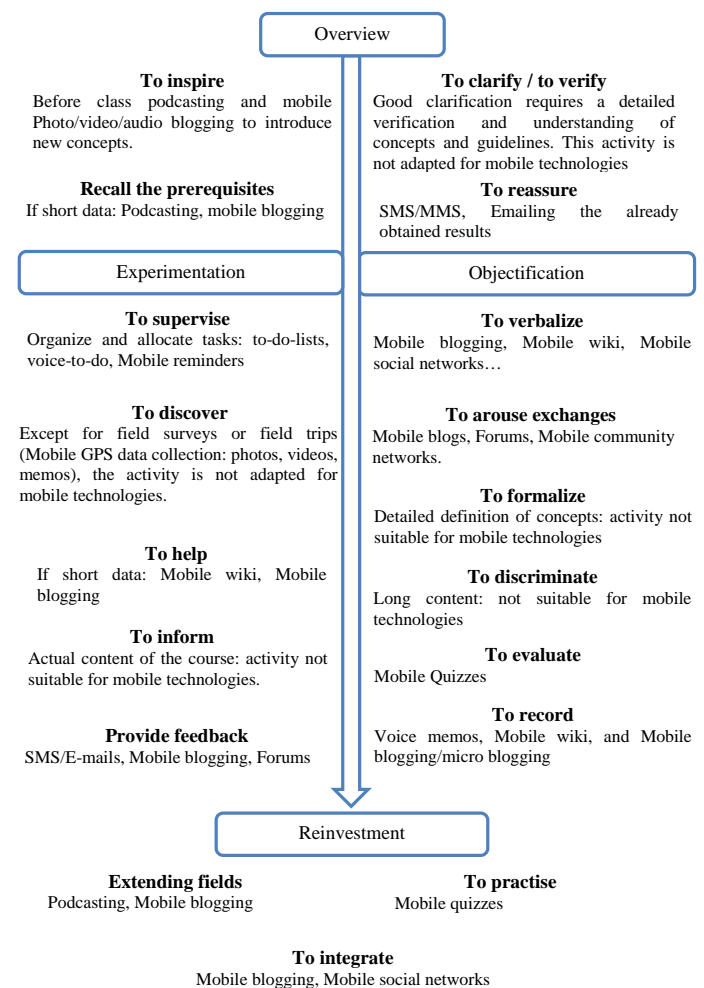


Fig 1 Detailed process of a mobile learning activity

Table III Associated Mobile Tools To Different Pedagogical Approaches

Pedagogical approach	Principals methods	Mobile tools
Behaviorist	<ul style="list-style-type: none"> • Rapid feedback and monitoring 	Mobile quizzes, Mobile reminders, etc.
Constructivist	<ul style="list-style-type: none"> • Collaborative learning • Experiential learning • Problem-based learning • Project-based learning 	Mobile micro-blogging, Mobile collaboration, Mobile Maps application, Mobile social networks
Individualistic	<ul style="list-style-type: none"> • Personalized programs • Modular education • Learner self-management 	Mobile check-lists, Rubrics, Quizzes, Mobile wikis, Podcasting, etc.
Connectivist	<ul style="list-style-type: none"> • Interaction network • Online community • Social learning • Informal learning 	Mobile bookmarking, Mobile social tagging, Podcasting, Mobile blogging, Mobile forums, etc.

B. Adapting the method for engineering learning systems MISA 4.0

Mobile technologies influence the teaching and learning process. Educational systems must follow these changes and develop design methods and modeling taking into account mobility. For this we chose the method for engineering learning systems MISA 4.0.

Content experts, instructional designers, media designers, teachers and trainers need tools and methods to achieve their learning systems. Regardless their size and complexity, learning systems are not just a set of resources or activities to follow. They are coherent set of learning scenarios, each has objectives and target populations and using reliable resources and adequate teaching materials for different learning situations.

In turn, the mobile education as presented above is not a simple random use of mobile technologies in a formal or informal learning context. It is a new learning style which should be used in an organized and regulated manner so as to distinguish its added value and ensure continuity in the training process while considering the mobility criteria and mobile technologies potential and limitations.

In this sense, learning systems design methods must take into account the dimension of mobility in order to guide the previously mentioned actors and facilitate the integration of such a concept.

The Method for Engineering Learning systems MISA 4.0 was used for this purpose.

LICEF center, research center of Télé-Université of Quebec have designed the Method for Engineering Learning Systems MISA and the knowledge model editor MOT+ enabling graphic representations of the models. MISA method introduces and uses new concepts in the instructional design field namely Documentation Elements and the various learning systems specifications of the method: knowledge and competency specifications, instructional specifications, media specifications and delivery specifications [20].

The learning system engineering process covers all the design activities, from identifying the learning and training

needs to implement the final product that will enable learners to acquire the knowledge sought. MISA method enables designers to rely on structured activities, to define milestones for tracking the project's progress and to create more and more concrete representations of the learning system.

Among reasons for choosing MISA method for our mobile context is that MISA is an outstanding, practical, comprehensive and open method [20] which:

- Can process any field of knowledge as well as the learning of techniques or development of attitudes. For example, it could be used in a variety of environments: educational, industrial, commercial, etc.
- Makes it possible to deliver the LS face-to-face in a classroom, at a distance in a collaborative group or self-paced learning format.
- The same LS project can support different target populations and learning scenarios can be customized according to the category of learner
- Adapts well to a variety of instructional materials, tools and means of communication as well as delivery services and locations.
- MISA's four groups of principles afford flexibility and consistency
- Many LS specification components created by MISA 4.0 may be easily reused from one project to the next, representing a major saving in terms of effort, cost and resources.

MISA is a generic method of instructional design. It facilitates the construction of varied scale learning systems, from a single learning unit to several courses including a variety of modules and learning activities. MISA offers guarantees of consistency and makes visible the various processes. It provides templates that focus efforts and minimize design time [18].

The method is based on a philosophy consisting of the decomposition of the learning system in four areas, namely the field of knowledge, the instructional field, the learning materials field, and the delivery field. It describes six phases

and four axes. The phases are:

- Defining problem and customizing MISA
- Defining preliminary solution
- Building learning system architecture
- Designing instructional materials
- Producing and validating materials
- Preparing delivery of the learning system

The four axes are:

- Knowledge and competency axis
- Instructional axis
- Media axis
- Delivery axis

Phases and axes of the method are regulated by operating principles governing the different steps of the method.

These principles are of four types namely the general orientation principles, axes coordination principles, customization principles and phase progression principles.

MISA uses the thirty five documentation elements (ED) concept, which is the methodological product of the different steps. Depending on the complexity of the learning system, the instructional designer can retain only seven documentation elements.

The choice of the MISA method as a method of designing a mobile learning system returns to its flexibility and consistency. MISA can be customized to suit the instructional designers' needs regardless of the size of the organization, the type and scope of the designed learning system or the available human, material, and financial resources. Designers do not have to produce all documentation elements or go through all the steps of the method. This flexibility and consistency is largely based on the four groups of operating principles previously mentioned. The diagram (Fig. 2) below shows the MISA method and its operating principles [20].

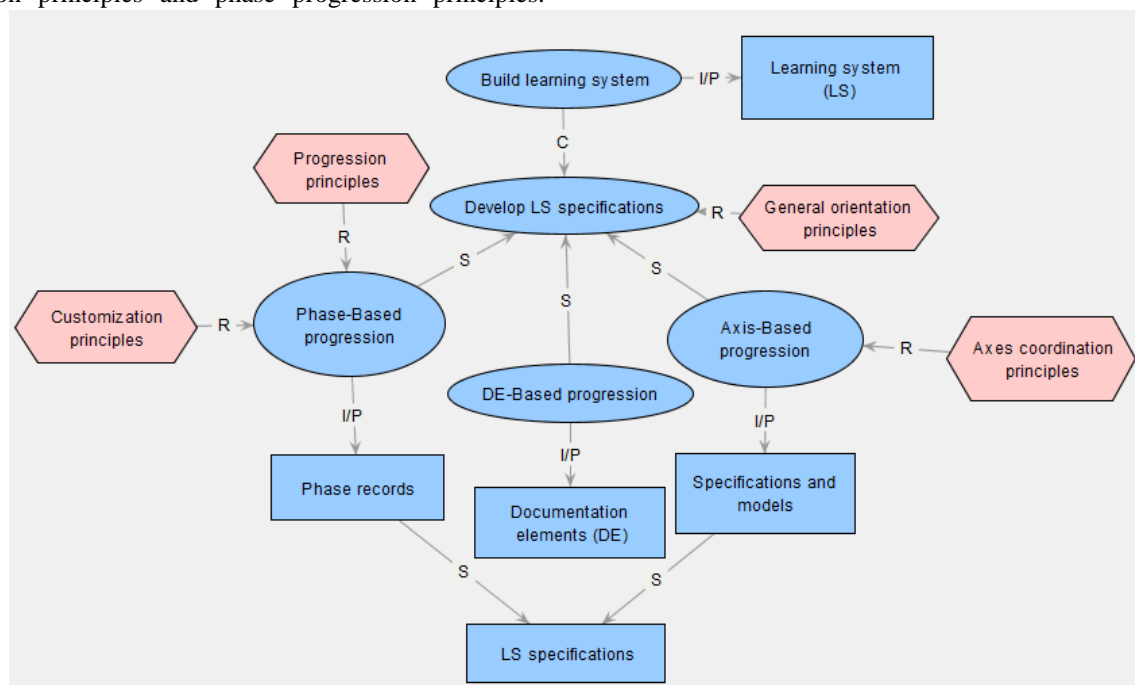


Fig.2 Method for Engineering Learning Systems MISA- Overview

MISA provide four types of models: the knowledge and competency model, instructional model, learning material model, and the delivery model. The knowledge model defines and structures the knowledge as well as skills to be acquired by learners. Such a model promotes learner-centered and knowledge-centered approaches which are more suitable for mobile contexts and for effective learning systems.

Adapting MISA to a mobile context modifies its operating principles. At the general orientation principles and customization principles in particular we should note the recommendations and specifications appropriate for a Mobile Learning system. We must consider different teaching approaches introduced by the mobile learning, including connectivism and the types of activities that it generates. We must also consider the constraints presented on delivered content, the tools used, interactivity and sharing between users.

We should respect dimensions as detailed previously as the complementary, informal and contextual characters of mobile learning.

The principles outlined above were summarized and modeled by the knowledge and competencies modeling tool GMOT for better visibility. The figure (Fig. 3) shows the different operating principles of the MISA method [19].

Our approach aims to apply the features and specifications of mobile learning already mentioned to these different principles of MISA.

Indeed, every principle of MISA method treats a group of subjects as shown in the following.

The general orientation principles specify the theoretical approaches behind MISA. They offer varied pedagogical approaches in the construction of the learning system, and its delivery mode and support media. These principles are set at

the beginning of each axis of the method. This group of principles contains four sub principles; instructional model orientation principles, material development orientation principles and delivery orientation principles.

- **Instructional model orientation** These instructional principles cover seven different topics: the type of learning event Network, types of learning scenarios, collaboration principles, instruments and resources, evaluation of learning, scenarios adaptability, and integrative concept.
- **Material development orientation principles** guide the media materials to ensure consistency while designing the learning system. They focus on four topics: the types of materials, their support, their interaction and their forms.
- **Delivery orientation principles** concern especially

human resources needed to use the learning system, tools and means of communication, services and operating environments. They concern eleven groups of subjects: mode delivery types, means of communication, tools, delivery periods, delivery time, delivery locations, composition and groups' management, evaluation objectives, assessment actors, trainers and facilitators, and learning system evaluation.

Customization principles enable the instructional designer to follow an itinerary that is custom-built for each project. Prior configuration of documentation elements at the beginning of the project or after the first phase is done according to the pedagogical approaches, delivery methods and scope of the learning system.

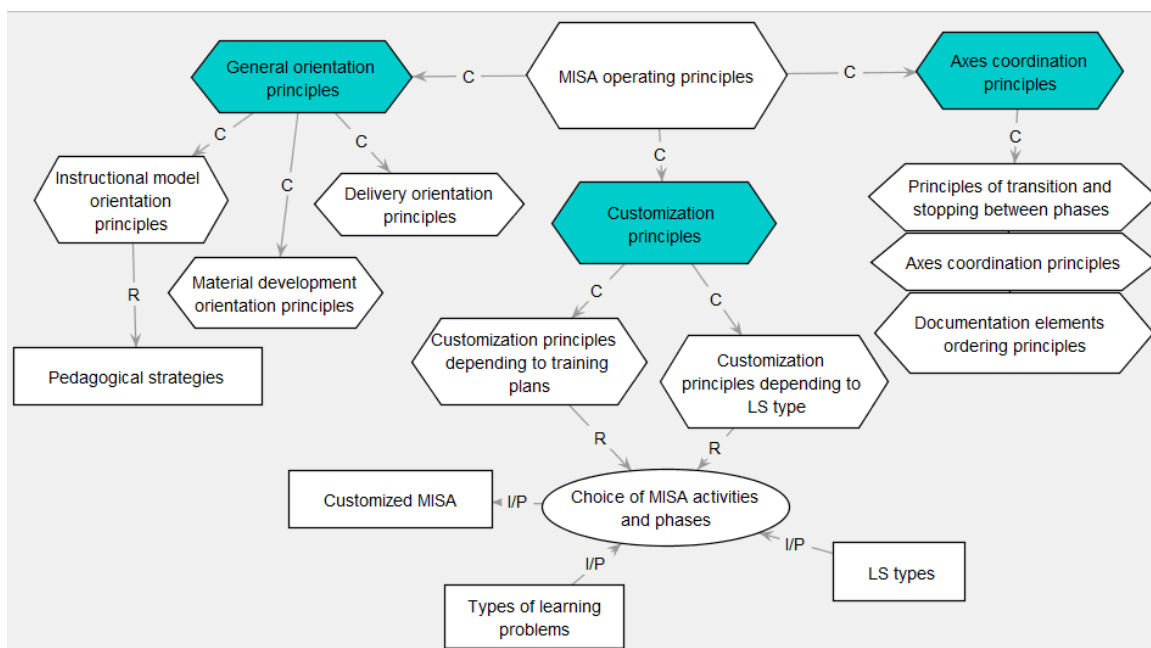


Fig.3 MISA Operating Systems

Mobile learning allows us to move from traditional cognitive and behavioral approaches to situated, socio-constructivist and andragogical approaches:

- **Situated learning:** recommends the use of authentic tasks in the most feasible possible contexts. The implementation of a contextual learning requires considering its various features namely learning in an authentic context using authentic activities, collaborative knowledge construction and integration learning assessment into learning activities [27]

In this sense, mobile technologies functionalities of localization as GPS for example and of contextual data collection such as photos, videos and notes enable better exploitation of the current environment by extracting, analyzing and instant sharing of data. Authentic remain an essential feature of mobile learning.

- According to [28], connectivist learning is based on :

- ❖ The creation of connections between sources of information;
- ❖ Creating a learning network and integrating it to ensure a continuous expansion of knowledge;
- ❖ Autonomy, diversity, openness, interactivity and connectivity as network properties;
- ❖ The learning environment is open to integrate new users and new learning resources;
- ❖ Allows multiple routes for multiple synergies of learning communities.
- ❖ Based on collaboration tools, improving teamwork and knowledge creation from

other community members' experiences.

These new learning methods influence the different principles of MISA method. Indeed:

- The general orientation principles should take into account pedagogical methods introduced by mobile learning, including situated, connectivist, private and personal learning. These methods generate new forms of activities, collaboration and evaluation.
- The content delivered via mobile devices should be brief, concise and interactive which will influence the granularity of learning units.
- These constraints will influence learning events, network types, learning scenarios types, collaboration principles and learning evaluation.
- These constraints will introduce new types of resources privileged by mobile devices such as simulations, synthetic schemes, guided tours, etc.
- Mobile Learning as defined previously encourages the presence of multimedia resources, digital media and dynamic interactivity between users and materials.
- The specification of the materials development orientation principles will be influenced by these constraints which will also take into account the adaptation of interfaces to high interactivity of materials required by the different learning situations and the technical characteristics of Mobile Learning. It will also specify the high level of assistance required by mobile users.
- Mobile Learning is a situated and private learning. These characteristics must be taken into account in the implementation of the delivery orientation

principles. Delivery should be based, in addition to learners' needs and preferences, on the context (e.g. using GPS). It must not invade the personal space and privacy of users and respect the schedules and delivery periods selected by the user. Instructional designers must consider the community concept of mobile learning (through social networks and blogs for example) in the definition of the composition and groups' management.

- In a mobile context, these principles will enable promoting, mobile learning educational approaches and strategies in the customization principles.

In a mobile context, in addition to standard teaching approaches already mentioned, customization principles allow integrating connectivist approach elements, situated learning and private and individualized learning. These principles should also include delivery methods generated by these approaches. Mobile learning can enhance formal learning in the classroom, blended learning or informal learning by introducing possible information delivery related to classroom management (schedules, timetables, etc.), to keep learners updated. Also it facilitates information collect in museums and field trips, and their instant sharing for analysis and comparison with peers and learning communities.

In the figures below we have presented a part of the changes to be applied while specifying different principles of the MISA method.

Figures (fig. 4, fig. 5 and fig. 6) illustrate these changes by a different color (pink):

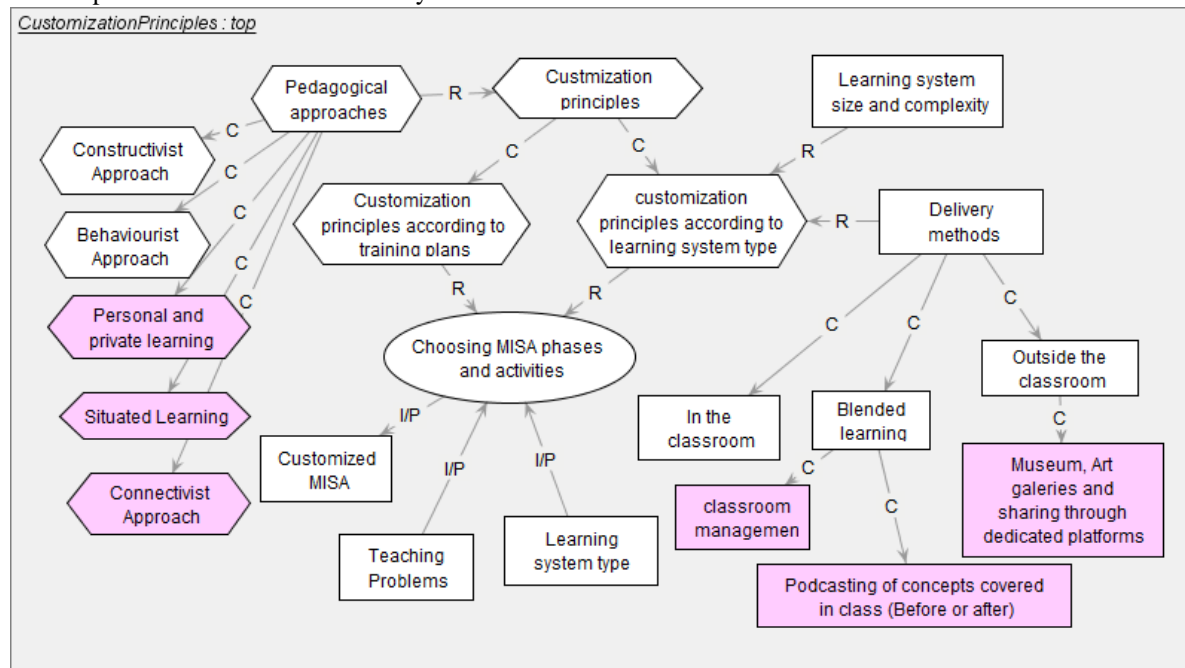


Fig. 4: Adapted MISA Customization Principles

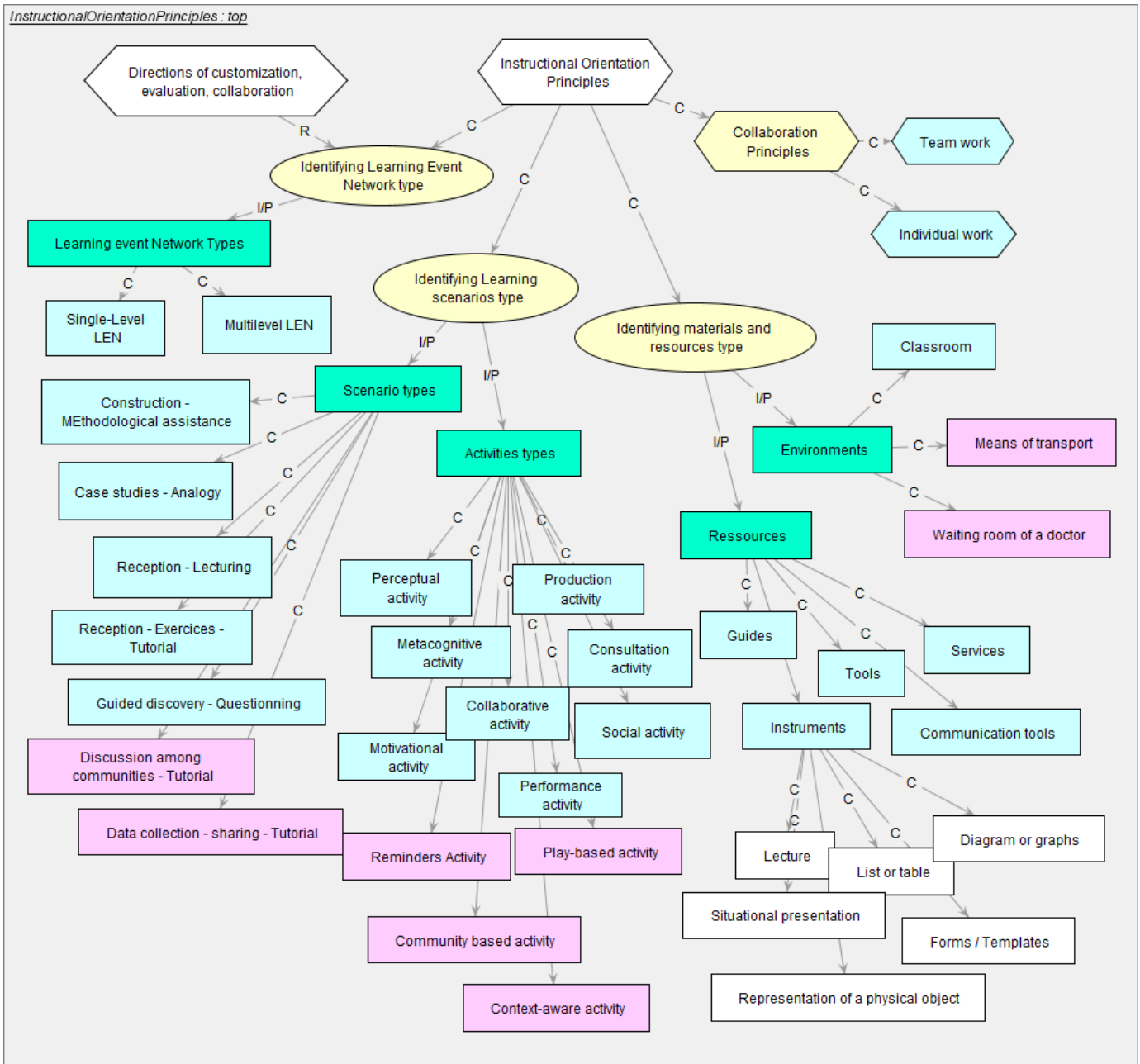


Fig. 5: Customized Instructional orientation principles

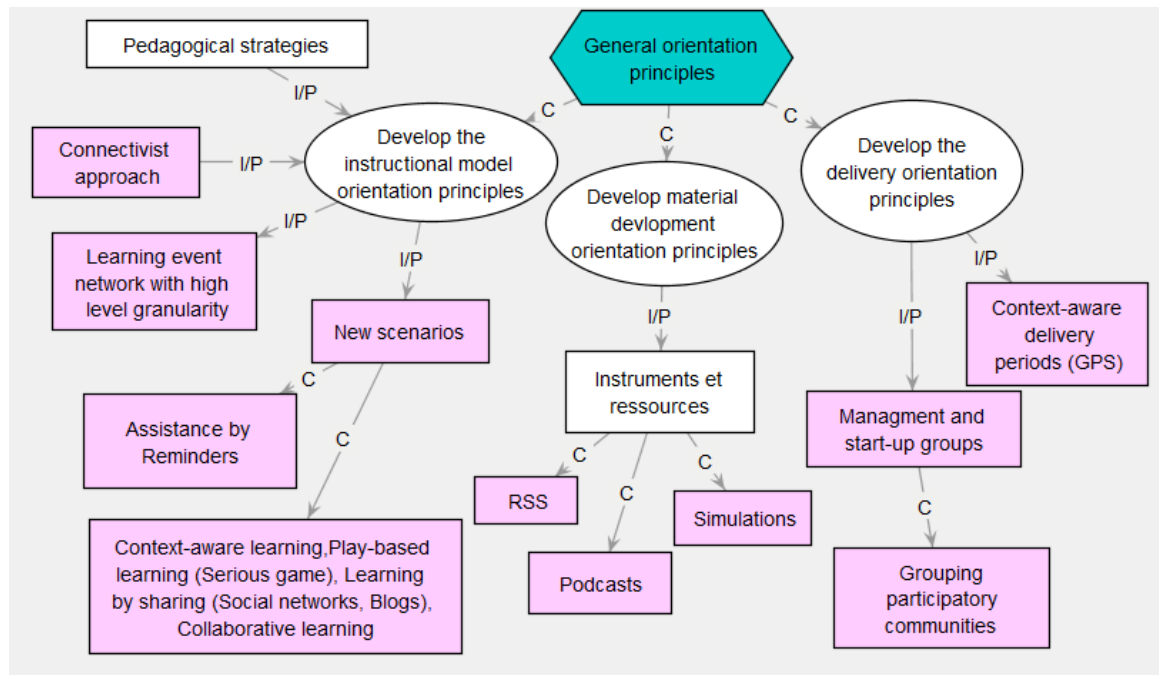


Fig. 6 Customized General orientation principles

IV. CONCLUSION

According to Gardner Inc. Smartphones sales increased by 46.9% in the third quarter of 2012 compared to the third quarter of 2011. The mobile devices use varies between GPS coordinates, payment by credit cards, data transfers, tasks organizing, communication, etc. [2]. These devices are becoming a daily presence in the life of people who want to be “always connected” [3]. Their advanced features allow using them in a learning context, giving users a possible solution to the continuing need for learning in a society increasingly mobile.

Mobile learning offers novel opportunities for existing educational systems. It allows immersion learning in the personal space of students who become not only consumers of educational content, but creators of new situations and learning activities.

Mobile learning theorization projects and studies are multiplying. They use various approaches and methodologies. Research has also begun to explore the perceptions and readiness of learners and educators for this new concept. The establishment of a pedagogical model integrating mobility as an essential component of learning is now a necessity.

Hooft calls to rethink what happens at school in the field of education. The school has become a process rather than a defined space and a fixed time entity [8].

Mobile learning seeks to restructure and develop learning systems to meet the increasingly growing need for mobility needs and lifelong learning. This learning style will extend teaching through new contexts. It takes into account the mobility of learners and communicative character that requires ongoing collaboration and exchange as well as the need to

obtain relevant information where and when it is needed.

Highlighting different features and pedagogical considerations is only the first step of the process of theorizing mobile learning, which has proven to be indispensable for the delimitation of the problem. It is also a crucial step to adapting the method for engineering learning system MISA. The different steps of this method are governed by operating principles. These principles allow flexibility and adaptability of the method by giving greater freedom to the instructional designer. They also enable applying our own recommendations and guidance to design a mobile learning system.

Our work focuses on identifying these recommendations and guidelines for the execution of each task of the method according to the context of mobility. These specifications will incorporate appropriate new pedagogical types of learning scenarios, learning activities, new forms of collaboration and exchange.

V. REFERENCES

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