

# Towards Gathering Initial Requirements of Developing a Mobile Service to Support Informal Learning at Cultural Heritage Sites

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## ABSTRACT

Informal learning allows learners to be in charge of their own learning process instead of being a content consumer. Harnessing mobile technology in informal learning field could help learners in taking a learning opportunity whenever they need either individually or in a group. This paper presents a small-scale study to investigate how people may use mobile technology for learning purposes in cultural heritage contexts. A focus group approach was used to capture preliminary results of user requirements. Based on these results, a scenario-based method was used to reflect a tangible picture regarding how people interact with mobile services. This study serves as an initial step of the series of gathering user requirements in developing a mobile location-based learning service.

## KEYWORDS

Mobile Technology. Cultural heritage. Informal learning.

## 1. INTRODUCTION

Harnessing mobile technology in informal learning (mobile learning or m-learning) provides opportunities for people to learn regardless of their location either individually or in a group (Sharples, 2000). M-learning helps encourage people to undertake new experiences in life as well as promoting lifelong learning (Fallahkhair et al., 2004, Vavoula, 2003). In addition, m-learning offers people the opportunity to learn within different contexts thus enabling people to learn while they are doing their daily activities (Brown et al., 2010, Kukulska-Hulme and Traxler, 2005) which takes place throughout people's experiences (Cohen, 1993). Learning from experiences could be considered as informal learning in which enables learners to be in charge of their own learning process instead of being a content consumer.

Engaging in aspects of cultural heritage may form a significant facet of the informal learning process. Since cultural heritage reflects the identity of societies (Vidal González, 2008), it could be important for people to learn more about the historical information that relates to heritage sites. This may help people to appreciate their history, which could further promote a sense of loyalty and engagement (UNESCO, 2013).

Additionally, visiting historical sites reinforces the revival of the glorious past that the communities have had during a particular age. This would help people to derive a power from that history and to be proud of belonging to that community, and also maintain a link between the present and the past, which would stimulate the perpetuation of culture (Du Cros, 2001, Caton and Santos, 2007).

Learning about historical stories and events that have taken place in a certain space not only attaches people to their roots (Poria et al., 2006), but also evokes their emotion and identity towards societies that they belong to (Poria et al., 2004). In turn this may inspire them to give more to serve their communities and, contribute to community advancement.

Since people learn by interacting with each other (Tseng and Chen, 2014), and mobile learning facilitate the interaction between people in different contexts (Lam et al., 2010), effective mobile services should be introduced to enhance this interaction. This aspect could successively support informal learning in cultural heritage contexts. This paper presents an empirical study of how people use mobile devices for learning purposes with respect to culture heritage sites. A focus group approach was used to capture initial user requirements. A Scenario-based method was used to envisage the interaction process between users and mobile services based on the results of this study.

## **2. FOCUS GROUP**

The present section describes the focus group approach that was used in this study including: the overall methodology, the methods that used to collect and analyse data, and finally, reporting the results.

### **2.1 Methodology**

A focus group discussion was used in this study. Six participants took part in this discussion; their age ranged from 28-50, three male and three female. All of them are familiar with mobile technology. Participants were recruited among the PhD student community. A Doodle notification was sent to them by email asking to state day/time that is suitable for them in order to organize the discussion meeting. A thematic analysis method was used to analyze the data (Braun and Clarke, 2006). The data was coded manually and also electronically using QSR Nvivo 10.

### **2.2 Data Analysis**

The data was analysed by using a thematic analysis method which consists of six phases that were set out by Braun and Clarke (2006) :1) Getting familiar with the data. 2) Generating initial codes. 3) Searching for themes. 4) Reviewing themes. 5) Defining and naming themes 6) Producing the report.

As noted by Braun and Clarke (2006), themes could be ‘data-driven’ which is emerged from data without any prior ideas about it, or theory-driven’, which means that data has been coded around some initial ideas from the literature. Whilst both sources were used in this study, the obtained themes are more ‘theory-driven’ as the researchers have had some initial ideas regarding this research from the literature. However, a few themes have also emerged from the data.

The data were coded manually and electronically. First, manually: paper, highlighter, coloured paper and pencil. Second, electronically, using computer software: (QSR Nvivo 10) (Bazeley and Jackson, 2013, Bazeley, 2009). The electronic version was used to increase the reliability of coding data by looking at the data from a different angle. Using Nvivo helped to take in-depth insight to the dataset. Its value is that it is more accurate than do it manually in terms of avoiding missing some potential themes that might be important, due to the easy-checking by using software rather than go through the transcription manually every time to check (Basit, 2003). Two lists of themes have been obtained from using manual and electronics versions of coding. A list of final themes emerged by reviewing and combining these two lists. The coding process was conducted in three cycles: ‘generating initial codes’, ‘searching for themes’, and ‘reviewing themes’.

It is necessary to clarify that throughout this paper we intend to use ‘code’ for the extracting information in the first level, ‘category’ for descriptive level of coding, and ‘theme’ for a more abstract level (Bazeley, 2009). The details of how each phase of the thematic method was carried out are as follows:

1) Getting familiar with the data

This phase involved transcribing the verbal data, reading and re-reading through the entire dataset and also noting down some initial ideas. An initial list of potential themes was obtained through this phase.

2) Generating initial codes

This stage included deconstructing information from its original dataset into initial codes. These codes were assigned clear labels to act as rules for inclusion. The details of coding data in both versions (manually and electronically) as follows:

Manually: The interesting patterns that are repeated across the dataset was highlighted (patterns related: problems, services, motivation) and also new patterns have emerged such as ‘a learning concept’. Afterward initial codes were generated as illustrated in Table 1.

Table 1. An example of coding data manually

<p>“...if I go there I want to take picture and keep memory, I want to see memories, I wanna write down. Take picture and save them (manage pictures), I want to take direction as well, and some times I've been lost anyway, I want to find the history of things not just brief, I wanna go in depth like Charles Dickens, so, so. Probably I wanna to have a coffee in place like Charles Dickens lounge, I want when I go back have a look at what I've ...”</p>	<p>1- Talking about features and services. 2- Talking about information and facilities</p>
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Electronically: the Open Coding stage was carried out using Nvivo. This stage included extracting information from the original dataset into initial ‘non-hierarchical codes’. Information was extracted for each participant to define a node or nodes based on the answer. For example, if the participants wrote down online ticketing and online booking for using mobile devices in cultural heritage sites, the node could be ‘online services’. As we went through the dataset any similar patterns were assigned to the nodes already defined for those patterns. When a new piece of information emerged, a new node was defined to assign this new information to. For instance, ‘learners and visitors’ are different than ‘usage of mobile devices’, so, a new node was defined to assign it.

3) Searching for themes

This phase included re-ordering initial codes, re-labelling and merging similar codes in order to ensure that labels for inclusion accurately reflect the contents.

The initial codes identified from the previous phase were grouped together in meaningful categories. The related codes were assigned to a certain category in order to identify themes. A mind map was used in the manual version of coding (see fig 1). Furthermore, in the electronic version; re-ordering and re-labeling of nodes was carried out to identify categories.

4) Reviewing themes

This stage included breaking down the categories that were obtained from the previous phase into sub-categories to offer a clear insight to the meaning of categories.

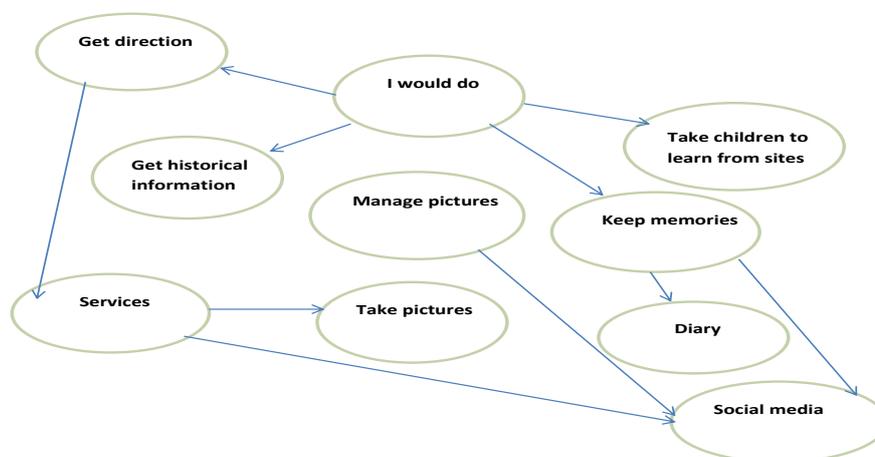


Figure1. Illustration of grouping patterns using mind map

Furthermore, it is offer an opportunity to reviewing potential themes that might emerge from the defined categories in the previous phase.

This phase was carried out in the manual version using pieces of coloured papers. The pieces were stacked onto an A2 paper to form more specific categories (sub-categories).

Similarly, in the Electronic version: nodes were re-constructed into sub-categories.

#### 5) Defining and naming themes

This phase included consolidation of codes from the three cycles of coding data.

Themes were defined and named according to the meaning of each group that emerged from the previous phase.

At the end of the Defining and Naming Themes phase, the results from electronic and manual versions of coding were reviewed. A list of themes has been produced based on combining the results from these two versions (detailed description in the next section).

#### 6) Producing the report

Based on the analysis of the data, a report was produced to summarise the analysis phases as well as the results.

## 2.3 Results

This study revealed a set of broad themes, which serve as initial requirements of developing a mobile learning service. These themes include:

**Learners and Devices:** Learners could be categorized as groups and individuals, and also could be categorized as adults (elderly and young people), and children with their parents, grandparents, and teachers in a school trip. Learners interact with the cultural heritage sites using mobile devices which include: mobile phones, tablets and wearable devices (e.g. google glasses). In terms of kinds of mobile applications (apps), participants reported that is important to consider all types of operating systems to meet the multi-variation interest of people regarding types of mobile devices, “...different people has different preference”..., “...is it a cross platform app?,...what kind of apps that people comfortable with?”.

A common view amongst participants was regarding considering user profile. Participants stressed that it is important to consider user preferences, “...personalize your app to suit your convenience...”, which means designing a user model that includes all user’s preferences based on user’s interests (Cocca, 2011).

**The Learning Notion:** The discussion has revealed different opinions about what the notion of ‘learning’ means. One of them considers learning as the process of getting information through courses, so, mobile learning is the ability to access online courses through a mobile device such as MOOCs (Massive Open Online Courses). The rest were divided between considering learning as; firstly, the process of retrieving information and retaining it for using when needed, secondly, as any type of information that people obtain during their daily life (e.g. looking at trains or buses time).

**Motivation and Attitude:** The participants had diverse reasons for visiting cultural heritage sites and also for using a mobile device whilst there. The main reasons that motivate people to visit cultural heritage sites are: 1) learning, 2) entertaining, 3) discovering other countries cultures. Some of participants stressed that visiting historical sites could play a significant role in terms of helping people to learn about the history; either for themselves or their children, “I would like to take my children to historical site to help them learn from them...”.

Moreover, some of participants pointed out that the nature of people, who are interested in those sites and they enjoy history, would drive them to visit those sites. Entertainment could be a reason for visiting cultural heritage sites. Curiosity in discovering cultures, either their own cultures or other society’s cultures, might influence people to visit heritage and historical sites, “...I might go to visit cultural heritage or historical sites if I am on holiday in another country” , “ I would discover society’s cultures, so the best way is to visit cultural heritage and historical sites...”.

Additionally, there was a sense amongst participants that a mobile app that provides almost all services that visitors/learners could need in cultural heritage sites, would encourage people to use it would have all their needs providing in one app.

**Services and Features:** The main debate in the focus group discussion was about some existing services that are being used by people that could be utilised for cultural heritage contexts; such as the ‘Google Now’ app that notifies people about aspects based on their interests (Google). Some features that they are hoping to find in a mobile app; such as connecting the app with the social media to share information, photos, etc., keep memories and manage pictures and diaries, “...*I go there, ...I want see memories, I wanna write down, take picture and save them...*”.

Furthermore, provision of interesting services may motivate them to visit cultural heritage sites. For instance, providing some useful information about some interesting aspects or facilities that could bring people attention, “... *I like Charles Dickens; probably I wanna to have coffee in place like Charles Dickens’ lounge...*”

In addition, participants claimed that it is important to personalize the app to meet user preferences, which could in turn, motivate people to use it, “...*personalize your app to suit your convenience...*”, also, it would be advantageous if the service can provide a story narrator, that might attract children which in turn encourages parents or grandparents to use it when taking children for a day out, “...*they can listen to a story while they are visiting the site...*” or utilize a quiz, “...*quizzes for example...*”, “... *you can make [quizzes] in different level...*” Finally, participants suggested providing a unique and international code to be recognized everywhere which will help the app to be for a global use.

**Information:** Information plays a significant role of developing mobile learning services for cultural heritage contexts. The reliability and usefulness of the information could encourage people to use this app. The debate in the discussion was about how people can obtain right information in a right time. Participants stressed that the quality of the information and the way that could be obtained is very important in terms of: 1) generating reliable information, in which should be generated immediately at a real time. Managing and maintain data in an efficient manner, “...*how many places you gonna generate this information for, is just England!?!...*”. 2) pulling information from the cloud, which is easier in terms of it doesn't need to be generated immediately, however, it needs to be checked in terms of authenticity, “...*if you are using information from the cloud, you have to think about the authenticity...*” .

Moreover, participants suggested providing some useful information for instance, how many visitors are visiting the site in a particular day or time, or some information about transportation. Those type of information could be helpful in terms of avoiding a crowdie day or to know about the type of transportation that is available, “...*it can give you information like taxis, buses, it could be helpful or how far from the bus station...*”. Participants mentioned that enabling user to review comments that was generated by other visitors might help people to have an initial idea regarding a historical site before visiting it.

**Usability, Acceptance and Usefulness:** Participants highlighted some factors that may affect people's acceptance of using a new technology such as ease of use as well as provision of useful features and information. Participants stressed that asking a lot of questions and providing many choices could make the app complicated and not easy to use, which may dissuade people from using the software, “...*[if the app is] more complicated, more interaction and more question you will lose number of users...*”.

Additionally, participants suggested giving the users a choice to disable or enable some services (e.g. switch off the notification service). This could give them an opportunity to choose what they prefer to acquire in a certain time. That may motivate them to use the app in which they do not feel restricted by such an annoying app (e.g. annoying notification), “... *make it easy when you can switch things off or not...*” this would provide users with multilevel of interaction and thus, cater for the diversity of interests leads to increased adoption.

**Challenges and interventions:** Participants underlined some challenges regarding using a mobile device in cultural heritage sites such as; a poor network quality in some remote places.

The small screen size of some devices, such as mobile phones, might be not comfortable for elderly people who have got sight problems so they might prefer to use a tablet, “...*that is an implication for elder people who may be would find it difficult to look at a small screen...*”.

The scalability might cause a problem in terms of the amount of retrieval data. For instance videos and images got tend to take a large amount of space in a mobile device memory (Alkhafaji et al., 2014). Nevertheless, using cloud computing as storage for the historical information might be considered as a solution for this issue.

Furthermore, participants pointed out that to enable people to become engaged with the app, a level of trust must be established, "... [people] may not feel comfortable with something knows where they are...". Confidentiality is an important aspect in such an app; people might not like apps that ask for personal information. This might lead to issues about why the app asks all these questions or how it knows about a particular aspect, "...when google suddenly give you an advert about some stuff you've been looking at, you are thinking how it knows that, and you thinking am not sure I like this...".

In addition, participants, emphasized that there are some people, probably the old generation, do not feel comfortable with the new technologies and may find it not easy to use, which may affect their attitude towards using a mobile device, "...is just I personally wouldn't, because I don't have that sort of easy to use a mobile phone...", "...there is a generation of people who like to have a physical book rather than an app...". However, it would be more useful to provide some interesting services such as personalizing the app that could bring their interest and encourage them to use it at cultural heritage sites, "...is like a trigger that makes somebody who never use that kind of things go and use it...", "...I can remember saying I wouldn't never have touch screen phone...then few years later you get you can't imagine life without it...".

Finally, another interesting issue has been mentioned by some participants who reported that the weather could be considered as a problem in the UK, which may prevent people to use their mobile devices in outdoor settings. However, some participants stated that using a Bluetooth headphone set might solve this problem.

### 3. DISCUSSION

The result of the focus group discussion acts as an introductory stage of the gathering user requirements process. It gives an elementary idea about how people would use mobile technology in cultural heritage contexts. In the other words, it shows how people would like to interact with mobile services. In turn, it helps in shaping the interaction process between users and systems. The results, while preliminary, suggest some interesting aspects in terms of interaction design.

One important aspect is considering user's profile; people would like to personalize their mobile app based on their profile (Cocea, 2011). In addition, even though people prefer the easiest and quickest ways for doing activities and interact with systems, they also like obtaining them in reliable and effective ways. With respect to using a mobile device to learn from cultural heritage sites, people prefer a mobile app that is easy to use and at the same time can provide rich and reliable information.

Although, some people are not keen to visit cultural heritage sites, they like to do it for their children's sake or for getting extra services while visiting those sites (e.g. visiting Christmas shops in the Dockyard). Hence, despite the diversity of participants' points of view, all of these opinions were revealed that learning about history and cultures would leads them to visit cultural heritage sites.

Another important aspect that was highlighted in this discussion is collaborative learning. The result illuminates that most of people like to share knowledge and gain information via interacting with others. In other word, they like to do activities in a group which enables them to communicate with each other, and at the same time to share information, which may enhance their learning experiences (McLoughlin and Lee, 2008, Laurillard, 2009).

One more interesting aspect has emerged from data, which is the learning perception and how people understand learning. Interestingly, the result shows that people might learn incidentally and informally. Nevertheless, most of the time is happening unconsciously in which they do not perceive that they are learning. Given that, learning could be defined as acquiring information throughout a lifetime either through educational systems, formal learning, or life experiences, informal and incidental learning (Marsick and Watkins, 2001, Ainsworth and Eaton, 2010).

The results revealed that some considerations should be taken into account when designing a mobile app in terms of interaction design. Main considerations include: user profile, ease of use, and sharing information. The next section will illustrate some results of the focus group study that has been used to embody user's characteristics and preferences using a scenario-based design method (Carroll, 1999, Fallahkhair et al., 2004).

## 4. SCENARIO-BASED DESIGN

A scenario-based design method has been widely used in the field of HCI (Carroll, 2000), this is due to its ability to envision the interaction between users and services (Rosson and Carroll, 2002). Furthermore, scenario-based method helps to identify the suitable context of use and the main actors which consider the key elements for gathering requirements (Carroll et al., 1998). We have developed a novel scenario that responds to some results of the focus group study presented as follows:

**Scenario:** Dana and Sam are parents of three children; Sarah is 6, Jannah is 8 and Tom is 10. They are keen to get their children to learn about culture and history. They do believe that the best way to do it is taking them to visit cultural heritage sites. However, they concerned about how to get them enjoy the trip and learn at the same time, especially that the kids are different in their preferences and how they like to learn. Sarah and Jannah like to listen to a story whereas Tom likes quizzes. Sam's noticed that some of his colleagues use a mobile app when visiting cultural heritage sites. This app enables them to personalise it based on their preferences and also give them an opportunity to choose how they prefer information to be presented (learning preferences). Sam downloaded this app in his mobile phone as well as to his wife's mobile phone and also to the kids' tablets. During a summer holiday, they took the kids to visit the Southsea Castle in Portsmouth. Sarah and Jannah chose listening to the historic information about this castle in a story form. Sarah chose to listen to the story as an audio cartoon film, while Jannah chose to listen to a story that was told by a narrator. Tom chose to get information by taking a quiz that asks him to find the tunnel for instance and tick the right choice about why this castle was built? At the same time the family created a network between them, which enabled the parents to keep their kids tracks, share information, and also to enjoy their trip together as a group.

## 5. CONCLUSION AND FURTHER WORK

A Small-Scale study has been presented in this paper. The study was conducted to capture an initial requirement for developing a mobile location-based learning service with respect to cultural heritage contexts. A focus group approach was used in this study. This study serves as a bedrock in the process of collecting user requirement in the user-centred design approach.

Although the current study is based on a small sample of participants, the results suggested a set of interesting themes, which will be useful to be considered in designing interactions of mobile learning services. These themes include: learners and devices; the notion of learning, motivation and attitude; services and features; information, usability, acceptance and usefulness and, challenges and interventions. A scenario-based method was used in this paper to illuminate some of the results regarding the interaction design between users and mobile services.

The study that has been presented in this paper forms the first stage of a research project. This research is intending to develop a mobile location-based learning service with respect to cultural heritage contexts. There are a number of areas that we envision to carry out further work: Firstly, to conduct further steps to fulfil the eliciting of users requirements which includes: a) distributing a questionnaire form to obtain a wide-scale of data. b) Conducting additional interviews to gain in-depth details regarding using mobile devices for learning purposes. We are also planning to develop a task model based on the results of our questionnaire and interview studies using the socio-cognitive engineering methodology (Sharpley et al., 2002). Finally, a prototype mobile app will be developed as a proof of concept based on the task model.

## REFERENCES

- Ainsworth, H. L. & Eaton, S. E. 2010. *Formal, Non-Formal and Informal Learning in the Sciences*, ERIC.
- Alkhafaji, A. S., Fallahkhair, S. & Cocea, M. Smart ambient: a pilot study to contextualise a location-based mobile application to support informal learning from cultural heritage sites. *Advanced Learning Technologies (ICALT)*, 2014 IEEE 14th International Conference on, 2014. IEEE, 199-200.

- Basit, T. 2003. Manual or electronic? The role of coding in qualitative data analysis. *Educational Research*, 45, 143-154.
- Bazeley, P. 2009. Analysing qualitative data: More than 'identifying themes'. *Malaysian Journal of Qualitative Research*, 2, 6-22.
- Bazeley, P. & Jackson, K. 2013. *Qualitative data analysis with NVivo*, Sage Publications Limited.
- Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, 3, 77-101.
- Brown, E., Börner, D., Sharples, M., Glahn, C., De Jong, T. & Specht, M. 2010. Location-based and contextual mobile learning. A STELLAR Small-Scale Study.
- Carroll, J. M. Five Reasons for Scenario-Based Design. Proceedings of the 32nd Hawaii International Conference on System Sciences, 1999 Hawaii.
- Carroll, J. M. 2000. *Making use: scenario-based design of human-computer interactions*, MIT press.
- Carroll, J. M., Rosson, M. B., Chin Jr, G. & Koenemann, J. 1998. Requirements Development in Scenario-Based Design. *IEEE TRANSACTIONS ON SOFTWARE ENGINEERING*, 24.
- Caton, K. & SANTOS, C. A. 2007. Heritage tourism on Route 66: Deconstructing nostalgia. *Journal of Travel Research*, 45, 371-386.
- Cocea, M. 2011. *User Modelling and Adaptation in Exploratory Learning*. PhD, University of London.
- Cohen, R. 1993. *Using experience for learning*, McGraw-Hill International.
- Du Cros, H. 2001. A new model to assist in planning for sustainable cultural heritage tourism. *International Journal of Tourism Research*, 3, 165-170.
- Fallahkhair, S., Pemberton, L. & Masthoff, J. A Dual Device scenario for informal language International Advanced Learning Technologies 2004 Finland. IEEE, 16-20.
- GOOGLE. *Google Now* [Online]. Available: <https://www.google.com/landing/now/>.
- Kukulka-Hulme, A. & Traxler, J. 2005. *Mobile learning: A handbook for educators and trainers*, Psychology Press.
- Lam, J., Yau, J. & Cheung, S. K. 2010. A review of mobile learning in the mobile age. *Hybrid Learning*. Springer.
- Laurillard, D. 2009. The pedagogical challenges to collaborative technologies. *International Journal of Computer-Supported Collaborative Learning*, 4, 5-20.
- Marsick, V. J. & Watkins, K. E. 2001. Informal and incidental learning. *New directions for adult and continuing education*, 2001, 25-34.
- Mcloughlin, C. & Lee, M. J. 2008. The Three P's of Pedagogy for the Networked Society: Personalization, Participation, and Productivity. *International Journal of Teaching and Learning in Higher Education*, 20, 10-27.
- Poria, Y., Butler, R. & Airey, D. 2004. Links between tourists, heritage, and reasons for visiting heritage sites. *Journal of Travel Research*, 43, 19-28.
- Poria, Y., Reichel, A. & Biran, A. 2006. Heritage site management: Motivations and expectations. *Annals of Tourism Research*, 33, 162-178.
- Rosson, M. B. & Carroll, J. M. 2002. Scenario-Based Design.
- Sharples, M. 2000. The Design of Personal Mobile Technologies for Lifelong Learning. *Computers & Education*, 34, 177-193
- Sharples, M., Jeffery, N., Du Boulay, J., Teather, D., Teather, B. & Du Boulay, G. 2002. Socio-cognitive engineering: a methodology for the design of human-centred technology. *European Journal of Operational Research*, 136, 310-323.
- Tseng, S.-P. & Chen, T.-C. 2014. educoco: A Mobile Social Learning Platform for Project-Based Learning and Collaboration. *New Horizons in Web Based Learning*. Springer.
- UNESCO 2013. *Managing Cultural World Heritage* Paris: France, The United Nations Educational, Scientific and Cultural Organization (UNESCO).
- Vavoula, G. 2003. *KLeOS: A Knowledge and Learning Organisation System in Support of lifelong Learning*. PhD unpublished, University of Birmingham.
- Vidal González, M. 2008. Intangible heritage tourism and identity. *Tourism management*, 29, 807-810.