



POLITECNICO DI MILANO  
DEPARTMENT INDACO  
DOCTORAL PROGRAMME IN DESIGN

Sociality and Meaning Making in Cultural Heritage Field.  
Designing the Mobile Experience.

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### **Abstract**

The large-scale access to cultural resources, the current change in the audience expectations, together with an underuse of the potentialities offered by mobile technology calls for a rethinking of the role of mobile interpretation within cultural institutions.

Right in the in the area of intersection between cultural heritage and technology moves the research, which deals, from a design perspective, with the role of mobile technology in fostering learning and social engagement during the visit experience.

The main aim is indeed to provide designers and developers with a framework able to guide a conscious design of cultural mobile experiences, fully exploiting the potentialities offered by this kind of technologies with clear objectives and the awareness of the means to achieve them.

Meaning making and social engagement in museums and cultural institutions at large are studied through desk research in order to get insights and to provide the design framework with a theoretical scaffolding. The world of mobile gaming is addressed as well and pointed as an interesting field to be studied and from which draw meaningful cases and best practises.

Secondary research and case studies have allowed to identify and analyse the main features to be considered in the design of a mobile cultural experience and to list a set of mechanics of interaction aimed at fostering social engagement with mobile technology.

Cultural learning approaches, models of sociality as well as mechanics derived by mobile gaming field converge into a structured design framework and a process aimed at supporting designers and developers in the creation of mobile cultural experiences and at sensitizing them about key issues in the design of mobile activities.

The framework and the process have been tested through two pilot projects, one completed and one ongoing, that showed positive results: the tool has proven useful and flexible in supporting the design of mobile cultural experiences, helping developers to take into account all the critical features and to optimize the design process.

Users involved on testing sessions of the first developed mobile application report quite accordingly an increased knowledge on the topics and to have enjoyed the experience, while the second pilot project is still ongoing and the mobile experience has not yet been implemented.

**Abstract (ita)**

L'accesso su vasta scala alle risorse culturali, il cambiamento delle aspettative da parte del pubblico, associati ad un sottoutilizzo delle potenzialità offerte dalla tecnologia *mobile* richiedono un ripensamento del ruolo della *mobile interpretation* all'interno delle istituzioni culturali.

Proprio nell'area di intersezione tra i Beni Culturali e la tecnologia si muove la ricerca, che tratta con approccio progettuale il ruolo della tecnologia *mobile* nel favorire l'apprendimento e il coinvolgimento sociale dei visitatori durante l'esperienza di visita.

L'obiettivo principale è fornire a designer e sviluppatori uno strumento in grado di guidare una progettazione consapevole di esperienze *mobile*, sfruttando appieno le potenzialità offerte da questo tipo di tecnologie con obiettivi chiari e la consapevolezza dei mezzi per raggiungerli.

Lo studio della letteratura sui temi dell'apprendimento e del coinvolgimento sociale nei musei e nelle istituzioni culturali, ha permesso di creare una struttura teorica a supporto del *design framework* e, allo stesso tempo, si è indagato anche il mondo del *mobile gaming*, ritenuto un interessante campo di studio da cui trarre casi significativi e buone pratiche.

Lo studio della letteratura e l'analisi di casi hanno permesso di identificare e analizzare le principali caratteristiche da tenere in considerazione nella progettazione di un'esperienza mobile per i Beni Culturali e di individuare una serie di meccanismi di interazione per favorire il coinvolgimento sociale.

Approcci di apprendimento culturale, modelli di socialità così come meccaniche di interazione derivate dal campo del mobile gaming convergono in un framework strutturato e in un processo, volti a supportare designer e sviluppatori nella creazione di esperienze culturali mobile e sensibilizzarli sulle questioni chiave della progettazione di tali attività.

Il framework e il processo sono stati testati attraverso due progetti pilota, uno completato e uno in corso, che hanno mostrato risultati positivi: lo strumento si è infatti dimostrato utile e flessibile nel supportare la progettazione di esperienze culturali mobile, aiutando gli sviluppatori a tenere in considerazione gli aspetti critici e ad ottimizzare il processo di progettazione.

Gli utenti coinvolti nelle sessioni di test del primo progetto pilota hanno riportato in modo concorde un'accresciuta conoscenza sui temi trattati e di aver apprezzato l'esperienza, mentre il secondo progetto pilota è ancora in corso e l'esperienza mobile non è stata ancora implementata.

## Publications

During the research, the following articles and papers based, or partially based, on the work described in this thesis have been presented:

**Spallazzo, D.** (2011). Visitors, Cultural Heritage and Locative Media. Toward a New Aesthetics of Relations. *DPPI2011. Designing Pleasurable Products and Interfaces*. New York: ACM.

**Spallazzo, D., Ceconello, M., & Lenz, R.** (2011). Walking, Learning, Enjoying. Mobile Technology on the Trail of Design Masterpieces. *12th International Symposium on Virtual Reality, Archaeology and Cultural Heritage VAST 2011*. Eurographic Association: Geneve.

**Ceconello, M., & Spallazzo, D.** (2011). Valorizing design culture through digital technologies. *Revista de Design, Inovação e Gestão Estratégica - REDIGE*, 2 (2), 44-63.

**Spallazzo, D.** (2010). *Nuove tecnologie per l'apprendimento culturale - Working paper*. Il design del patrimonio culturale fra storia memoria e conoscenza. L'immateriale, il virtuale, l'interattivo come materia di progetto nel tempo della crisi.

**Spallazzo, D., Trocchianesi, R., & Spagnoli, A.** (2009). Il museo come organismo sensibile. *AICA2009*. Roma.

### **Acknowledgments**

I would like to thank the supervisor of this thesis, prof. Raffaella Trocchianesi for her wise advise, support and kindness, my tutor prof. Mauro Ceconello for his guidance and for the involvement in didactic and research activities, and many thanks to prof. Paolo Volontè, who revised this thesis, for his time and sharp suggestions.

A special thanks to Ronald Lenz, who allowed me to spend a research period at Waag Society in Amsterdam, and thanks to the Waag team, who shared with me knowledge and a stimulating creative environment.

I would like to express my appreciation to the chair of the Doctoral Programme in Design, prof. Francesco Trabucco and to the former chair prof. Ezio Manzini for their dedicated work in growing and improving this programme.

Many thanks to all the staff of Studio Museo Achille Castiglioni, Giovanna and Irma Castiglioni, Dianella Gobbato and Antonella Gornati, who believed in my project and took part in the development of Looking for Achille Castiglioni; thanks to Cristina Bruzzi and Laura Rosati, for their hard work in developing LfAC, thanks to Paolo Maria Nosedà for his voice and time and to all the students and friends who took part in the testing sessions.

Thanks also to Francesca Sandrini and Mariachiara Bianchi of Museo Glauco Lombardi, for their work and support in the design of the mobile experiences and for the work still ahead.

I would like to thank also all those colleagues and friends who have somehow contributed to the development of this work, sharing ideas and giving suggestions.

Last, but not the least, I thank all my family for their love and support.

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# 1. Introduction.

## Framing the research

*The first introductory chapter briefly describes the area of concern in which the research is set, explaining the issues addressed, the research questions and the point of view from which the research is dealt.*

*The second part of the chapter describes the process followed, the main steps and the methods and briefly discusses the structure of this dissertation.*

The access to cultural heritage resources is a large-scale phenomenon which relates a great variety of cultural institutions with a very diversified and broad audience, increasing the complexity of the relationship between the cultural product and its public.

We are facing a mass phenomenon (Sacco & Segre, 2008) characterized by an audience that is very far from that of the first museums, made by noble or upper middle-class connoisseurs who possessed the knowledge necessary to fully understand the exhibited objects (Marani & Pavoni, 2006).

The contemporary visiting model often rests on passive contents' consumption (Serio, 2004), and it's unable to fulfil the objectives of education and enjoyment fixed by ICOM for museums (ICOM, 2010), or to foster the so called enabling cultural experience (Sacco & Segre, 2008), an experience able to overcome the simple contents' delivery towards an active audience engagement in acquiring new competencies and skills.

The audience has changed, it's becoming more diverse and consequently different expectations are arousing: someone is just curious, solicited by broad cultural interests, and looking for "serious contents" but with a light mediation in order to approach not known topics in a facilitated manner (Serio, 2004); others are eager to enter a constructive dialogue with contents and the institutions (Tallon, 2008) and to play an active rather than passive role in their visits (Johnson, Witchey, Smith, Levine, & Haywood, 2010) while a part of the audience "*expect the ability to respond and be taken seriously [...] to discuss, share and remix what they consume*" (Simon, 2010, p. ii).

Museums and cultural institutions must decide whether to follow these evolving visitors expectations or not (Schwarzer, 2001) and how best to do so (Tallon, 2008).

Digital technologies and in particular mobile technologies are often pointed as a driver for the change and the next wave of innovation (Treviranus, 2009; Johnson, Witchey, Smith, Levine, & Haywood, 2010) but the employment of these tools in cultural heritage field is anything but unproblematic.

The introduction of digital technologies in museums and cultural institutions finds very often curators and education directors neither prepared nor equipped technically and culturally (Settis, 2002) and consequently unable to design and realize autonomously a digital experience (Treviranus, 2009) or simply to direct their development.

The deployment of digital interpretations for museums has been therefore quite completely outsourced (Tallon, 2008) and its evolution has been a technological implementation of traditional visiting models (Proctor, 2010).

What follows is very often a poor user experience (Treviranus, 2009) and digital technologies are not exploited at their best, because "*employed by staff*

*in ways similar to those during the very early days of museum field*" (LaBar, 2011, p. 383).

Consequently, to "sporadic bursts of excitement and innovation" (Treviranus, 2009, p. 3) in mobile interpretation, respond strong critics of those who consider mobile museum interpretation a poor way to squeeze extra money from "zombie-visitors" who like to be told what to think (Hickling, 2004).

Despite the Manichean opposition described above what emerges is that digital technologies and, in particular, mobile technologies are not fully exploited for their real potentialities (Tallon, 2008) and that the "mobile museum experience is often poorly designed, poorly supported, poorly integrated and rarely sustained" (Treviranus, 2009, p. 3).

What still lacks is a fair vision of mobile technologies for what they are, tools which can help to create a better relation with visitors (Crew, 2007), to enhance the learning experience (Klopfer, 2008), to connect users with other users and to provide new opportunities to engage them in novel ways (Gammon & Burch, 2008).

The discussion about mobile interpretation is therefore no longer about technologies themselves (Johnson, Witchey, Smith, Levine, & Haywood, 2010) but about the practises they enable (Salgado, 2009) and how these practises could be integrated in the field, to enhance visitors' experience (Crew, 2007).

The discourse about practises departs from the world of technology and technologist and enter the design domain, an in-between discipline that tries to bridge cultural heritage field and its instances with technologies and their potentialities.

Designers are those who has the responsibility to foster design behaviour in the society at large (Nelson & Stolterman, 2003) and to act as key agents, envisioning new practises and people's behaviours within museums and cultural institutions (Salgado, 2009).

On this interpretation of design as a bridging discipline and of designer as gardener (Nardi & O'Day, 1999) and facilitator, relies the research, which introduces design competencies and skills within the domain of cultural heritage and technology.

### **1.1. Hypothesis and research questions.**

The research stems from the remarks discussed above and relies upon a main hypothesis: a designed use of mobile technology during visits to museums, cities and cultural institutions can enhance learning and social engagement.

The term designed, matched with use, explains that the research is dealt from a design perspective and the main aim is to provide designers and developers with tools able to guide a conscious design of the mobile experiences, fully exploiting the potentialities offered by mobile technologies with clear objectives and the awareness of the means to achieve them.

From this main hypothesis derive the research questions that guide it:

1. Which cultural learning models can be fostered exploiting mobile technologies?
2. Which models of sociality and what level of social engagement can be pursued through mobile technology during a cultural visit?
3. Which mechanics of interaction are enabled by mobile technologies and how they can be exploited to design a mobile experience?
4. Which are the main factors to consider while designing a mobile experience and how are they interrelated? What could be a general framework to support the design of a mobile experience?
5. What process could be followed to optimize the design of a mobile experience and which competences are required?

The research moves therefore within the design discipline but intersects three other main domains: one is the world of mobile technology, the second is the field of cultural learning while the third addresses sociality issues within cultural institutions.

Design is placed in the intersection, bridging the instances of each domain and trying to traduce them into a working and feasible solution, but design is also the point of view from which these three domains are observed and informs the approach of the entire research.

Looking at the schema (fig. 1.1) we can say that the research aims at defining what could be at the inner intersection of the three domains but in order to achieve it, all the other areas must be addressed.

## **1.2. Steps and methods.**

The three-years long research has followed eight main steps, summarized in the schema (fig. 1.2), in order to achieve the stated goals.

The first step is characterized by secondary research and is aimed at defining the state of the art in the field and consequently to refine the scope of the research and detail the driving questions.

Together with these outputs the first phase resulted also in the definition of the main methods to be employed in the research, namely secondary

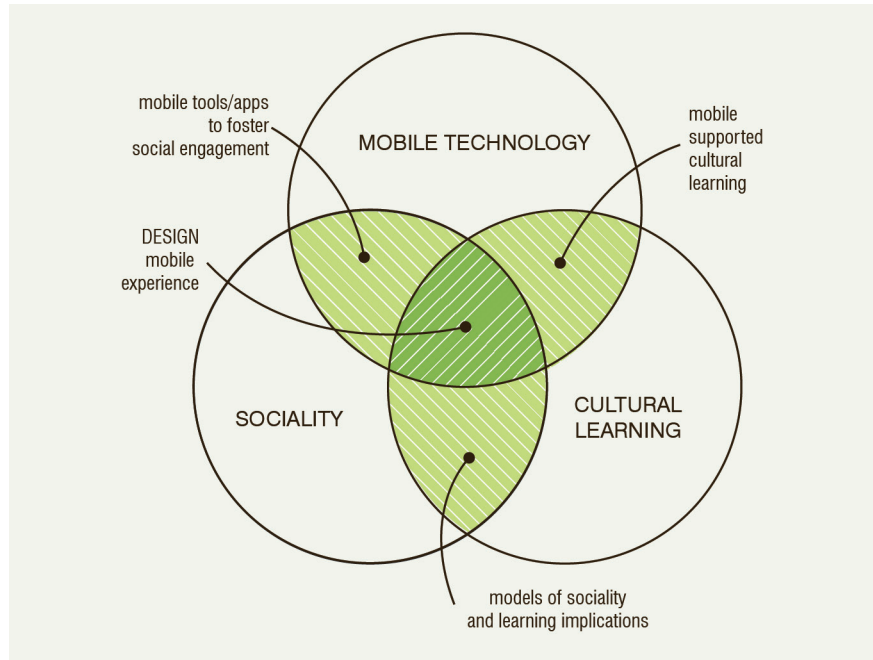


Fig. 1.1  
Research domains.

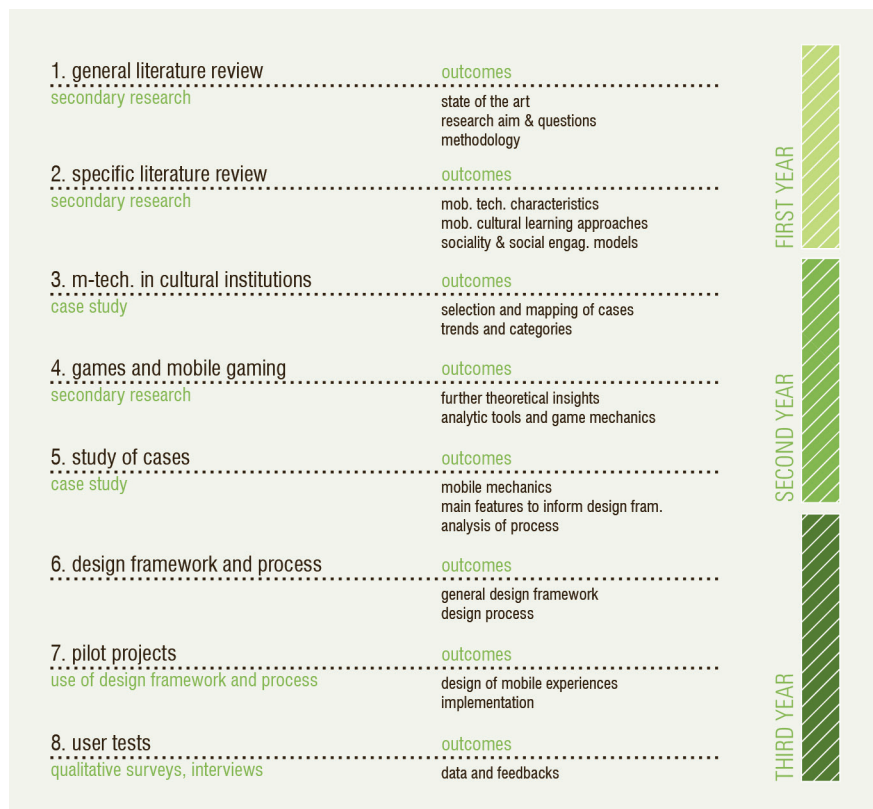


Fig. 1.2  
Steps, methods and  
outputs arranged per  
years.

research and case studies, plus others such as pilot projects and qualitative surveys employed to verify the outcomes.

The first allowed also to identify the main domains to be addressed – mobile technology, cultural learning and sociality in cultural institutions – which are analysed and studied in the second phase.

Secondary research is the method chosen to address the three issues in order to identify tools for the analysis of cases and to gain insights for the definition of the general framework. The three domains are approached from a design perspective, which means that the study is conducted to support and inform the design framework.

The outcomes of the second phase are therefore the definition of the characteristics and potentialities of front end mobile devices, a broad classification of cultural learning approaches with mobile technology and the identification of the models of sociality and levels of social engagement achievable during the visit.

This phase resulted also in the definition of a “filter” to read and map several applications of mobile technology within museums and cultural institutions, aimed at clustering such a various phenomenon and at identifying trends and growing sectors.

This third activity consists therefore in the selection and mapping of remarkable projects that employ mobile technology to enhance the visit experience and ends with the identification of three main categories of mobile applications.

Mobile gaming is identified as a fast growing sector that suits particularly well with the defined aim of active visitors engagement: a new phase, characterised by secondary research, has been then necessary to gain insight about mobile gaming domain and to identify further tools to analyze the meaningful cases.

The fourth step is therefore again based upon desk research and informs the subsequent, characterized instead by a deep instrumental study of fourteen cases, selected by time and activity (Stake, 1995).

The expected result of this phase is to understand how game mechanics and dynamics can be employed within a mobile experience for museums and cultural institutions to foster learning and different levels of social engagement. From the study of cases emerges also which are the main features that can inform the design framework and which is the process they followed, data useful to inform the sixth phase.

This phase sees the creation of the general design framework, intended as a tool to support the design and the implementation of mobile cultural experiences and defines the possible steps to be followed in order to achieve

efficiently the stated goals.

Pilot projects are then structured following the design framework and the process during the seventh step, in order to test their usefulness, feasibility and efficacy.

The results achieved with the pilot projects are finally verified in the last step through users tests, qualitative surveys and interviews.

Summarizing, the research has been mainly conducted through eight steps and the alternate use of two methods, secondary research and case study.

Secondary research has been employed to outline the state of the art in the field and in the involved domains, to structure the design framework and in order to inform the study of cases.

Case study has allowed firstly to map and organize a significant number of mobile applications in cultural heritage field and secondly to analyze in depth those which resulted meaningful for the research.

Users tests followed by qualitative surveys and interviews have been also used to test the results of the first pilot project, LfAC, and consequently have feedbacks on the usefulness and efficacy of the design framework.

To the methods employed to carry the research out we should add those, deriving mainly from the design domain, proposed within the design framework and applied during the implementation of the pilot projects. The proposed process itself derives indeed from the typical design process that Nigel Cross includes in the design praxiology (Cross, 2006) and scenario building (Carroll, 1999; Manzini, 2001) is seen as the culminating phase of a creative process of generation of new visiting models.

### **1.3. Structure and chapters.**

The structure of this thesis (fig. 1.3) broadly follows the steps described in the previous section and is organized in three parts.

The first part includes the chapters two, three and four and present a broad literature review addressing mobile technologies and their use in the heritage field (chapter two), cultural learning and possible common approaches with mobile learning (chapter three), sociality issues within museums and cultural institutions (chapter four).

The second part is structured in four chapters and describes the study of cases and data analysis: chapter five portrays the use of digital mobile devices in museums, art cities and cultural organization through the analysis and categorization of several mobile applications; chapter six analyses games and mobile gaming to gain insight in the field and to inform the study of cases; chapter seven reports the structured study of fourteen cases and the collected

data are analysed and discussed in chapter eight.

The third part describes the research results, presenting in detail the design framework and the related design process (chapter nine) and how it is applied to develop the pilot projects (chapters ten/eleven).

The thesis ends with a discussion about the achieved results, the contribution and limits of the research as well as the future works.

Each chapter is introduced by a brief summary which outlines the contents and is ended by the list of bibliographical references cited within the text. A complete list of all the references, organized in alphabetical order, is instead presented at the end of the document.

1. Introduction. Framing the research	
2. Mobile technology and cultural heritage	
3. Cultural and mobile learning	
4. Participatory cultural institutions and social engagement	
	} PART 1
5. Mobile experiences in cultural institutions	
6. Mobile experiences and games	
7. Study of cases	
8. Data analysis	
	} PART 2
9. Design framework and process. Detailed description	
10. Pilot project. Looking for Achille Castiglioni	
11. Pilot project. A mobile experience for G. Lombardi Museum	
12. Discussion and conclusion	
	} PART 3
References	

Fig. 1.3  
Chapters and parts of  
the thesis.



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# PART I

background and literature review



## 2. Mobile technology and cultural heritage

*“Mobile, digital, and personal: these are the three defining qualities of this technology category” (Tallon, 2008, p. XVIII)*

*Chapter two aims at outlining the state of the art on the use of mobile technology in museums and cultural institutions.*

*The first section describes what is intended with the term “mobile technology” within this thesis, a clarification useful to avoid easy misunderstanding connected to the term. Several definitions of mobile technology are presented as well as some statistics about its use.*

*The following sections outline the development and the use of this technology in cultural heritage field and describe its characteristics, in order to correctly frame the experiences analyzed in the next chapters and to provide an overview on a tricky and debated issue.*

*The last part of the chapter describes the characteristics of the most commonly used mobile devices and summarizes the expected future developments.*

### 2.1. Mobile technology: definition and statistics.

The term mobile technology indicates a set of technological devices that have portability as defining characteristic and it is usually associated to the term mobile computing, which usually refers to a human-computer interaction model in which the machine, the computer is carried during its use.

Wireless communication, mobile devices and mobile software<sup>1</sup> are the defining traits of mobile computing: the first element underlines issues related to data transmission<sup>2</sup>, the second highlights the portable nature of the devices, often indicated as handhelds, while the third element addresses the peculiarities of mobile software.

A not exhaustive list of devices classified as mobile technology can encompass several heterogeneous devices: mobile phones and smartphones, MP3 players, satellite navigation system, handhelds, tablets, portable videogames, professional GPS, beepers and so on.

Other definitions (Naismith, Lonsdale, Vavoula, & Sharples, 2004) are more focused on the context of use, juxtaposing a personal to a shared use, and assimilating the concept of mobile with personal: it stems a Cartesian plane (fig. 2.1) played on the two polarities personal/shared and portable/static that allows to count among mobile technology devices not exactly portable or personal.

Looking at the chart (adapted from Naismith, 2004) which maps mobile technologies employed to support learning in formal contexts, we can notice that the devices commonly defined mobile are all encompassed in the quadrant defined by personal and portable.

Naismith et al. (2004) includes in mobile technologies also interactive kiosks, very often used within museums and cultural institutions, despite their use is not strictly personal and the portability of these devices is not comparable to that of mobile phones.

Personal and portable are therefore the two main traits of mobile technology emerging from the first definitions, to which Tallon (2008) adds a third characteristic, that is to be digital:

*“Mobile, digital, and personal: these are the three defining qualities of this technology category. They are mobile in that they are location independent, available anytime, anywhere; they are digital in that their functionality is based on an electrical system that uses discrete values; and they are personal in that there is a one-to-one relationship between the visitor and the medium, with the visitor in control.”* (Tallon, 2008, p. XVIII)

1  
[http://en.wikipedia.org/wiki/Mobile\\_computing](http://en.wikipedia.org/wiki/Mobile_computing)

2  
Vasilis Koudounas -  
[http://www.doc.ic.ac.uk/~nd/surprise\\_96/journal/vol4/vk5/report.html](http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/vk5/report.html)

Tallon's definition highlights that mobile devices' portability is not only linked to the concept of physical movement but also to the absence of links with specific temporal and spatial dimensions: anytime, anywhere is the motto that summarizes the independence of mobile technology for physical spaces and temporal limits.

The term "digital" is also useful to better define mobile technology, excluding for example analogical, personal and portable devices such as walkman that are currently out of the contemporary technological landscape and do not meet the requirements of multimediality connected to mobile technology.

The UCT - Universal Convergence Technology, indicated by Kim Veltman in 2005 (Veltman, 2005) as new paradigm in substitution of the ICT - Information and Communication Technology finds its more mature exemplification in front end mobile technology (Valtysson, Holdgard, & Ling, 2011) such as smartphones and tablets that combine tools and consequently media usually separated into a single device.

We listen to music, take photos and film, we call, we see films and videos, chat, surf on the web and get traffic information with a single portable, personal and digital technological device.

Convergence which becomes a cultural characteristic in the famed essay of Henry Jenkins *Convergence Culture* (Jenkins, 2006) and in his blog *Confessions of an Aca-Fan* in which he defines convergence as:

*"... the flow of content across multiple media platforms, the cooperation*

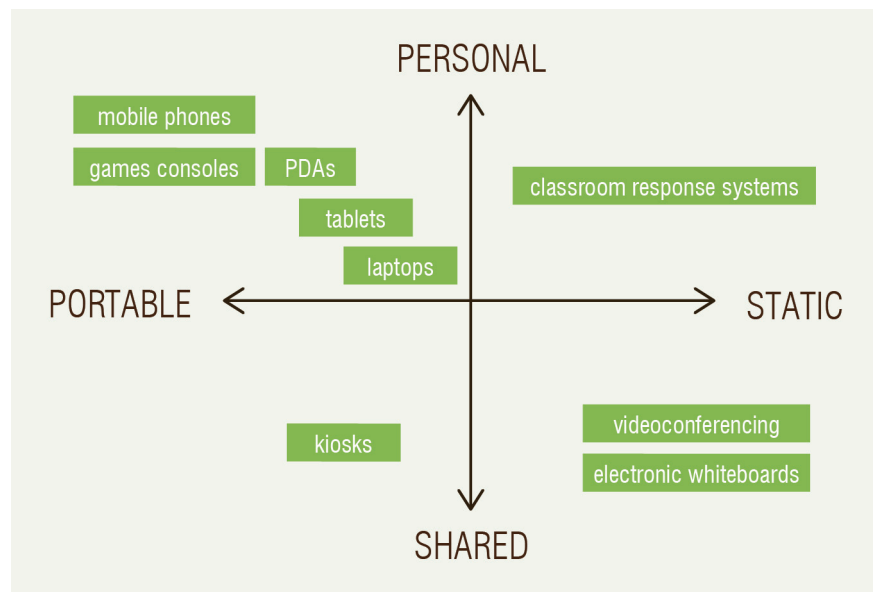


Fig. 2.1  
Classification of  
mobile technologies  
(adapted from Naismith et al., 2004).

*between multiple media industries, and the migratory behavior of media audiences who would go almost anywhere in search of the kinds of entertainment experiences they wanted. [...] I will argue here against the idea that convergence can be understood primarily as a technological process - the bringing together of multiple media functions within the same gadgets and devices. Instead, I want to argue that convergence represents a shift in cultural logic, whereby consumers are encouraged to seek out new information and make connections between dispersed media content. The term, participatory culture, is intended to contrast with older notions of media spectatorship.”<sup>3</sup>*

Convergence is therefore not only the physical union of different media but also a cultural model, for sure enabled by technological evolution, which proposes a new role for users who can leave that of spectator to become active explorer and creators of contents.

A main characteristic of front end mobile devices is indeed the capability to surf the web wherever the user is, allowing both real time browsing and content creation through collaborative web tools, such as blogs, forums and social software, defined MoSoSo - Mobile Social Software (Lugano, 2008; 2010) when accessed through mobile devices.

This section has presented several definitions of mobile technology and has briefly mentioned some of its implications: in order to avoid any possible misunderstanding it's useful to clarify that the term “mobile technology” is used in its most common usage, referring to smartphones, mobile phones, palms and tablets and assuming personal, digital, portable and multimedia as the its defining traits.

### **2.1.1 Mobile technology data.**

Data about mobile usage in the world and its growth outlook are here briefly presented in order to properly frame the phenomenon of mobile interpretation in cultural heritage field.

An effective infographics from Microsoft (Richmond, 2011) summarizes successfully main data about mobile usage.

In the world are in use about 4 billion mobile phones, more than half of the estimated world population<sup>4</sup>, of whom little more than 1 billion are smartphones.

According to an estimation by Gartner, represented in the infographics too, in 2013 web accesses from mobile devices will overcome those from desktops and laptops (Gartner, 2010) and, today, 91% of web accesses through mobile devices is aimed at socializing.

About one third of smartphone users enter their social networks through

<sup>3</sup>  
[http://www.henryjennings.org/2006/06/welcome\\_to\\_convergence\\_culture.html](http://www.henryjennings.org/2006/06/welcome_to_convergence_culture.html)

<sup>4</sup>  
 Referred to data retrieved from <http://www.worldometers.info>



mobile devices and one third of Facebook users and half of Twitter subscribers access them with mobile devices. The users most active on mobile social networks are women aged between 35 and 54.

According to an analysis by comScore (2011) the growth of smartphone owners between 2009 and 2010 was about 10 percentage points in U.S. and 9.5 in EU5, reaching 28% of the market in U.S. (The Nielsen Company, 2010) and about 15 millions of Italian citizens.

As expected the youngest are those more affected by the mobile phenomenon with high utilization rates between 13 and 44 years with peaks in age groups between 18 and 34 years (comScore, 2011).

Smartphone are mostly used to play (61%) for the weather forecast (55%), maps and searches (50%), social networks (49%), music (42%), news (36%), activities that very often requires a connection to the web.

The purpose of this short sub-section is not to deal with the topic in a complete way, but the few reported data provide a fairly clear image of the dimension of mobile technology phenomenon in the world.

## **2.2. Mobile technology and cultural heritage: a brief history.**

The first handheld used within a cultural institution has been tested in 1952 at the Stedelijk Museum of Amsterdam: the audio descriptions in four languages (Dutch, English, French and German) were broadcasted by a main transmitter to visitors through receivers with headset. The technology was certainly front end but it forced visitors to move in synchrony, following the received directions.

The following technological development allowed then to have smaller and lighter tools, such as the Sony Walkman used for the first time in a famed exhibition dedicated to Tutankhamen with eight recorded tapes. Visitors can now move freely not necessarily in sync and with the guide's pace but the path is still rigid and linear.

The year 1993 marks the introduction of digital devices at the Louvre, and for the first time visitors can choose the audio contribution moving freely and at their pace in the museum's halls.

These three examples are chosen by Tallon (2008) to summarize a technological development that lasted little more than fifty years, that brought handhelds from offering ...

*“... custom content on a standardized device with set functionality - the audio guide - to offering custom content on different hardware platforms with custom functionality suited first to the museum but increasingly also to the visitor.”* (Tallon, 2008, p. XXI)

The same examples are reported by Proctor and Tellis (2003) to describe the evolution of mobile interpretation through its two main revolutions: the cassette-player and the rise of digital.

If the first revolution allowed a significant reduction in size of the handhelds while maintaining a limit in the time of the contribution (45 minutes) digital technology freed visitors both from limits of time and from the linear tour, letting them choose path and pace.

Mobile technology, in the definition of portable, personal and digital, entered the cultural heritage field to support the visit experience around the early 90s of last century and quickly replaces previous media, while keeping the visiting model unchanged.

The guided tour with audio contributions, be it free or linear, spreads and audio guides take the known form: according to Tallon (2008) the achievement of a stable hardware configuration implied a slowdown in research in the field, or better, a research conducted almost exclusively by societies active in the field and consequently not disseminated.

The technological evolution has substituted and improved the mobile tools, introducing palms, MP3 players and smartphones, but the audioguide is still the paramount model for the visit to museums, galleries, aquariums, zoos, cities and other cultural institutions open to the public.

The main change, enabled by mobile technology, according to Proctor (2010) is the transition from the linear tour to a random choice of contents: the stops, called *soundbites* by the author, are still the units of the tour, be they contextual information, guidance or music, organized in a linear tour or randomly.

To the soundbites mode, characterized by audio excerpts, Proctor adds the soundtrack mode aimed at giving *“them the keys to unlock the magic they find there. Help them see what the curator sees [...] Show them the sparks that fly when you put those artists in the same room, or on the same Web page. Directly or indirectly, explain the process that produced the connections among selected exhibits, the color of the walls, the type fonts.”* (Proctor, 2010)

The soundtrack model is still anchored to the audioguide but introduces an interesting breakpoint: to the information about works, objects, monuments are substituted or added contextual information and the backstage of the exhibition. The attention is shifted from the technological evolution to contents, of which curators are trying to reclaim.

The actual business model is indeed based on outsourcing to private audioguide providers both the contents creation and the research and consequently the technological evolution: they provide museums with audioguide

for free, and in turn they get a percentage on the revenues (Tallon, 2008).

The enhancement of the visit experience with mobile technology, read in the context of historic-technological evolution, does not seem to be radical: the main revolution has been the substitution of the traditional human guides with digital ones (Smith, 2009).

According to Smith the mindset of museums and cultural institutions has not changed and they used and are still exploiting the new multimedia, context aware and connected devices as the sons of the audioguide without fully exploiting the potentialities they possess. Following this interpretation, multimedia guides do not represent an evolution of the audioguide but a parallel track of development which need a new mindset in order to be fully exploited (Smith, 2009).

Interactivity, connectivity, feedback and social media are the tools provided by technological evolution (Proctor, 2010), which offer new opportunities but also new difficulties for the creation of novel visit models through mobile technology.

The technological evolution in cultural heritage field is therefore no more related to the technical development in itself, but rather to portability and ubiquitous web access, that link what happen in the exhibition space with what happens outside, letting visitors connect with objects, ideas, people, places and institutions (Johnson, Witchey, Smith, Levine, & Haywood, 2010).

Connectivity and portability are basic expectations of today, museums and cultural institutions need to deal with (Tallon, 2008) in order to meet visitors needs.

### **2.3. Mobile devices and their characteristics.**

This section describes the most common mobile devices actually in use within museums and cultural institutions, their characteristics and potentialities.

The devices are here described following a categorization proposed by Proctor (2010; 2011) who clusters them according to the potentialities they offer: audio players, multimedia devices, mobile phones, smartphones and tablets.

#### **2.3.1. Audio players.**

Contemporary audio players are the outcome of a technological evolution began with the cited project at Stedelijk Museum, going through the famed reel-to-reel audio players, employed for the first time in Franklin Roosevelt's house in 1957 (Damala, 2009), the Sony Walkman till mp3 players that

can contain several audio contributions in diverse languages within a single device.

These players are usually borrowed from the institution and allow visitors to freely browse within the exhibition, following a personal path and selecting contents with codes that relate to the exposed works.

Audio contributions are usually edited by museum staff or by societies that provide the service and assume a communication one-to-many: these devices are usually called audioguides, today sharply criticized.

The most frequent critics regard the unidirectional model of communication they propose, with visitors in a passive role, absorbing information packaged from experts (Cosley, et al., 2008), usually standardized and simplified in order to get a better appeal on a mass public, that risk to be boring for experts (Proctor, 2011).

Furthermore contents are usually related to the exposed works or exhibits (Cosley, et al., 2008) and miss contextual information (Smith, 2009). Very often contents' quality itself is questioned: audio contributions are frequently created by societies which provide the service (Tallon, 2008) and when edited by curators and experts they could suffer their poor experience in designing mobile experiences (Treviranus, 2009).

Furthermore the free tours that audio players propose, induces weird visitors' behaviour, who crowd in front of the works included in the tour, standing still until the end of the contributions (Proctor, 2011), and disregard quite completely works of the permanent collection in favour of those of temporary exhibitions or of the greatest hits (Smith, 2009).

*“A ruse to squeeze an extra few quid from gullible patrons happy to amble around like zombies while a disembodied academic voice tells them what to think.”* (Alfred Hickling in Guardian, November 24th 2004, cited by Tallon, 2008).

The merciless opinion of the British journalist summarizes the critics against audioguides and the distrust that visitors themselves have for these devices, together with the awareness that only a few institutions can afford to avoid them, and find a personal niche *“like the beloved corner grocery that still uses an oldfashioned cash register”* (Schwarzer, 2001).

### **2.3.2. Multimedia guides.**

The term multimedia guide is here referred to those digital tools that support different types of media: audio, video, pictures, texts plus some characteristics of interactivity.

The first use of multimedia guides in cultural field is dated back by Damala to 1994, with the project iGo, developed for the Minneapolis Institute of Art (Damala, 2009): in 2005 Proctor collects 101 examples of use of multimedia guides in cultural institutions (Proctor, 2005).

Common examples of multimedia devices employed in museums are palms and front end mp3 players - like the famed Apple iPod that in some versions offers the same potentialities of a smartphone - that accompany visitors with audio contributions and videos, images and textual descriptions.

These devices very often allow a level of interactivity that goes beyond the simple contents selection, providing tools for choosing further deepenings or different contents referred to the same work, or to select the path on an interactive floor map.

Multimedia device can be owned by the institutions which rents them or by visitors themselves: it's an important innovation that free the institution from the need to provide a service and allow visitors to use their own device.

The institutions that make available on their website free of charge podcasts or vodcasts (Proctor, 2010) are growing: the first - born from the union of iPod and Broadcasting - are audio contributions that the user can download on his own device and listen to during the tour; the latter are the video version of podcasts and the name derives from Video On Demand Broadcasting.

This contents, once downloaded on devices can be experiences also in a place other than museums, galleries, art cities, freeing the guide from the exhibition.

Very often multimedia guides combine different media in order to provide visitor with a richer experience, matching for example images and texts to audio descriptions: a particular kind of multimedia guide is the visioguide, that does not exploit every available media but provide only audio descriptions matched with simple visual information (Damala, 2009).

The actual use of multimedia guides does not differ very much form that of traditional audio guides, based on a tour with stops and the delivery of audio descriptions together with images, texts or videos.

The already cited opinion of Smith (2009) who maintains that multimedia guides are completely different in contents and platform from the audioguides, identifies the cause of this attitude in a failed real change of the mindset.

Together with the ability to handle different media, these devices very often allow users to surf the web through wi-fi connectivity and to localize them through GPS and consequently deliver contextual information.

This capability, together with the access to the web, are the basis for a different use of multimedia devices that goes beyond the tour model (Proctor,

2010), enabling visitors' active involvement and a meaningful relationship among people, institutions and collections (Johnson, Witchey, Smith, Levine, & Haywood, 2010).

### **2.3.3. Mobile phones.**

In this subsection I deal with traditional mobile phones, able to call and send sms but without the capabilities offered by smartphones, such as to install new software, connect to the web, or have geographical information. This definition is necessarily very blurred because there are mobile phones able to surf the web but not equipped with GPS - Global Positioning System, - and other that allow user to manage data but not to access the web and so on.

The discrimination isn't therefore made in terms of capabilities but rather looking at the tools used during the visit: with mobile phones I identify those tools that exploit calls and sms to support the visit from those that exploit web access, mobile apps and location awareness, classified as smartphones and tablets.

The visit systems based on mobile phones, indeed, usually require visitors to dial a number signed on the exposed work or to send a sms to get back an audio or textual description.

Among the possible applications offered by mobile phones, Proctor counts also a bidirectional communication between the institution and the visitor who can listen to an audio contribution but also answer quizzes and leave a vocal or textual comment (Proctor, 2011).

A project which employs mobile phones is City Treasure (Botturi, Inversini, & Di Maria, 2009) that uses sms to involve classes on school trip in a treasure hunt in Lugano (analyzed in chapter 7).

Without going to the heart of the chosen business model (who pays the calls or the sms?) is interesting to note that even in the case of mobile phones, as well as with some multimedia devices, there is a marked tendency towards the use of visitors' devices.

The main advantages deriving from the use of a personal device are essentially two: it frees the institutions from the operating costs of devices and of the connected service and avoid the training of visitors to the use of a new system and interface (Proctor, 2010).

On the contrary, a limit deriving from the use of a personal device during the visit may stem from the fear to run out of battery (Proctor, 2010; 2011; Schavemaker, Wils, Stork, & Pondaag, 2011) and from the costs of calls and sms, especially abroad, a condition that excludes foreign tourists almost completely from the use of such devices.

Moreover, the use of a mobile device in a closed exhibition space such as a museum or an art gallery can be problematic both for possible signal's reception difficulties and for a diffused cultural resistance to the use of mobile phones in public indoor spaces.

#### **2.3.4. Smartphones and tablets.**

The difference between mobile phones and smartphones is almost vague and variable in time and a clear definition of their characteristics and differences does not exist: as an example we can think about contemporary mobile phones with performance and applications for sure more advanced than those of a two years older smartphone.

The distinction, as already stated, is not only based upon device's performances and potentialities, but rather on the use we make of the tool to support the visit: mobile phones exploit sms and calls, while smartphones make use of internet connection, location awareness, augmented reality and so on.

Making a simplification for the sake of clarity we can list some peculiar characteristics: unlike traditional mobile phones, smartphones are based on non proprietary operating system that allow to add applications, can connect to the web through wi-fi or 3G data, have a camera and very often can localize users with GPS/aGPS.

These functions are very often available also on front end tablets, that offer a wider screen that makes easier to consult information.

Following the subdivision proposed by Proctor (2011) we can identify two main ways to employ smartphones and tablets to support cultural heritage visits, namely web apps and mobile apps. The first are websites optimized to be accessed by mobile devices, which offer a web version of the guided tour, accessible both by visitors on site and remotely.

If the institution offers wi-fi coverage, web tours are usually free of charge and are not linked to a specific operating system and consequently accessible from every mobile devices with a browser. Very often web tours offer additional tools such as the possibility to publish contents on social networks, take photos and share them and leave comments visible to other visitors (Proctor, 2010).

Smartphones and mobile apps are certainly the fastest growing in cultural heritage field and all provide visitors with the same functionalities offered by web tours together with the stability of contents stored on devices.

The main disadvantage deriving from mobile app is the necessity to develop apps for each different operating system using exclusively their distribution system: AppStore for Apple, Android Market and Amazon AppStore for Android, OviStore for Symbian, BlackBerry App World for RIM, Windows

Marketplace Mobile from Windows Mobile systems, just to list the most common.

This brief list shows how difficult and expensive could be for a cultural institution to develop an app for smartphones, difficulties that usually force them to choose a unique platform, thus limiting the use only to the owners of a particular device.

A recent study on the use of the iPhone to support museums visit (Valtysson, Holdgard, & Ling, 2011) has highlighted the enormous success of the Apple phone: at August 2010, three years after the launch, 360 iPhone apps for museums were available on the App store (one new app every three days), of which only 1 out of 7 was developed by and for public museums.

The authors, among the reasons for iPhone's success, identify a fetishism tied to Apple products and brand, made evident from the race engaged by American and European museums to be the first to develop an iPhone app. The Apple phone is also often associated to the so called "creative class", an interesting audience for museums and galleries, easily reachable through the App store (Valtysson, Holdgard, & Ling, 2011).

If we add to these data that in the world only 1% of mobile phones is an iPhone, as reported by the same authors, it's clear that mobile apps and in particular iPhone apps are addressed to a small percentage of the population, with high income and front end in technological adoption.

iPhone has become the epitome of smartphones, despite the relative low market penetration, but it's only one of the several smartphones that mark a growing trend and cover about 30% of the American and European mobile market (The Nielsen Company, 2010; comScore, 2011)

#### **2.4. Mobile Technology and Cultural heritage: front end applications and hypothesis of development.**

In 2010 museum edition of "The Horizon Report" edited by Johnson et al. the most promising technology for the cultural field are analyzed according to three different temporal horizons (Johnson, Witchey, Smith, Levine, & Haywood, 2010). Mobile technology and social media are pointed as the technologies that are more likely to be widely adopted in short time (0-12 months), while in two/three years augmented reality browsers and location based services should be widely employed. Semantic web and gesture based computing are instead foreseen to diffuse in cultural field within four or five years.

All the technologies listed above are linked, more or less, to mobile technologies and the next two sub sections deal in particular with LBS, location



based services, and with AR, augmented reality, while some remarks about social media and MoSoSo, mobile social software, will be presented in chapter four.

#### **2.4.1. LBS - Location Based Services.**

The acronym LBS stands for location based service, a term that indicates services able to dynamically update information and contents on the basis of the actual position of users.

These service are not exclusively linked to mobile technology, because they could be accessed for example from a desktop PC, but their huge success is certainly due to smartphones, and in particular to those able to track automatically users' current position.

Proctor in 2005 and Damala four years later propose a list of nine ways to locate visitors in the exhibition space (Proctor, 2005; Damala, 2009): manual selection of the position, through numeric keypad or directly on the map; wireless network; infrared; GPS and aGPS; Bluetooth; RFID; ultrasound; radio frequency and image recognition.

To these methods we can add the diffused QR-Codes, Quick Reference Codes, and Tags, bi-dimensional codes readable through mobile cameras and directly linking to contents, applications or web pages.

Looking at LBS not from the point of view of technology but from their employment, Oomen et al, propose five clusters of location based services: location-aware display of contents, contributing contents by end users, QR codes, augmented reality applications and location based games (Oomen, Brinkerink, & van Toor, 2011)

Localizing the user can have positive effects not only for visitors who can get contextual information and direction within the exhibit space, but also for the staff of institutions who can analyze the flow of visitors (Damala, 2009). Furthermore institutions can extend their influence outside their borders, for example driving potential visitors towards the institution itself (Johnson, Witchey, Smith, Levine, & Haywood, 2010) or disseminating contents for promotional purposes, or proposing urban tours that link museums' collection with the surrounding space.

#### **2.4.2. AR - Augmented Reality.**

Augmented reality means superimposing and mixing an informative layer (usually multimedia) on reality, creating an hybrid space of interaction among reality and virtuality.

The first applications of augmented reality date back to the early 70's but it's only since 2008 that augmented reality browsers are widely diffused,

mainly thanks to mobile devices (Johnson, Witchey, Smith, Levine, & Haywood, 2010).

This software exploit smartphones' camera, GPS, compass and web access to combine information with the surrounding reality, superimposing data to locations. Some applications do not exploit GPS to deliver contents, but image recognition or dedicated marker.

The most widespread augmented reality browsers, just to name a few, are Layar, Junaio, Wikitude and Yelp, which deliver diverse informative layers both cultural and commercial.

In museum field augmented reality browsers are a further tool to deliver contextual information about the collection, to recreate settings and virtual reconstruction of objects and damaged monuments.

The iTacitus<sup>5</sup> project, funded by European Commission, allow for example to layer images and historic reconstruction on buildings; the project Street Museum<sup>6</sup> of the Museum of London uses augmented reality to layer historic photos in the right place where they was taken, organizing diffused exhibitions in London downtown.

The Powerhouse Museum<sup>7</sup> of Sidney uses Layar to set up an exhibition similar to the Street Museum and the Stedelijk Museum of Amsterdam has experienced for years augmented reality (Schavemaker, Wils, Stork, & Pondaag, 2011).

5  
<http://itacitus.org/>

6  
<http://www.museumoflondon.org.uk/resources/app/you-are-here-app/index.html>

7  
<http://www.powerhouse-museum.com/layar/>

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### 3. Cultural and Mobile Learning

*“A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment.”*  
ICOM, 21st General Conference in Vienna, Austria, in 2007

*The latest ICOM definition of museum explains clearly why is important to dedicate a chapter to the topic of learning in museums and cultural heritage organizations: education is indeed the first aim of a museum together with study and enjoyment.*

*This chapter tries to define a comprehensive even if not fully exhaustive state of the art in the field of cultural heritage learning and mobile learning, aimed at identifying some possible contact points.*

*The first sections describe the most common theoretical approaches to cultural heritage learning, followed by a description of the definitions and theories related to mobile learning.*

*The following sections describe the most diffused learning paradigms and their impact on cultural and mobile learning, while the last section elaborates the findings and draws conclusions useful for the development of the research project.*

### 3.1. Cultural (heritage) learning.

*“Reviewing the learning theory literature was a complex task. Part of the difficulty was that learning theory is embedded within a number of overlapping and interrelated fields, such as educational theory, psychological theory and educational psychology. Each of those areas have developed a whole body of theoretical discourse and research relevant to learning”* (Kelly, 2007).

The paragraph drawn by Linda Kelly’s PhD thesis well describes the difficulties found in reviewing the museum learning literature and this section tries to order and synthesize the main definitions and theories developed in the field.

The starting point is the ICOM definition of museum in which we read the three main aims for these institutions: education, study and enjoyment.

If the second purpose is more related to academics, curators, and scholars in general, the first and the third ones are specifically addressed to the society, to museum goers who seek a learning and enjoying experience.

The enjoyment is intended as an integral part of learning, as the motivation that make us learn better and remember more, but is very far from the word edutainment, defined by Hooper-Greenhill a “clumsy word”, because, joining the two words education and entertainment, implicitly admits that the two concepts are irreconcilable (Hooper-Greenhill, 2007).

The word chosen in the definition to describe the learning experience is education, that, in certain areas of museum studies, is considered out of date: Hooper-Greenhill, for example, prefers the word learning because it indicates a major focus on the process and on the learner, while education still implies a focus on the institution and its educational delivery (Hooper-Greenhill, 2007). Other scholars go a step further and substitute the word meaning-making to learning (Falk & Dierking, 2000; 2008) emphasizing the active role of the learner, and meaning making is the word chosen in the title of this dissertation.

The literature dealing with learning/meaning-making in cultural heritage organizations is frequently, if not exclusively, related to museums but we can include also other cultural heritage institutions, such as libraries, archives, archaeological digs and other usually addressed with the acronym GLAMs - Galleries, Libraries, Archives and Museums.

Cultural heritage learning is a terminological attempt to include these kinds of organizations in the a broader definition that Zipsane refers to four areas of activity: archival contexts, cultural environments, museums and galleries (Zipsane, 2007). According to Zipsane, learning in archival context

is mostly related to the pleasure of discovery and to the potentially endless digging into archival material; the authenticity is the key factor for learning in open-air environments (archaeological digs, art cities, historic building ...) where learners can associate what they see with what they hear and touch; learning in museums is based on the collections and their interpretation and it's a process aimed at helping visitors to gain insights; learning in art galleries is instead based on the active interpretation of the artworks.

Despite the excessive simplification operated by the Danish author, the effort toward the overcoming of the term museum learning is appreciable.

Anyway it's undeniable that the discussion about cultural learning stems from museum studies and develops in that field, but it's equally important to consider learning in other contexts characterized by the relation between the patron and the collection - whatever it is - and played in a context that is essentially aesthetic (Lord, 2007).

Barry Lord defines museum learning as "*a transformative, affective experience in which we develop new attitudes, interests, appreciation, beliefs, or values in an informal, voluntary context*" (Lord, 2007). Museum-based learning is primarily affective because it is based on our feelings about the collection and very distant from formal learning that stems from studying books (Lord, 2007).

The definition proposed by Lord well suits with all kinds of cultural heritage organizations and the same remark is suitable for the definition advanced by Hooper-Greenhill, who describes museum-based learning as "*physical, bodily engaged*" whose styles are influenced by "*the nature, pace and range of this bodily movement*" (Hooper-Greenhill, 2007). Learning is strongly based on the physical experience, is intended as performance, "*enactment, intervention, participation, involvement and response*". The museum-goers "*are characterized as active, using their emotions and imagination to participate and engage with experience as they encounter them.*" (Hooper-Greenhill, 2007).

Both the definitions of Lord and Hooper-Greenhill emphasize the affective and emotional nature of museum-based learning that plays an important role also in the interpretation of Zipsane: cultural heritage learning involves several senses and learners are active, both physically and mentally, and emotionally affected (Zipsane, 2007).

Another aspect common to all the definitions described above is the physical nature of museum-based learning that Dexter Lord defines as a "*kinaesthetic experience, during which our mere movement seems to change the space, and the place somehow change us.*" (Dexter Lord, 2007). According to Dexter Lord the museum is a place with assigned meaning, an interpreted space where visitors wander and browse, and are stimulated to see things in a new

way.

What still misses is the social side of cultural learning which emerges in the interpretation of Leinhardt et al. that define it as a process of meaning construction, a socially mediated phenomenon, the consequence of a “*dialogue among the curatorial premise, the supporting tools of signage and other symbol systems, and the visitors themselves ...*” (Leinhardt, Knutson, & Crowley, 2003).

This interpretation echoes the Conversation Theory of Pask (1976) that describes the learning activity as a dialogue between systems of knowledge, a theory that plays an important role in the field of mobile learning, as described in the next sections.

Learning is no more focused on what has been learnt (Falk & Dierking, 2000), is a more “*haphazard and subtle affair*” (Hooper-Greenhill, 2007) and the results of the process are not well defined and uncertain.

The five GLOs - Generic Learning Outcomes, are an attempt to provide a common language to speak about the results of the learning process, without providing external measures to be achieved (Hooper-Greenhill, 2007):

1. Knowledge and understanding
2. Skills: intellectual, practical, professional
3. Attitudes and values
4. Enjoyment, inspiration, creativity
5. Activity, behaviour, progression.

In Hooper-Greenhill’s vision these five GLOs are not “*targets to be met*”, but rather “*a way of capturing and encoding ineffable qualities such as experience, pleasure and creativity*”, outcomes hardly quantifiable that need qualitative methods to be measured (Hooper-Greenhill, 2007).

Enjoyment and the ability to think creatively are for Rounds the final outcomes of a curiosity-driven museum visit, aimed at satisfying curiosity rather than acquiring specific knowledge (Rounds, 2004).

The author distinguishes the extrinsically motivated museum visit, finalized at “*acquiring knowledge for which we have a known use*” from intrinsically motivated/curiosity-driven visits that “*produce knowledge for which we have no known use*”, being the first narrow but deep and the latter wide but shallow (Rounds, 2004).

Rounds’ theory of curiosity-driven visit doesn’t exclude a learning-driven activity in cultural institutions but emphasizes enjoyment over learning in the ICOM definition, and gives importance to the process of learning in itself.

In his article *Learning for fun: the unique contribution of educational leisure experiences*, Packer (2006) draws very similar conclusions defining learning



for fun as the “*phenomenon in which visitors engage in a learning experience because they value and enjoy the process of learning in itself, rather for any other instrumental reasons, such as attainment of specific learning outcomes*” (Packer, 2006, p. 329)

In his five propositions about learning for fun, Packer supports his theory with empirical data from which it emerges that visitors seek an experience that is not a combination of education and entertainment but rather an experience in which learning is enjoyment. To fulfil this condition the experience must convey a sense of discovery and fascination, appeal to multiple senses, have the appearance of effortless and give different choices (Packer, 2006).

### 3.2. Mobile learning.

A very general definition of mobile learning can be found in Wikipedia:

*“The term covers: learning with portable technologies including but not limited to handheld computers, MP3 players, notebooks and mobile phones. M-learning focuses on the mobility of the learner, interacting with portable technologies, and learning that reflects a focus on how society and its institutions can accommodate and support an increasingly mobile population. There is also a new direction in M-Learning that adds mobility of the instructor and includes creation of learning materials “on-the-spot, “in the field” using predominately smartphone”.*<sup>1</sup>

According to this definition the key factors are the tools, that must be portable, and the mobility be it of the learner or of the teacher. The same remarks are proposed by O’Malley et al. that define m-learning as a process that happens when the learner is moving and taking advantages of mobile technologies (O’Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003).

Adding to these key factors Laurillard proposes a view of mobile learning as a digitally-facilitated site-specific process, that is motivating because it allows ownership and control (Laurillard, 2007).

More focused on conversation is the definition of Mike Sharples et al. who propose m-learning as “*the process of coming to know through conversation across multiple contexts amongst people and personal interactive technologies*” (Sharples, Taylor, & Vavoula, 2005).

Dialogue, conversation is the main process involved in mobile learning that allows the negotiation of meanings and the construction of a stable even if transient interpretation of the world. The authors make no distinctions between human and interactive systems involved in the conversation but notice that their definition lacks in recognizing the moral and social worth of

<sup>1</sup>  
<http://en.wikipedia.org/wiki/Mlearning>

human beings in respect to technology (Sharples, Taylor, & Vavoula, 2005).

The continuous communication with and through technology is a key factor of mobile and context aware technology, to which Klopfer et al. add other four issues: portability, social interactivity, context sensitivity and individuality (Klopfer, Squire, & Jenkins, 2002).

The characteristics proposed by Klopfer are echoed by Naismith et al. in the five key issues to be considered in designing mobile learning technologies: context, mobility, learning over time, informality and ownership (Naismith, Lonsdale, Vavoula, & Sharples, 2004).

Mobile learning is then an informal process that happens in mobility and is related to the context but also happens over time, with no precise temporal constraints: *anytime, anywhere* is the slogan that best describes this approach.

Kukulska-Hulme et al. propose a different and broader interpretation of mobile learning, viewing mobility as a property of the interaction between people and technology (Kukulska-Hulme et al., 2009). In this light mobile learning is the combined experience of retrieving data through different media, be them a desktop computer, a mobile phone or an interactive application.

The extended notion of mobility proposed by the authors is developed through five interrelated aspects of mobility (Kukulska-Hulme et al., 2009): *mobility in physical space* that refers to people on the move; *mobility of technology* that means both the portability of the devices and the possibility to transfer attention across devices; *mobility in conceptual space*, that is the movement from a concept or a topic to another one; *mobility in social space*, that refers to the different social contexts in which the learners perform; *learning dispersed over time*, that describes learning as a combined experience that happens through different media and across time.

Mobile learning is then the process of acquisition of new knowledge, experience and skill, while in mobility (in the multifaceted interpretation described above) and augmented by personal and public technology (Kukulska-Hulme et al., 2009).

The concept of augmentation is also echoed in Klopfer's essay Augmented Learning (Klopfer, 2008) that refers to mobile technology as a tool able to enhance the learning experience.

All the theories cited in this section as well as in the previous one about cultural learning are grounded in several and different broad learning paradigms that are briefly described and discussed in relation to their impact on mobile and cultural learning.

### **3.3. Cultural learning, M-learning and learning paradigms.**

Behaviourism, cognitivism and constructivism are the broad learning theories usually implied when discussing about learning in instructional environment (Siemens, 2004) and frequently cited by cultural learning theories. Referring in particular to museum/cultural learning theories two more theories - social and socio-cultural - can be added as well as the experiential learning theory, proposed by Kolb, and the recent theory of Connectivism, developed by Siemens.

The same broad learning theories are frequently employed in the field of mobile learning too, shaping activities, aims and models according to the different pedagogic paradigms.

Naismith et al. propose an interesting classification of mobile learning projects according to six theory-based categories: behaviourist, constructivist, situated, collaborative, informal, support of learning (Naismith, Lonsdale, Vavoula, & Sharples, 2004). In his critic review of mobile learning Frohberg (2006) argues that a theory-based clustering is not a good choice because pedagogy is not stable within mobile learning and because the categories are not well distinct and linked each other.

Despite Frohberg's remarks, it's useful here to present the different pedagogic approaches in order to understand how they are differently transposed within the fields of cultural learning and mobile learning and which are possible points of contact.

In particular four main paradigms, behaviourism, constructivism, socio-cultural theory and collaborative learning are addressed from both the points of view, while cognitivism, experiential learning and connectivism are dealt only in regard to the cultural field.

#### **3.3.1. Behaviourism in cultural and mobile learning.**

The behaviourist learning model is based on the idea that learning is the result of a change in the behaviour, in response to an external stimulus (Kelly, 2007). The mechanic on which this model works is stimulus-response-feedback, and aims at delivering very simple and focused knowledge.

Museums which adopt this learning model usually have a strong didactic approach aimed at transmitting knowledge from the institution to visitors (Hein, 1998). Following this approach collections are usually displayed within a didactic framework that structures concepts from the simplest to the most complex.

Discovery learning, according to Kelly (2007) fits in this category but represents a shift from teaching to learning, with an increased attention on the needs of the learners. Discovery learning usually structures the exhibition in

children's museums with hands-on activities that stimulate visitors to explore and ask questions.

In the behaviourist approach, visitors are seen as "*empty vessels waiting to be filled*", in the words of Peter Samis (2008, p. 4), passive containers of information transmitted by the institutions (Gammon & Burch, 2008): it's the *one size fits all* model that doesn't take into account the visitors' previous knowledge and their personal attitudes.

If we look at behaviourist paradigm from mobile learning point of view, we can notice that projects based upon behaviourist model are usually structured as stimulus-response-feedback, a model commonly defined "*drill and practice*" (O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003) or "*drill and feedback*" (Naismith, Lonsdale, Vavoula, & Sharples, 2004).

The learner is given information, is then asked to answer a question and finally the system provides a feedback: the transmission of information happens with the teacher-learner model, and the teacher can be a digital tool. The advantages of this model is essentially the possibility to tailor contents and to easily verify the progresses of learners (Naismith, Lonsdale, Vavoula, & Sharples, 2004)

### **3.3.2. Constructivism: how it affect cultural and mobile learning models.**

The constructivist theory openly challenges the idea of learner as an "empty vessel", suggesting that humans construct meanings on the basis of their prior knowledge and experiences.

While in behaviourist and cognitivist theories knowledge is seen as something external to the learner that need to be internalized (Siemens, 2004), knowledge in constructivism stems from the active role of learners who integrate new information in his or her cognitive schemata (Kelly, 2007).

George Hein, in his speech at the CECA conference (Jerusalem, 1991) and in the essay *Learning in the museums* (1998) discusses the meaning of constructivism for museums presenting the characteristics of the constructivist approach to cultural learning. In synthesis:

1. Learners need to be active and engaged in doing something
2. While learning, people learn about the process of learning as well as about the contents
3. Engaging the hands is important as well as the mind: physical involvement is necessary for children and desirable for adults
4. Learning is a social activity and conversation is linked to the learning process
5. Exhibits must provide different entry points to help people to under-

stand the message

6. We learn if stretched a little beyond our knowledge but within our grasp

7. Learning is contextual and we learn in relation to our prior knowledge, beliefs and prejudices

8. Learning happens on long periods of time and we need time to learn, to reflect and to revisit an idea.

Kelly observes that constructivism is widely employed as learning paradigm in science centres and museums, where the hands-on minds-on activities proposed are encouraged, but she also notices that even if *“supported by many museum practitioners, there are still some debates about its usefulness as an approach to developing museum exhibitions and public programs.”* (Kelly, 2007, p. 53).

Despite the debate mentioned by Kelly, constructivism have had a strong influence in the discussion on museum learning of the last ten years and the most recent definitions, presented in 3.1, are not exempt from its influence.

The constructivist learning paradigm claims for a direct and active involvement of learner, who is no more a passive “empty vessel” but rather an active constructor of its own knowledge, provided that he or she is given an environment in which to learn and the proper tools to operate. Mobile devices, thanks to their portability, allow users to be surrounded by real/realistic environment and in the same time provide tools supporting the learning activity (Naismith, Lonsdale, Vavoula, & Sharples, 2004).

Participatory simulations are an example of constructivist-based use of mobile technologies (Colella, 2000): the learners are given a networked device and are involved as actors in immersive simulations of complex systems (Naismith, Lonsdale, Vavoula, & Sharples, 2004).

The advantage deriving from this model is that learners can interact directly with the environment and test the effects of their actions on the system in real time.

Very often participatory simulations are structured as games or better as role-playing augmented reality games that will be discussed diffusely in chapter six.

### **3.3.3. Socio-cultural theories in museums and mobile devices.**

The work of the Russian psychologist Vygotsky (1978) is the background of the socio-cultural theory with which shares the idea that learning is a socially mediated process.

From the literature analysis conducted by Kelly it results that the socio-cultural theory applied to museums is underpinned by four elements: individual, culture, environment and historical development. The aspects related

to the individual include motivations and interests; culture refers to people's behaviour; environment refers to the physical context while the historical developments refers to the cultural practises (Kelly, 2007).

The socio-cultural theory criticises the emphasis on individual and maintains that the learning process does not happen only in the mind but is rather a social and collaborative process (O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003).

The situated learning paradigm, mainly developed by Jean Lave and Etienne Wenger (1991), can be classified within this approach, claiming that learning is not only the personal acquisition of knowledge but a process of social participation (Naismith, Lonsdale, Vavoula, & Sharples, 2004) that requires social interaction and collaboration and that knowledge needs to be presented in real contexts (O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003).

Learning is unintentional and we acquire knowledge by being involved in a "community of practice": moving from the periphery of the community to its centre we become more active and engaged in the culture, till assuming the role of experts - legitimate peripheral participation (Lave & Wenger, 1991; O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003).

Knowledge is gained if presented in authentic contexts and if learners are engaged in a community: mobile technology can be a powerful support to this approach with its portability, context-awareness and connectivity.

The EU funded project MOBIlearn<sup>2</sup> (2002-2005) recognized the importance of situated learning approach, exploring the concept of context-awareness as a means to stimulate learning and social interaction. The tests conducted in three different contexts (museum, first aid and university campus) demonstrate that mobile technology has great potentialities in supporting these activities, allowing interaction among people and providing information and guidance (Kukulaska-Hulme, Sharples, Mildrad, Arnedillo-Sánchez, & Vavoula, 2009).

Related to the socio-cultural theory, even if not completely encompassed, is the contextual model of museum learning proposed by Falk and Dierking (2000; 2008) that gives emphasis on context.

In their view the learner is involved in a continuous dialogue with his or her physical and socio-cultural environment (Falk & Dierking, 2008) and the learning process is influenced by three main contexts: personal, socio-cultural and physical.

The authors propose twelve factors that structure the three contexts (Falk & Dierking, 2008, p. 24):

*"Personal Context*

- *Visit motivation and expectations*
  - *Prior knowledge and experience*
  - *Prior interests*
  - *Choice and control*
- Sociocultural Context*
- *Cultural background*
  - *Within group social mediation*
  - *Mediation by others outside the immediate social group*
- Physical Context*
- *Advance organizers*
  - *Orientation to physical space*
  - *Architecture and macroscale environmental factors*
  - *Design of exhibitions, programs, and technology*
  - *Subsequent reinforcing events and experiences outside the museum”.*

#### **3.3.4. Social theories and collaborative learning.**

The behaviourist and cognitivist approaches are focused on the personal dimension of learning, the socio-cultural theories recognize the paramount role of social mediation in meaning making process but still focus on the individual as subject of the learning process.

Social theories take into account how the personal knowledge is shared within a social group and how the process of meaning making can be enhanced and collectively constructed through social engagement.

Museums and cultural institutions are perfect places to study how sociality can affect learning and unsurprisingly several studies address this topic (Blud, 1990; Uzzell, 1992; 1993; Paris, 1997; Falk & Dierking, 2000).

Some theorists maintain that social engagement during museum visit can actually improve the learning process (Paris, 1997; Silverman, 1999), while others underline that a social visit provide different benefits in respect to a personal one (Debenedetti, 2003; Packer & Ballantyne, 2005): anyway they share the common idea that social engagement can modify the learning process. These theories are particularly relevant to the aim of the research and are described in detail in next chapter which deals with sociality issues (4.4.).

Social engagement therefore affects meaning making and the collaborative learning model proposes activities that involve more than one learner who attempt to gain knowledge and to learn together: sharing experiences, skills and resources both face-to-face and through digital devices, learners engage in a common learning process.

CSCCL - Computer supported collaborative learning is an example of use of digital technology to promote and enhance interaction among learners, a

paradigm that acquires mobility and context-awareness with the use of mobile devices (MCSCCL).

Mobile technology allows indeed easy communication among devices but also data sharing and does not exclude face-to-face communication among learners (Naismith, Lonsdale, Vavoula, & Sharples, 2004).

Conversation, be it face-to-face or through blogs, communities, chat rooms, is necessarily the main means of the learning process in this approach. Gordon Pask with the conversation theory (Pask, 1976) describes the learning process as a conversation between different systems of knowledge, and these systems can be people or computers (O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003; Naismith, Lonsdale, Vavoula, & Sharples, 2004).

Learning happens when the systems (learner/computer) share their descriptions of the world and through conversation they come to a shared understanding of the world (O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003).

### **3.3.5. Cognitivism. Learning from stories.**

The cognitivist theory heavily relies upon Piaget's stage of development, and views learning as something that happens in the head through continuous development.

The four stages of human development proposed by Piaget - sensorimotor, preoperational, concrete operational, formal operational - are frequently used as guidelines to structure didactic activities (Kelly, 2007). Together with Piaget, also Bruner's theory on narrative (Bruner, 1986) is frequently included within this approach, informing models of cultural learning based upon storytelling.

According to Bruner, humans are natural storytellers and the stories are powerful tools to teach and learn: museums and cultural heritage organizations are perfect place to tell stories and the narrative approach to learning is diffusing among these institutions (Kelly, 2007).

Also Gardner's multiple intelligences theory is at the basis of this approach, exploding the "one size fits all" model of learning (Samis, 2008) typical of the early museums didactic activities.

### **3.3.6. Experiential learning. Learning by doing.**

David Kolb proposes a cyclical model of learning that have been employed by several museum practitioners in implementing exhibits. The learning process is structured through four steps: concrete experience, reflective observation, abstract conceptualization and active experimentation, that said in another way could be do, observe, think and plan (Kolb, 1984). In the process



it's not important from which stage one begins but it is mandatory to close the cycle in the proposed order.

To the four steps, Kolbs associates also four different learning styles: assimilator, that learns through logical arguments; converger, who needs a practical application of theories; accommodator, who needs an hands-on activity and diverger who learns observing and collecting information (Learning Theories).

Kolb's theory is not specifically addressed to museums and cultural institutions but his work is the basis for the theories of Serrell (1996) and Dunmore (2006) who revise his learning styles and adapt them to the museum field.

Ron Wakkary et al. report the four different learning styles proposed by the authors (Wakkary, Hatala, Muise, Tanenbaum, & Corness, 2007, p. 8):

*“Dunmore's model (2006)*

- *Browsers – wander randomly until an object grabs their attention, then require an explanation (about 50% of visitors)*
- *Followers – want the museum to select objects, and require narrative explanations of themes (about 40% of visitors)*
- *Searchers – visit the museum to learn about particular objects (about 9% of visitors)*
- *Researchers – have expert knowledge and expect specialist access (about 1% of visitors)*

*Serrell's model (1996):*

- *Analytical learners – learn by thinking and watching, prefer interpretation that provide facts and sequential ideas*
- *Imaginative learners – learn by feeling and watching and by listening and sharing ideas. Enjoy social interaction, like to be given opportunities to observe and to gather a wide range of information*
- *Common-sense learners – learn by thinking and doing, prefer to try out theories and test them on themselves, and look for solutions to problems*
- *Experiential learners – learn by feeling and doing, enjoy imaginative trial and error, prefer hands –on experiences, and they look for hidden meaning.”.*

### **3.3.7. Connectivism. How technology is modifying our way to learn.**

*“Over the last twenty years, technology has reorganized how we live, how we communicate, and how we learn. Learning needs and theories that describe learning principles and processes, should be reflective of underlying social environments. [...] Learners as little as forty years ago would complete the required schooling and enter a career that would often last a lifetime. Information development was slow. The life of knowledge was measured in decades. Today, these foundational principles have been altered. Knowledge*

*is growing exponentially. In many fields the life of knowledge is now measured in months and years.*" (Siemens, 2004)

These considerations are the starting point of the theory proposed by George Siemens (2004; 2006), the Connectivism, that elaborates a new theory of learning based on the transformations introduced by digital technologies and the web.

The main statement of the theory is that we can no longer acquire personally all the knowledge we need and that we derive our competence from forming connections. Weak ties assume an important role in allowing short connections between information: innovation, as well as serendipity and creativity can stem from connections between diverse ideas and fields (Siemens, 2004).

In Siemens's definition the know-how and know-what is enhanced by know-where: it's important to know where to find quickly information and rapidly divide what is important from what is not.

The ability to acquire new knowledge is related to the ability to form a personal network that feeds into organizations and institutions, which feed back to the network and to the individual (Siemens, 2004).

The principles of Connectivism as enounced by the author are (Siemens, 2004):

- *“Learning and knowledge rests 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”,*

A following elaboration of the theory results in the Connectivism taxonomy (Siemens, 2006), staged in six points. Awareness and receptivity, connection-forming, contribution and involvement are the first three steps that bring learners from acquiring basic skills to the active contribution in

his own network/ecology. Pattern recognition, meaning-making, praxis are the last three steps that allow learners to recognize what is happening, understand what it means and think about thinking (metacognition).

Peter Samis (2008) notes that the first three steps of connectivism taxonomy fit well with the three categories of visitor participation proposed by Bonnie Pitman at the 2007 Annual Meeting of the American Association of Museums: aware, curious and committed.

Connectivism provides some interesting cues for cultural learning and introduces technology in the learning process not only as a supporting tool but rather as something able to alter or rewire our brain and to define and shape our thinking (Siemens, 2004).

### **3.4. Cultural and mobile learning: towards an integration.**

This section tries to match the previously discussed theories of cultural learning with those supporting mobile learning projects, finding out points of contacts and common approaches.

The scope is not to define integrated paradigms or models able to fit with cultural and mobile learning, because it's out of the aim of this thesis, but rather is to identify main common approaches useful for the development of the research and the case studies' analysis.

A possible way of comparing and matching the different paradigms is to follow the subdivision proposed in this chapter and based on the broad learning theories they refer to (behaviourist, constructivist ...).

This subdivision has been adopted in the previous sections because it's clear and comprehensible for the description of the paradigms but it shows some weakness if used to cluster existing mobile cultural learning projects or to support the development of new ones.

The main weakness is that a classification based upon the pedagogic paradigms doesn't allow a clear placement of the projects because the categories are not well distinct (Frohberg, 2006). A participatory simulation (constructivism) can for example be situated (and so fitting into the socio-cultural paradigm) and ask users to answer specific questions (behaviourist).

Another issue risen by Frohberg is that pedagogy in mobile learning projects is not stable and little design changes can shift the project from a paradigm to another (Frohberg, 2006).

To overcome these limitations there's a need of broader and more flexible categories, able to encompass different learning paradigms and describe an attitude more than specific behaviours.

The proposal here advanced is to use three main categories based on three

possible major aims of the projects: learning, be engaged and socialize.

I call the three categories respectively focused, immersive and collaborative (fig. 3.1). These approaches will be employed in categorizing the projects examined within the case studies' analysis (chapter seven) and in the general framework proposed in chapter nine.

#### **3.4.1. Focused approach. Clear information and quantifiable outcomes**

The focused approach encompasses all the projects mainly aimed at providing visitors with a learning experience with quantifiable outcomes.

The projects that fit in this category are usually based on a teacher-learner model, in which the institution gives visitors focused and precise information.

The behaviourist learning paradigm is here highly influential and discovery learning is very often translated into mobile supported treasure hunts and quizzes with a clear sequence of steps and objectives that learners have to meet.

Drill and feedback activities are commonly employed to deliver information, test the results of the learning process and give feedback, but the common mobile multimedia tours can easily fit in this class as well.

The list describes the main characteristics of the focused approach:

- learning is the main aim
- the approach is teacher-centred
- mobile devices are typically the teachers
- information are usually highly personalised
- information are delivered as separated and not coordinated bites
- the collection is more important than the context
- contents are edited by experts and curators.

#### **3.4.2. Immersive approach. Learning by acting.**

The projects fitting in the immersive approach are mainly focused in providing visitors/learners an engaging and totalising experiences, in which they play an active role.

Compared to the focused approach there's a shift from a teacher-centred to a learner-centred model: the institution does not give visitors ready information but rather a set of tools to construct a personal meaning.

The strong influence of constructivism is clear in its focus on physical and mental engagement but also the cognitivism and Bruner's theory on storytelling are echoed.

Participatory simulations are a typical example of immersive approach but also augmented reality games, role-playing experiences and other projects

heavily based on a narrative background can be encompassed in this approach.

The main characteristics of the immersive approach are:

- enjoyment and visitors active engagement are the main aims
- the approach is learner-centred
- mobile devices are tools to build knowledge and coordinate the actions
- very often is a role based experience and information are tailored on the role
- the contents are usually encompassed within a broader story
- the collection is as important as the context
- contents are edited by experts and curators but also by writers.

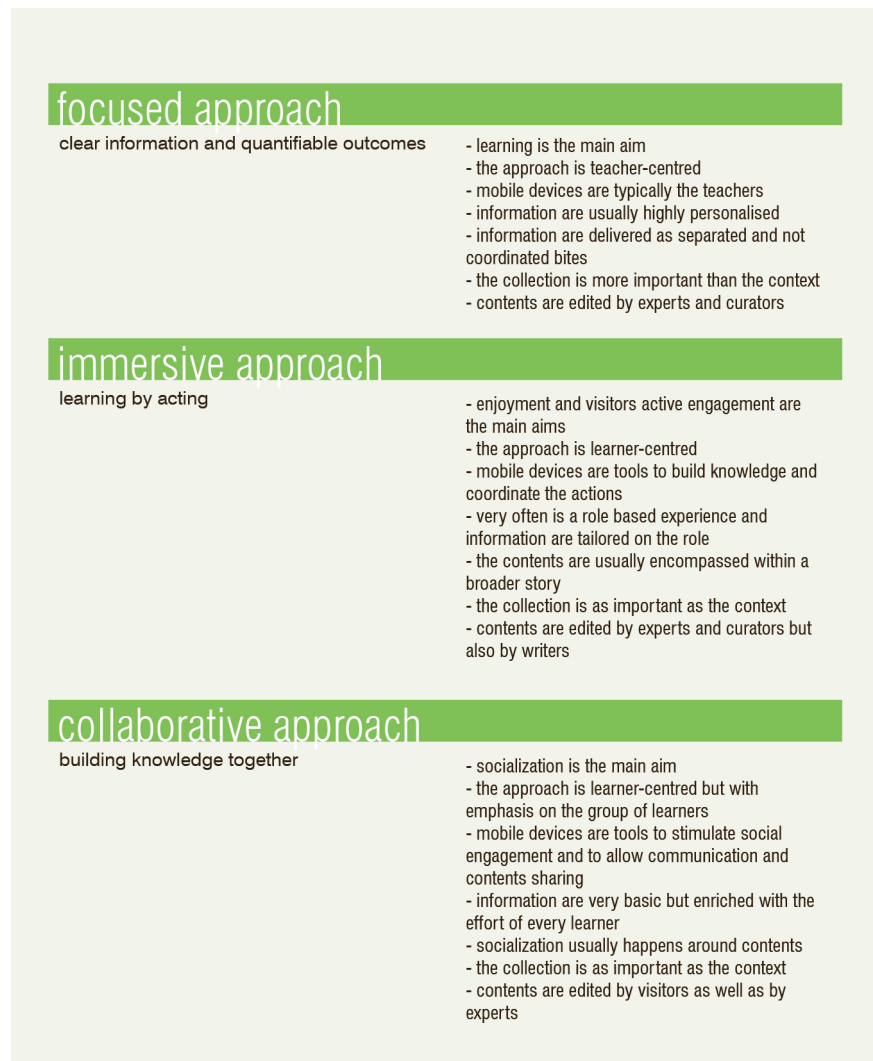


Fig. 3.1  
Mobile-Cultural  
learning approaches.  
Synthetic schema.

### **3.4.3. Collaborative approach. Building knowledge together.**

The last category encompasses projects that attach importance to socialization among visitors, providing them with experiences, tools and conditions to foster dialogue and collaboration.

The learning process is a social activity in which every participant share his or her knowledge or skills toward a common goal, as suggested by the collaborative learning theory.

The context, in Falk and Dierking's meaning (2000) - personal, socio-cultural, physical - assumes an important role and mobile devices help visitors/learners to gain information from the environment and from other visitors and to communicate both face-to-face and through the devices.

The collaborative approach does not refer to a specific learning paradigms but has strong influences from the socio-cultural theory, the conversation theory and the collaborative learning models.

Examples of collaborative approach are group mobile games or multimedia tours specifically addressed to families.

The main characteristics of the collaborative approach are:

- socialization is the main aim
- the approach is learner-centred but with emphasis on the group of learners
- mobile devices are tools to stimulate social engagement and to allow communication and contents sharing
- information are very basic but enriched with the effort of every learner
- socialization usually happens around contents
- the collection is as important as the context
- contents are edited by visitors as well as by experts.

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## 4. Participatory cultural institutions and social engagement

*“People go to museums in groups: couples, families, classes, friends, dates. Museum spaces, while seemingly imposing and alienating, have been appropriated by visitors as large public spaces in which to engage in social activities. The visit-ritual element here is about socializing with other museum visitors.”*  
(Bell, 2002, p. 6)

*Chapter four addresses the topic of sociality within museums and cultural institutions at large, dealing with the diverse possible social configurations and the different levels of social engagement that can be pursued.*

*The second part of the chapter briefly deals with issues related to visitors’ participation and User-Generated Contents and tries to understand if there are and what could be the benefits of social engagement in terms of learning.*

*The last part of the chapter deals with the tricky and unsolved question of mobile technology as personal and/or social tool.*

The need of social engagement, aroused by social networks and web 2.0, is increasingly affecting museums and cultural institutions that are today facing with new requirements from visitors that desire to “*create, share and connect with each other around contents*” (Simon, 2010, p. ii).

Nina Simon describes the participatory museum as its obvious evolution in the social web era, an institution open to the change that needs to coordinate the actions of the individuals towards a collective useful result (Simon, 2010).

The *me-to-we* process described by the American museum practitioner is another step towards the idea of museums and cultural institutions as social places where people can engage in direct or indirect social experiences. More and more frequently social interaction is being pointed out as a crucial feature for cultural institutions, challenging the idea of museum as a silent and sacred space.

The essential museum proposed by Heumann-Gurian, for example, should provide visitors with a satisfactory experience through aesthetic pleasure, social interaction and personal validation (Heumann-Gurian, 2007).

Liminality, sociality and engagement are the three main components of museum ecology, according to Genevieve Bell: people go to museums in group and the visit-ritual is about socializing with other museum visitors (Bell, 2002).

The word ecology, used by Bell out the biological field to describe the whole museum experience, is echoed by Salgado with her definition of ecology of participation in museums as a conceptual tool and activity that involves the community, the interactive piece, the places and the practices (Salgado, 2009).

When discussing about the social side of museum visit we can find different terms (sociality, sociability, participation, social engagement ...) that all share a common feature, an action between more than one visitor, but with different nuances. It's useful here to define briefly how these terms are used in the document.

Social engagement is intended as the more general term that describes the visitor's personal involvement in a social activity; in this understanding social engagement encompasses both sociality and participation.

Sociality is the willingness and an activity which starts a social contact with at least another persons, be he/she a friend or a stranger; sociality is here preferred to sociability that describes a more general and personal attitude to establish social contacts.

Participation defines instead the active visitor's involvement in creating and sharing contents, in taking parts to activities and eventually collaborate

with others towards a common goal.

This chapter discusses the issue of social engagement during cultural experiences, summarizes some points about participation and describes different models of sociality. The last part deals with the learning implications of sociality (and the social implication of learning) and proposes a discussion about the social side of mobile technology.

**4.1. With whom? Cultural visit and sociality.**

According to Paulette McManus, the social aspect of a cultural experience is not simply an adding pleasure but it's a source of satisfaction at the very heart of the experience (McManus, *Le contexte social: un des déterminants du comportement d'apprentissage dans les musées*, 1994) and people's behaviour in museums is dependent on the social context of the visit and on the nature of the group (McManus, 1987; 1996).

Very often the idea of spending few hours with a good company is a key motivation for the visit in itself (Debenedetti, 2003; Packer & Ballantyne, 2005), but what are the models of social appropriation of the exhibit space?

Debenedetti addresses this issue proposing a dynamic between two polarities - affiliation and anonymity - creating four different modes of social appropriation of museum space (Debenedetti, 2003).

The "together-alone" or "accompanied-anonymous" framework is described by the author through a semiotic square (fig. 4.1) structured in: fusion visit, private experience, separated experience and pursuit of social contact.

The fusion visit stems from a complete sharing of the experience, with companions that follow the same path and share every choice, an experience

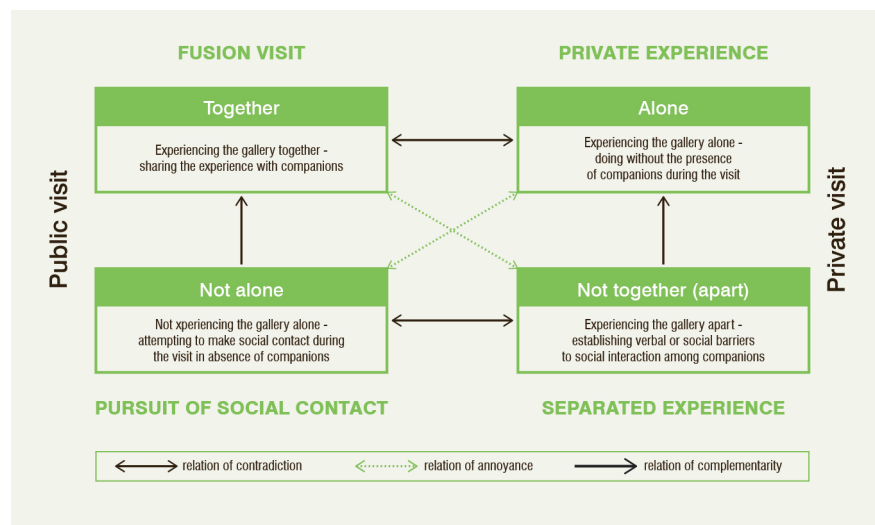


Fig. 4.1 Modes of social appropriation of museum space. Semiotic square. (adapted from Debenedetti, 2003).

well exemplified by a family visit. On the contrary the private experience is characterized by the total absence of social interaction, it is a solitary visit by choice.

In the schema, the two squares are placed in a position of relative contradiction, being the first on the side of public visit and the latter on the side of private visit.

The other two stages are less static and presuppose an action, a movement from one condition to another: in the separated visit, indeed, accompanied visitors decide to freely move from a social to a personal experience and vice-versa, using verbal or physical barriers to social interaction when needed; on the contrary the “not alone” square is animated by the pursuit of social interaction by a singleton who seeks to overcome his or her anonymity (Debenedetti, 2003).

These two squares are set in a position of relative contradiction as well, but they are complementary respectively to the squares “together” and “not together”, highlighting an action that shift from one position (affiliation/anonymity) to its opposite.

Translating this theoretical framework into the realm of museum visit and mobile interpretation we can easily recognize very common behaviours.

The “not together-apart” model describes for example the behaviour induced by personal audio guides that transform a social experience into a private visit: accompanied visitors move together through the exhibits but usually listen to different audio descriptions and look at different exhibits.

The private experience is supported by audio guides as well, while the together experience presents some difficulties in terms of mobile interpretation that will be better addressed in the last section of this chapter.

The social interaction pursued by singletons in the “not alone” model is both face-to-face and through indirect communications and the activities proposed by Debenedetti to support this model range from guided tours and social events to multimedia installations and discussion forums on the web (Debenedetti, 2003).

The behaviour based on the pursuit of social relations opens new opportunities for mobile interpretation but also some issues to be addressed such as the relation with strangers.

#### **4.1.1. The stranger and the pursuit of social relation.**

George Simmel in his short essay “The Stranger” (Simmel, 1950) describes this social figure as a unity of nearness and remoteness:

*“The stranger is close to us, insofar as we feel between him and us common*

*features of a national, social, occupational, or generally human, nature. He is far from us, insofar as these common features extend beyond him or us, and connect us only because they connect a great many people.*" (Simmel, 1950, p. 2)

To be a stranger, in the interpretation of the German sociologist, is a positive relation and a specific form of interaction: the stranger is part of the group but, at the same time, he's outside and a means of confrontation.

The stranger is an outsider, a newcomer and is not a friend nor an acquaintance, a person with whom we haven't any ties but we can easily change our status if we break the anonymity with a conversation.

Dialogue is the discriminant between anonymity and acquaintance, and conversation is what lacks also in the definition of familiar stranger proposed by Stanley Milgram (1972): the familiar stranger is someone we meet every morning at the bus stop but we have never talked with; we don't know him or her but we notice if he or she is not there.

The pursuit of social relation during museum visit proposed by Debenedetti is exactly the breaking of anonymity, the direct or indirect connection among persons who don't know each other.

But how to connect people and on what basis?

Klijnen et al. suggest that similarity or homophily, in the definition of Lazarsfeld and Merton (1954) is an important antecedent of relational ties, because people prefer to interact with similar people and homophily eases communication (Klijnen, Lievens, de Ruyter, & Wetzsel, 2009).

On the contrary it's also possible to connect people on the basis of heterophily as proposed by Everett Rogers in his book *Diffusion of innovation* (Rogers, 1962) in which he maintains that heterophilious networks are better in spreading innovation.

Following this duality, homophily is more likely to foster strong ties among people while heterophily is more related to weak ties and to the image of stranger proposed by Simmel.

Granovetter describes the strength of a tie as "*a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie. Each of these is somewhat independent of the other, though the set is obviously highly intracorrelated.*" (Granovetter, 1973, p. 1361).

Relying on Granovetter's theory of the strength of weak ties and Rogers's work on the diffusion of innovations, Klijnen et al. argue that people with only strong ties can access information merely from a small group, lacking those from distant parts, while on the contrary people with weak ties enjoy

more contacts and are more likely to obtain diverse information (Kleijnen, Lievens, de Ruyter, & Wetzsel, 2009).

These assumptions are also the echoed in Siemens' Connectivism (Siemens, 2004) which links a successful learning with the ability to build a wide personal network.

We can connect people on the basis of homophily, fostering possible strong ties but little spreading of information, or on the contrary we can facilitate heterophilious networks characterized by weak ties and diverse information, but we have still to define what are the attributes to be considered homogeneous or heterogeneous.

Lugano and Kleijnen et al. refer that the first works about network studies explored homophily by demographic characteristics such as gender, age, ethnicity, education, and by socioeconomic status (Lugano, 2008; Kleijnen, Lievens, de Ruyter, & Wetzsel, 2009). Later on, psychological attributes such as aspirations and interests were taken into account, introducing a categorization more based upon the individual and his or her attitudes.

Following this approach, Simon suggests that people need personal and not social entry points to engage confidently with strangers in a museum, and that personal entry points are useful to scaffold social experiences (Simon, 2010).

Introducing the concepts of homophily and heterophily in the field of mobile technology and mobile social networks, Lugano notices that also mobile usage patterns can be easily used as an attribute, and homogeneous patterns can model interactions among strangers (Lugano, 2008).

The "not alone" model discussed by Debenedetti and the discussion here presented about its implication, entails an high level of social engagement (the direct or indirect relation with unknown persons) and we can assume that this model is only the end point of a process that starts with no social relation and pass through different levels of social engagement. The next section addresses this issue following the interpretation proposed by Nina Simon.

#### **4.2. Levels of social engagement.**

Nina Simon uses a powerful example: the museum's curator or the designer can be seen as a cocktail party host who warmly welcomes each individual and tries to connect him with others he might like (Simon, 2010).

She calls this process "me-to-we" design, emphasizing a bottom-up approach that relies on the role of the individuals in supporting a collective engagement.



The process she proposes is structured in five steps that describe five different relations between visitor and institution and based upon the contexts (fig. 4.2).

*“Each stage has something special to offer visitors. Stage one provides visitors with access to the content that they seek. Stage two provides an opportunity for inquiry and for visitors to take action and ask questions.*

*Stage three lets visitors see where their interests and actions fit in the wider community of visitors to the institution. Stage four helps visitors connect with particular people—staff members and other visitors—who share their content and activity interests. Stage five makes the entire institution feel like a social place, full of potentially interesting, challenging, enriching encounters with other people.”* (Simon, 2010, p. 26-27)

The long quotation well describes the process that starts from a total absence of sociality and arrives to the direct social engagement, going through more nuanced steps of indirect social relationships.

The first two steps indeed are focused on the individual who does not interact with other visitors but rather with the collection/contents in the form of a passive content consumption or as an active interaction and manipulation.

The stage three slowly introduces social interaction as a form of indirect relation among visitors, a feeling of the social presence of the others that becomes a real connection in the following steps.

The five steps proposed by Simon interestingly structure the process as a continuum in which every steps needs the previous one but is not mandatory to reach every time the last step, which transforms the institution into a

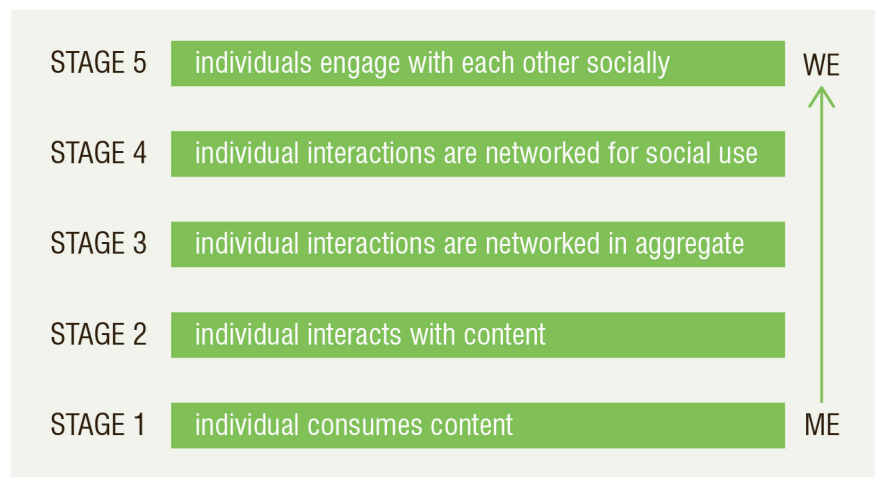


Fig. 4.2  
Five stage of social engagement.  
(adapted from Simon, 2010).

social hub (Simon, 2010): not every visitor is indeed interested in socializing directly and not every institution aims at being a space for social aggregation.

Interestingly the results of Debenedetti's interviews about the social dimension of visit (Debenedetti, 2003), suggest that people highly evaluate anonymity and that social engagement is not always pursued even if solitary visits are not so common.

It is therefore worth to briefly address the issue of indirect sociality as an activity that sours anonymity but does not involve face-to-face relations.

#### **4.2.1. Indirect sociality and the sense of social presence.**

The third and fourth stages of Simon's process introduce the concept of indirect social relation, a model widely employed in the collaborative web, that uses blogs and forums as well as social software as a means of conversation.

Writing comments, voting for, sharing contents, tagging are typical activities that fit in the definition of indirect social relation, because they are actually a dialogue, a conversation but not face-to-face and often asynchronous.

A peculiar feature of these applications is that they can make people feel a sense of social presence, of being surrounded by others: while experiencing a museum or visiting a city alone, the visitor can feel himself surrounded by others.

"Alone together" is how Ducheneaut et al. summarize this particular situation speaking of massively multiplayer online games (Ducheneaut, Yee, Nickell, & Moore, 2006): it's like reading a book in a crowded café, or playing a MMOG<sup>1</sup> surrounded by background chatter; you are alone but you can jump very quickly in a conversation.

Going a step further, the authors describe the "alone together" state as characterized also by an audience and by spectacle: every public comment/activity a player/visitor makes is in front of an audience and can contribute to the construction of a personal identity and reputation and the comments and activities of the others are a spectacle for the player/visitor.

MMOG are a very peculiar and liminal reality but the three features highlighted by Ducheneaut et al. can easily fit for a cultural institution too: reading other visitors' comments related to an exhibit make us feel their presence and can entertain us and writing our personal comments say something about ourselves to the following visitors.

It's a form of indirect communication well known also in the field of mobile social networking or micro blogging, where a post or a check-in can stimulate social molecularization (Humphreys, 2008) and knowledge about different topics.

Digital technology is certainly a powerful tool to involve visitors at this

<sup>1</sup> Massively Multiplayer Online Game.

level of social engagement but its use is not mandatory: the conventional guest book is a simple example of stage three that does not make use of digital technology.

### **4.3. Participation and visitors' voice.**

The mention to social networking and web 2.0 introduces the second main issue of the chapter that is visitors' participation, the active involvement in exploring, creating and sharing contents.

According to Dalsgaard et al., there are three models or levels of visitors' participation within a cultural institution: (co-)exploring, (co-)constructing and (co-)contributing (Dalsgaard, Dindler, & Eriksson, 2008). Co-exploring is a process of active involvement with the subject, co-constructing is a process of social construction of something new while co-contributing is related to comments and annotations: the levels of participation are therefore defined on the basis of the activities that visitors perform while visiting.

Another categorization, proposed by Simon, is instead based upon visitors' involvement in the design process (Simon, 2010): contributory projects, collaborative projects, co-creative projects plus hosted projects.

Contributory projects encompass all the categories proposed by Dalsgaard et al. because they refer to experiences that ask visitors for limited actions in an institutionally controlled process.

Visitors are instead active partners in the design process in collaborative projects, in which the institution still conserves the control of the project. In co-creative projects visitors are involved with the institution's staff in the entire design process, and keep control over the project development.

The last category added by Simon are the hosted projects, in which the institution offers some of its spaces to present programs and exhibits entirely realized by the public.

To the models of participation Simon adds also three different approaches that institutions can adopt for contributory projects: necessary contribution, supplemental contribution and educational contribution.

The first approach heavily relies on visitors' participation and the project fails if people do not get involved; in supplemental contribution visitors' participation enhances institutional projects while in educational contribution the act of participating is aimed at providing visitors with skills (Simon, 2010).

Kelly and Russo propose a classification of visitors in four categories: spectators, joiners, commentators and creators, being the first the less involved and the last the most involved (Kelly & Russo, 2008).

These categories are a subset of Forrester's *social technographics*<sup>2</sup> cited by Simon (2010): creators, critics, collectors, joiners, spectators, inactives.

An important remark is that every category is not exclusive of the others and that a user can be a creator in a condition and spectator in another, moving in and out of categories, according to age and personal/social circumstances (Kelly & Russo, 2008).

Visitors can therefore be involved at different levels of engagement, with different approaches and at different steps of the design process, but how visitors' voice can be managed within cultural institution?

The issue of UGC - user generated contents - within museums and cultural institutions is not a new one: Tallon traces the first example of UGC back to 1985 with the audio tour *Masterpieces without the director* of the Metropolitan Museum of New York (Tallon, 2008) which allowed visitors to hear through their personal cassette players comments by other Met's visitors, arranged by a theatre group.

The project challenged museum's authority and for the first time promoted visitors' voice: 15 years later the shift in digital media, induced by web 2.0, from a centralized control to user-generated contents is transforming museums and cultural institutions and the social dimension is becoming paramount (Walker, 2008).

Digital technology allows cultural organizations to disseminate contents but also to open a new channel of communication with visitors that can now send contents back to the institutions: the question is now for institutions why and how to encourage user generated contents (Parry, 2008).

In Heumann Gurian vision of essential museum, the curator's voice would be just one of the reliable voices available to visitors (Heumann Gurian, 2007) that can give feedback, write comments and produce contents before, during and after the visit (Parry, 2008).

Silverman has a different opinion and maintains that curators' voice must provide an excellent and well-researched interpretation and that visitors' voice is in addition to and not instead of the main exhibit message (Silverman, 1999).

Gammon and Burch shift the focus on users' benefits of participation and list three categories: the benefit is delayed (through bookmarking and post visit deepening of information); the benefit is abstract (visitor can tag exhibits and add comments); the benefit is nonexistent (visitor enter feedback in guestbook-style) (Gammon & Burch, 2008).

This view highlights that user generated contents are likely to benefit the institution more than visitors, while the premises for users' involvement are to create a more social experience (Smith, 2009) and to help visitors develop

2  
[http://www.forrester.com/empowered/tool\\_consumer.html](http://www.forrester.com/empowered/tool_consumer.html)

new skills related to creativity and innovation (Simon, 2010).

Simon shifts on the institution the duty of coordination of the individuals' actions towards a useful collective result and of making people feel that their contribution is really helpful and meaningful (Simon, 2010).

#### **4.4. Social engagement and meaning making.**

Simon suggests that participatory techniques in cultural organizations can enhance the so called "21st century skills", that is skills related to creativity, collaboration and innovation (Simon, 2010) and this idea is shared by Smith, claiming that the main result of participatory actions is a more social experience (Smith, 2009).

Other scholars are more focused on the role of sociality in the learning process and is now commonly documented that social interaction is crucial in the process of learning (Falk & Dierking, 2000).

This assumption does not mean that social experiences are better in fostering learning but that sociality plays an important role in the learning process.

Several authors involved in the theoretical discussion about sociality and learning claim that social interaction in museums and cultural institutions enhances learning.

Paris, for example, lists five benefits: people stimulate each other's imagination and negotiate meaning; the shared goal enhances motivation; there are social supports for learning; people learn through observation and the companions provide a means of confrontation (Paris, 1997).

According to Silverman these benefits are obtained through conversation among companions, that are usually structured in five frames: determining what something is; expressing opinions; describing what is observed; relating special knowledge about what is observed and at last relating personal experience to what is being observed (Silverman, 1999).

Packer and Ballantyne report that Uzzell (1992; 1993) and Blud's (1990) interpretation of learning as resolution of cognitive conflicts between people supports the idea that social interaction can better foster learning (Packer & Ballantyne, 2005).

Theorists, therefore, widely agree that sociality has the ability to enhance learning but some results of field researches conducted in museums are not so sharp in the conclusions.

Packer and Ballantyne, for example, claim that solitary and shared experiences are equally beneficial, but in different ways (Packer & Ballantyne, 2005). The benefits of a solitary experience, according to the authors, are mostly related to a greater control and choice, that is autonomy, to the abil-

ity to choose a personal pace and engage with information and exhibits at a deeper cognitive level (Packer & Ballantyne, 2005).

The advantages of a shared visit are consistent with Paris' five benefits (Paris, 1997), namely enhanced motivation, stimulation of imagination and negotiation of meaning together with a more enjoyable experience (Packer & Ballantyne, 2005).

Several interviews conducted by Debenedetti (2003) to art museums' visitors led the author to very similar conclusions: affiliation is the most common accompaniment status but solitary visitors attach a very positive value to their status.

In detail he lists the benefits of a social experience as mutual enrichment, recreation, reassurance, prestige and knowledge transmission, while the advantages of a solitary visit are an higher cognitive and emotional involvement, a sense of ease, autonomy and more profound relationship with the artworks (Debenedetti, 2003).

#### **4.5. Is mobile personal or social?**

The discussion about social engagement in cultural heritage organization needs to be widened to include a short reflection about mobile technology and its possible use as a means to enhance sociality.

In chapter two indeed, mobile devices are described as highly personal and the question whether they work toward or against social experiences remains open (Parry, 2008).

Mobile devices are heavily employed in cultural institutions to foster highly personalized experiences but at the same time they can engage visitors socially, allowing direct and indirect communication.

The use of handhelds to enhance customization fits into a tradition of private reflection and self direction (Parry, 2008) but at the same time, by doing it, they can disrupt the social experience and force visitors towards not natural behaviours (Simon, 2010). Ross Parry argues that there is maybe something intrinsic in digital media that privileges an individual use, as for example the "selfish" single monitor (Parry, 2008).

At the same time mobile devices give access to the web that is populated by collaboration, sharing, and community building experiences, supporting in this way high levels of collaboration and social engagement (Parry, 2008).

Visitors can indeed share easily pictures, comments, and communicate through their personal devices but, as argued by Walker, "*co-located learners often prefer to gather around a shared screen than to collaborate using individual screens.*" (Walker, 2008, p. 117).

The role of mobile devices in cultural interpretation is therefore tricky and characterized by a strong duality: on one side personal devices for highly customized experiences and, on the other, the same devices to create something collective and public, a divergence that is likely to continue in the future (Parry, 2008) and that must be taken into account while designing a mobile experience.

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# PART II

case studies and data analysis



## 5. Mobile experiences in cultural institutions

*“In the black and white film, a crowd of well-dressed Europeans moves as one through Amsterdam’s State Museum. The voice-over explains, “By use of a ‘hearing aid’ the visitors get information and are being guided to the different artworks in the exhibition. The spoken words are recorded in several languages on a so-called tape recorder.” As the “invisible guide” instructs, heads lean in to examine a detail in a painting, and then just as suddenly, move away to the right to follow the tour into the next gallery.” (Proctor, 2010)*

*Chapter five starts the second part of the thesis which illustrates the collection and the analysis of data through case studies and desk research.*

*In particular this chapter describes a first selection of interesting cases of employment of mobile technology within cultural field aimed at portraying the world of mobile interpretation in cultural heritage field.*

*The collection as well as the analysis is made with the goal of identifying the current trends and isolating the most meaningful cases to be analysed in depth.*

*This brief chapter illustrates how mobile gaming has been identified as a meaningful field to be investigated and introduces the chapter six that deals with the game domain.*

### 5.1. Point of view: sociality and engagement.

In order to describe how mobile technology is employed in museums and cultural organizations a Cartesian system with the x-axis played between a personal and a social experience and the y-axis characterized by the polarities reflective and active have been employed (fig. 5.1).

The polarities characterizing the x-axis stem from the duality of mobile devices' usage described in the previous chapter: on one side personal, the individual use of a personal device aimed at the customization of the experience and, on the other side, social, a social use of a personal device (Parry, 2008).

Simon's steps of social engagement (Simon, 2010) can be useful to inspire a more detailed and discrete categories in the continuum between the two polarities. The four categories chosen are: personal experience, personal interest in a wider context, indirect social engagement and direct social engagement.

The y-axis describes the visitors approach in terms of personal engagement, from a passive contents' consumption, reflective, in which observation, reading and reflection are paramount to an active role, active, that portrays a mentally and bodily engaged visitor.

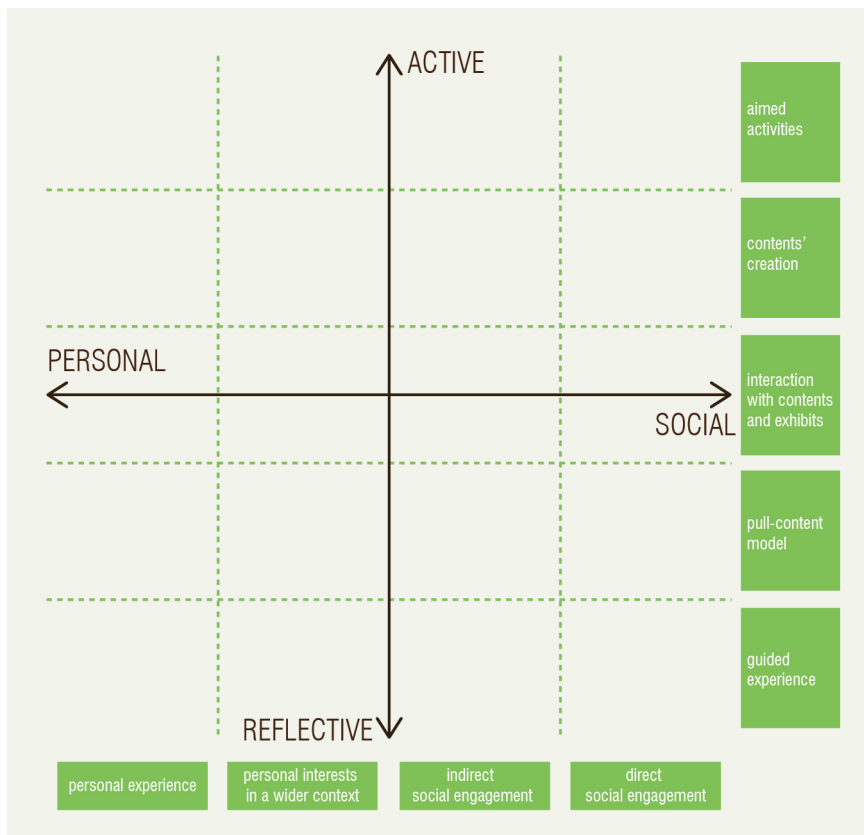


Fig. 5.1  
Cartesian chart used  
to map the surveyed  
projects.

The latest theories of cultural learning, discussed in chapter three, as well as the levels of participation discussed in the previous chapter, are highly influential in the definition of these two polarities. The five subcategories chosen are: guided experience, pull-contents model, interaction with contents/exhibits, contents' creation.

The chart is useful to map several projects that involve the use of mobile interpretation for museums, art cities and cultural organization and to find out different models and approaches: the mapping is not properly intended as a research tool but it's aimed at identifying different areas of density and describing mobile usage in cultural institutions.

Consequently the projects mapped in the chart are not analyzed in depth, as stated above, but only classified according to the four polarities described and placed in the Cartesian system: some of these projects will be then analyzed in detail in chapter seven as case studies.

### 5.2. Cases' list.

The selection of the projects has been conducted through desk research and refers to a period of time between the beginning of 21th century and today. An important clarification is that all the cases here listed and included within the Cartesian map have not been analysed in depth but only used instrumentally to identify those project that best suit with the aim of the research and that was worth to be analysed in detail.

The following table lists the projects by year of completion and gives references for further investigation.

Year	Project's name	References
2002	Sottovoce	<a href="http://www2.parc.com/csl/projects/guide-books/default.html">http://www2.parc.com/csl/projects/guide-books/default.html</a> (Grinter, Aoki, Szymanski, Thornton, Woodruff, & Hurst, 2002; Szymanski, Aoki, Grinter, Hurst, Thornton, & Woodruff, 2008)
2003	PEACH	<a href="http://peach.fbk.eu/home.html">http://peach.fbk.eu/home.html</a>
2004	CoCicero	(Laurillau & Paternò, 2004; Dini, Paternò, & Santoro, 2007; Santoro, Paternò, Ricci, & Leporini, 2007)
2005	Frequency 1550	(Raessens, 2007; Huizenga, Admiraal, Akkerman, & Dam, 2008; Huizenga, Admiraal, Akkerman, & Dam, 2009; Huizenga, Admiraal, Akkerman, & Dam, 2009; Akkerman, Admiraal, & Huizenga, 2009)

Tab. 5.1  
List of surveyed  
projects.

Year	Project's name	References
2005	Mystery@Museum	(Klopfer, Perry, Squire, Jan, & Steinkuehler, 2005)
2005	Mystery in the museum	(Cabrera, et al., 2005)
2006	Myartspace	(Vavoula, Sharples, Rudman, Meek, & Lonsdale, 2009)
2007	Brighton Fishing Museum	(Danks, 2007; Danks, Rodriguez-Echavarría, Griffiths, & Arnold, 2007)
2007	CHIP	(Wang, et al., 2008; Wang, et al., 2009)
2007	iMuse	(Orlando, 2008)
2007	REXplorer	<a href="http://www.rex-regensburg.de/">http://www.rex-regensburg.de/</a> (Ballagas & Borchers, 2007; Ballagas, et al., 2007; Ballagas, Kuntze, & Walz, 2008)
2007	ViaMineralia	<a href="http://vr.tu-freiberg.de/viamineralia/">http://vr.tu-freiberg.de/viamineralia/</a> (Heumer, Gommlich, Jung, & Muller, 2007)
2008	Archie Project	(Luyten, Van Loon, Teunkens, Gabriels, Coninx, & Manshoven, 2006; Luyten, et al., 2008; Schroyen, et al., 2009)
2008	City Treasure	<a href="http://www.etreasure.ch/site/?page_id=48">http://www.etreasure.ch/site/?page_id=48</a> (Botturi, Inversini, & Di Maria, 2009)
2008	Explore!	(Costabile, De Angeli, Lanzillotti, Ardito, Buono, & Pederson, 2008; Ardito, Buono, Costabile, Lanzillotti, & Piccinno, 2009)
2008	Kurio Project	(Muisse, Tanenbaum, Wakkary, & Hatala, 2008; Wakkary, et al., 2009)
2008	MP3 Mondovi	<a href="http://mp3.fitzcarraldo.it/home/?q=project">http://mp3.fitzcarraldo.it/home/?q=project</a>
2009	iTacitus	<a href="http://www.itacitus.org/">http://www.itacitus.org/</a>
2009	Love Art: National Gallery	<a href="http://www.nationalgallery.org.uk/news/iphone-app">http://www.nationalgallery.org.uk/news/iphone-app</a>
2009	NaturePlus	<a href="http://www.nhm.ac.uk/natureplus/index.jspa">http://www.nhm.ac.uk/natureplus/index.jspa</a> (Barry, 2010)



Year	Project's name	References
2009	Plug	<a href="http://plug-futur-en-seine.it-sudparis.eu/en/">http://plug-futur-en-seine.it-sudparis.eu/en/</a> (Simatic, et al., 2009)
2009	Powerhouse Museum on Layar	<a href="http://www.powerhousemuseum.com/layar/">http://www.powerhousemuseum.com/layar/</a>
2009	Your, Vincent	<a href="http://www.vangoghmuseum.nl/vgm/index.jsp?page=205134&amp;lang=en">http://www.vangoghmuseum.nl/vgm/index.jsp?page=205134&amp;lang=en</a>
2010	AMNH explorer	<a href="http://www.amnh.org/apps/explorer.php">http://www.amnh.org/apps/explorer.php</a>
2010	ARTeMuse	(Shaer, Olson, MaCheire, & Valdes, 2011)
2010	Musée du Louvre	<a href="http://itunes.apple.com/it/app/musee-du-louvre/id337339103?mt=8">http://itunes.apple.com/it/app/musee-du-louvre/id337339103?mt=8</a>
2010	PhillyHistory	<a href="http://www.phillyhistory.org/PhotoArchive/">http://www.phillyhistory.org/PhotoArchive/</a>
2010	Streetmuseum	<a href="http://www.museumoflondon.org.uk/Resources/app/you-are-here-app/index.html">http://www.museumoflondon.org.uk/Resources/app/you-are-here-app/index.html</a>
2010	UAR. Urban Augmented Reality	<a href="http://en.nai.nl/exhibitions/3d_architecture_app">http://en.nai.nl/exhibitions/3d_architecture_app</a>
2010	Uffizi	<a href="http://www.parallelo.it/uffizi_iphone.asp">http://www.parallelo.it/uffizi_iphone.asp</a>
2010	WhaiWhai	<a href="http://www.whaiwhai.com/">http://www.whaiwhai.com/</a>
2011	ARTours	<a href="http://www.artours.nl/">http://www.artours.nl/</a> (Schavemaker, Wils, Stork, & Pondaag, 2011)
2011	China Heart	<a href="http://www.chinaheart.org.au/index.php">http://www.chinaheart.org.au/index.php</a>
2011	JustAddArt	<a href="http://www.bonnefanten.nl/nl/actueel/nieuws/just_add_art_bonnefanten_gratis_iphone_app">http://www.bonnefanten.nl/nl/actueel/nieuws/just_add_art_bonnefanten_gratis_iphone_app</a>
2011	MoMA mobile	<a href="http://www.moma.org/explore/mobile/index">http://www.moma.org/explore/mobile/index</a>
2011	MuseumApp NL	<a href="http://itunes.apple.com/app/museumapp-nl/id457512318?mt=8">http://itunes.apple.com/app/museumapp-nl/id457512318?mt=8</a>
2011	Tate Trumps	<a href="http://www.tate.org.uk/modern/information/tatetrumps.shtm">http://www.tate.org.uk/modern/information/tatetrumps.shtm</a>

### 5.3. Map's analysis.

Looking at the Cartesian system (fig. 5.2) we can easily identify three main areas of density in the first, third and fourth quadrant, plus some projects grouped around the crossing of the axes.

In the third quadrant, the area defined by personal experience and pull-contents model encompasses multimedia mobile guides for museums and open-air tours: these projects are the evolution of the traditional audio guides proposing multimedia contents activated manually by users or automatically by the system.

Some projects such as the Louvre App, Your Vincent and Uffizi let visitors listen to audio descriptions or look at high quality images or videos, by choosing the artwork browsing among a list or on the floor plans; some others like UAR, iTacitus, ARtours display contents through augmented reality, activating automatically contents and virtual layers.

The common feature is being a personal and personalized application based on the pull-content model, without any possibility to share contents or to connect with other users.

The other two dense areas are both encompassed in the "active" region of the diagram and differ on the level of social engagement: in the fourth quadrant we find applications that can be experienced alone or in group but not specifically aimed at socialization while in the experiences grouped in the first quadrant sociality has a paramount role.

Noteworthy is that all the experiences encompassed in these areas are based on game dynamics, that involve visitors in bodily and mentally engaging activities.

In particular the projects described by personal experience/aimed activity employ mobile gaming mainly as a way to foster and to the test the learning process during the visit while the applications encompassed in direct social engagement/aimed activity propose a more immersive experience, very often based upon role playing.

Another remarkable, despite less dense, area is that comprised between personal interests in a wider context + indirect social engagement/interaction with contents and exhibits: it encompasses those applications that allow some web 2.0 and wiki dynamics, such as sharing, tagging, commenting, co-creating.

A further remark is that quite all the applications that do not stem from academic research (usually museum-edited mobile app) are encompassed in the personal area of the diagram while on the contrary quite all the experiences in the social area are pilot projects developed by research centres and

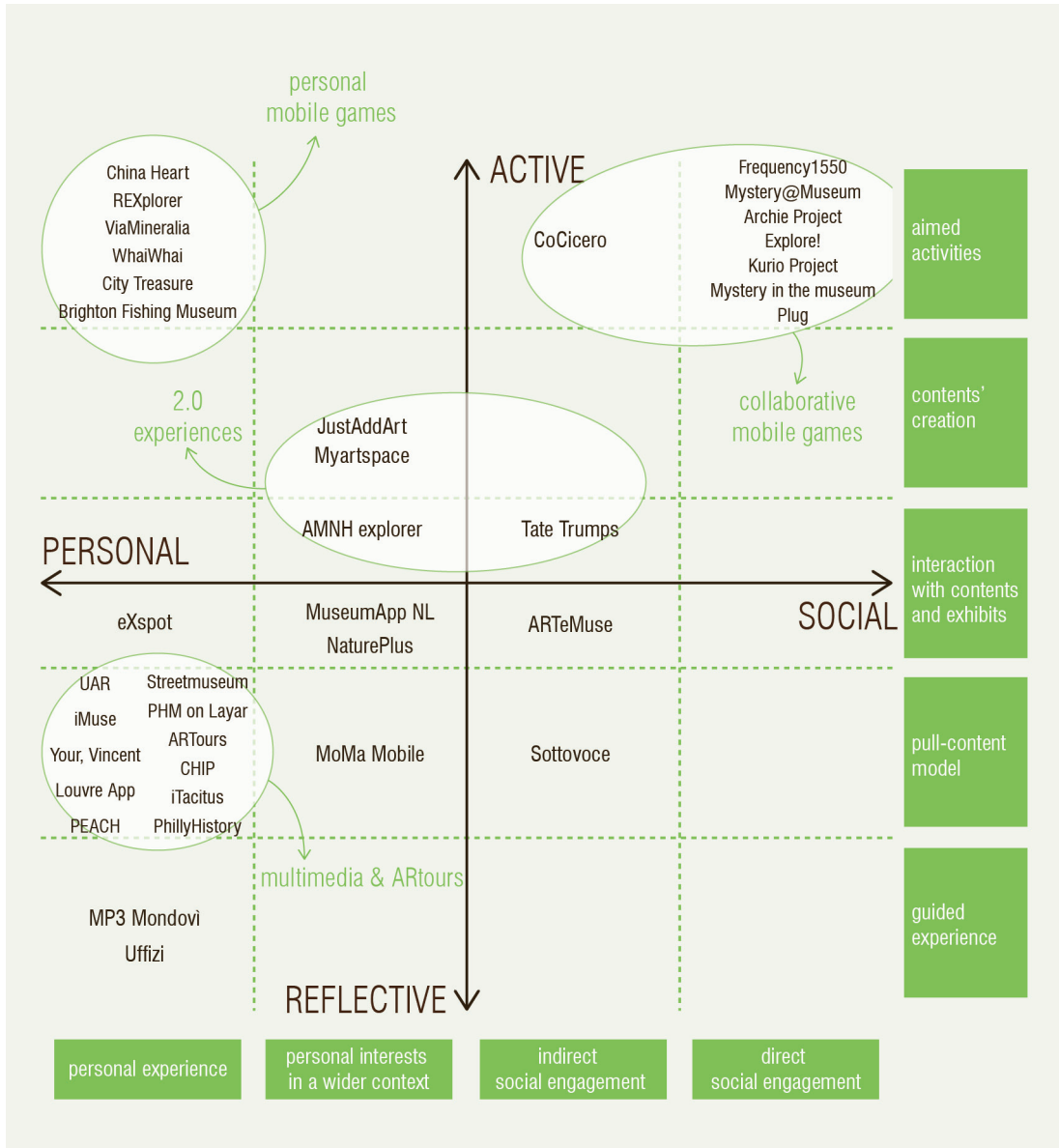


Fig. 5.2 Map of surveyed projects with areas of density.

universities.

This classification, despite rough and quite simplistic, highlights three main current trends in mobile interpretation for museums and cultural institutions: mobile multimedia and AR guides, mobile gaming and the use of mobile social networking, the same pointed by Johnson et al. as the applications that are more likely to develop in the field (Johnson, Witchey, Smith, Levine, & Haywood, 2010).

If we consider the theoretical framework discussed in the previous chapters about cultural learning and social engagement, it's undeniable that the experiences included in the first quadrant are based on the most recent theories, stimulating an active role of visitors and social engagement.

On the contrary the experiences encompassed in the third quadrant are based on a more traditional view of mobile interpretation, with a personal pull-content activity: mobile devices' potentialities are employed to add functions, such as visitors' positioning and augmented reality.

It seems worthwhile to better study the experiences that are comprised in the upper part of the diagram, that are mostly based on gaming dynamics (about 80% of the applications).

It's not new the use of gaming in museums and cultural institutions where games are *"being used as audience development tools to entice new people to come through the doors or interact online; as marketing assets and brand-building conversation starters; and for education and learning, enabling better interpretation, understanding and engagement"* (Beale, 2011, p. 15) and I add to stimulate social engagement.

The next chapter addresses the issue of games and mobile gaming in museums and cultural institutions and it's aimed at defining tools to better understand and analyze the case studies.

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## 6. Mobile experiences and games

*“A game is an opportunity to focus our energy, with relentless optimism, at something we’re good at (or getting better at) and enjoy. In other words, gameplay is the direct emotional opposite of depression.” (McGonigal, 2011, p. 28)*

*The Cartesian system presented in the previous chapter and the mapping of several mobile interpretation projects have highlighted two wide and dense areas that encompass mobile experience based on game dynamics: on these projects, placed in the upper part of the map, the analysis will focus.*

*Nevertheless in order to analyze correctly these projects some theoretical tools from the game domain are needed: in particular it’s useful to highlight what is a game, what are its structures and characteristics and what are the common genres.*

*This chapter frames the concept of play/game and its characteristics, discusses the use of game as a means to foster learning and then proposes an overview on mobile gaming, describing the most common genres and their characteristics.*

### 6.1. Game: definition and characteristics.

Johan Huizinga, with his essay *Homo ludens* (1938), has been the first academic to seriously address the topic of play and to provide a definition:

*“[Play is] a free activity standing quite consciously outside “ordinary” life as being “not serious”, but at the same time absorbing the players intensely and utterly. It is an activity connected with no material interests, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in orderly manner. It promotes the formation of social groupings, which tend to surround themselves with secrecy and to stress their difference from the common world by disguise or other means.”* (Huizinga, 2002 - first edition 1938)

Play is therefore a voluntary activity governed by rules that happens in the so called magic circle, a liminal condition with its own boundaries of time and space.

Twenty years later Roger Caillois lists six attributes of play that recall directly the first definition. In his interpretation, play is free, is voluntary, separate, uncertain, unproductive, governed by rules and based on the make-believe, that is the awareness of a second reality (Caillois, 1958; 2006).

The French sociologist proposes also four categories of game: *agon*, *alea*, *mimicry* and *ilinx*. *Agon* is the sport competition; *alea* is based on chance such as dice game; *mimicry* is a role play experience such as cops & robbers; *ilinx* is characterized by a state of dizziness, such as a rapid whirling (Caillois, 2006).

The 1970 definition of Abt claims that *“a game is an activity among two or more independent decision-makers, seeking to achieve their objective in some limiting context.”* (Abt, 1970).

The role of decision is recognized also in Costikyan definition of game as *“a form of art in which participants, termed players, make decisions in order to manage resources through game tokens in the pursuit of a goal.”* (Costikyan, 1994): what is new is the reference to art, but it can also be noticed that the word play has been replaced by game, highlighting a surprisingly complex relationship between the two terms (Salen & Zimmerman, 2004).

According to Salen and Zimmerman play can both encompass and be contained into game: in the first sense game is a formalized kind of play and therefore is a subset of play, while the second interpretation is more conceptual and play is seen as one of the several components of game (Salen & Zimmerman, 2004).

Avedon and Sutton-Smith choose the word game and define it as an exercise of voluntary control, with a contest between powers, regulated by rules and aimed at producing a disequilibrium (Avedon & Sutton-Smith, 1971).

More focused on the activity is the definition of Suits who defines playing a game a “*voluntary effort to overcome unnecessary obstacles.*” (Suits, 1990).

Salen and Zimmerman read game as “*a system in which players engage in an artificial conflict, defined by rules, that result in a quantifiable outcome*” (Salen & Zimmerman, 2004) and their definition is echoed one year later by Jasper Juul who extends the description claiming that “*a game is a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels attached to the outcome and the consequences of the activity are optional and negotiable*” (Juul, 2005).

Looking at the defining characteristics of game Salen and Zimmerman lists five points - system, players, artificial, conflict, rules and quantifiable outcomes (Salen & Zimmerman, 2004) - that slightly differ from the qualities proposed by Crawford, that are representation, that describes game as a subjective representation of a subset of reality, interaction; conflict and safety, that explains game as a safe way of experience reality (Crawford, 1997).

Marc Prensky stresses the role of rules as the element that set games apart from other types of play and proposes it as one of the six structural elements of games together with goals, outcomes and feedback, conflict, interaction, story (Prensky, 2001). In Prensky’s definition, the story, that is the narrative side of game, emerges for the first time.

Goal, rules, feedback system and voluntary participation are instead the four defining traits of games according to Jane McGonigal who proposes a strictly positive vision of game as “*an opportunity to focus our energy, with relentless optimism, at something we’re good at (or getting better at) and enjoy. In other words, gameplay is the direct emotional opposite of depression*” (McGonigal, 2011, p. 28).

Hunicke et al. propose a more design-oriented view in which games are characterized by three main components - rules, system and fun - and their design counterparts, mechanics, dynamics and aesthetics: mechanics are the basic components of games, dynamics are the behaviour of mechanics acting on players and aesthetics are the desirable emotional responses of players (Hunicke, LeBlanc, & Zubek, 2004). Aesthetics has a paramount role and can be describes through - but it’s not limited to - a taxonomy: sensation, fantasy, narrative, challenge, fellowship, discovery, expression and submission (Hunicke, LeBlanc, & Zubek, 2004).

Analysing the several definitions here presented, despite the differences, I

can list some traits that emerge more than others and that are useful in the definition of the framework discussed in chapter nine.

The first element is the liminality of game, the magic circle, that creates a subset of reality with its peculiar temporal and spatial dimensions and defined rules. Liminality is also suggested by Bell as a defining characteristic of museums (Bell, 2002) and is challenged by mobile gaming and hybrid reality games, described in the next sections.

Rules distinguish formal play from informal play and govern its liminal dimension: they need to be accepted by all players, another crucial component of game, that act towards a goal, engaging in a conflict, be it collaboration, competition or both. Players can indeed be involved in a solo game experience and play against or with other players to achieve the goal, or be involved in a team that compete or collaborate with other teams.

Group games very often are structured as a role playing experience in which every player has a special role with peculiar abilities and need the help of other players (with other and complementary abilities) to meet the goal.

Liminality, rules, players and conflict are therefore the most recurrent characteristics of game to which the story can be added, the narrative dimension that plays an important role in the aesthetics of the experience (Hunicke, LeBlanc, & Zubek, 2004) and the distinction between mechanics and dynamics.

## **6.2. Games and meaning making.**

Chapter three have addressed the topic of meaning making referred to cultural organization and to mobile technology, resulting in the definition of three common approaches: focused, immersive and collaborative.

The aim of this section is to briefly analyse the pedagogic paradigms that support the use of game as a learning tool and eventually find some relations with the proposed approaches.

The term educational game or, better, serious game (Zyda, 2005; Felicia, 2009; Ulicsak & Wright, 2010) is widely used to describe games that have "*a learning model embedded, the content is integrated into the game, so learning is intrinsic to play*" (Ulicsak & Wright, 2010, p. 27).

Ulicsak and Wright identify three generations of educational games: the first is based on behaviourism, the second on cognitivism and the third much more fragmented in terms of pedagogic paradigms.

The behaviourist approach is translated into the educational games' realm with prizes for the correct responses to a stimulus or different stimuli (Ulicsak & Wright, 2010): the model stimulus-response-feedback well suits with

the focused learning approach proposed in chapter 3.

The second generation of serious games is characterized by simulations in which players are actively engaged in learning-by-doing activities (Ulicsak & Wright, 2010): the immersive approach well describes these applications.

The third generation of serious games is more oriented towards the experiential model of learning (Kolb, 1984) and heavily relies upon situated learning models; serious games are also used to mediate learning through discussion, reflection and analysis as proposed by socio cultural theory (Ulicsak & Wright, 2010). The collaborative and social dimension of learning, that is at the heart of the collaborative approach, find therefore a counterpart in the pedagogic paradigms of serious games.

In this regard McGonigal notices that collaboration in games is an hard task that requires three distinct efforts: cooperation, coordination and co-creation (McGonigal, 2011). The first effort describes a collective action towards a common goal, the second means sharing resources and synchronization while co-creation is a generative act, aimed at creating something that is not achievable alone.

### **6.3. Mobile gaming.**

ComScore's review on mobile usage for 2010 highlights that about 25% of American and European mobile owners used mobile phones and smartphones to play games (comScore, 2011).

Mobile technology is therefore, for one quart of users, a platform for mobile gaming, whose characteristics are described in this section.

Eric Klopfer synthesizes the defining features of mobile gaming with six attributes (Klopfer, 2008): social, authentic and meaningful, connected to the real world, open-ended, intrinsically motivating and filled with feedback.

According to the author, mobile games are based on existing social ties and mobile devices do not need to develop new means to foster new social relationships because they already allow real time connectivity, both-to-face and through other tools. Furthermore, mobile devices allow people to be surrounded by the real world, enabling authentic experiences that keep the contact with the environment.

These characteristics are directly related by Klopfer to the constructivist paradigm of learning, enhanced by the situated learning approach: in this view, highly localized and lightly augmented games seem to be a perfect tool to exploit the learning capabilities (Klopfer, 2008).

Klopfer refers to mobile gaming as an experience that makes use of technology to enhance learning but technology not necessarily encompasses or

govern the entire experience.

The role of ICT in technology enhanced experiences is addressed by Montola et al. defining two main typologies: technology sustained games and technology supported games.

The first rely heavily on digital technology and can be seen as computer games that interface with physical world, while in technology supported games ICT is part of the game but is not the entire game (Montola, Stenros, & Waern, 2009).

Hybrid reality games, or better, games that keep a strong relation with the context and reality, are pointed as a technology to be watched for learning purposes and the next sub-sections describes the most common typologies of mobile games that blur the line between reality and virtuality.

### **6.3.1. Hybrid reality games.**

In 1994 Paul Milgram and Fumio Kishino proposed a taxonomy of mixed reality visual displays (Milgram & Kishino, 1994) which draws upon the so called virtuality continuum (fig. 6.1).

Augmented reality is described by the authors as a lightly augmented representation of reality: the real context is paramount and digital technologies add a layer of virtuality (multimedia contents, information, 3D models ...). Moving towards virtuality in the continuum, we meet augmented virtuality which describes instead a virtual environment augmented by real objects (Milgram & Kishino, 1994).

The experiences usually enabled by mobile devices are set in the augmented reality area: they can indeed exploit location awareness and connectivity to add a virtual layer on reality, which remains paramount.

The literature usually refers to this kind of augmentation with two terms, augmented reality (Squire, et al., 2007; Klopfer, 2008) and hybrid reality (De Souza e Silva, 2006) focusing the first on a light augmentation and the second on the result of the augmentation.

To avoid any possible misunderstanding in the text the term augmented reality will refer to any experience in which reality is lightly augmented with virtual data, be they videos, sounds, texts, images, fictional characters or 3D digital models. In this wide definition we can also add those experiences that exploit location awareness and connectivity to convey contextual information to users, even if they don't merge reality and virtuality through the camera of mobile devices.

We will instead use hybrid reality to refer to games in order to avoid possible confusion with the alternate reality games (Klopfer, 2008; Montola, Stenros, & Waern, 2009), whose acronym is ARGs very similar to augment-

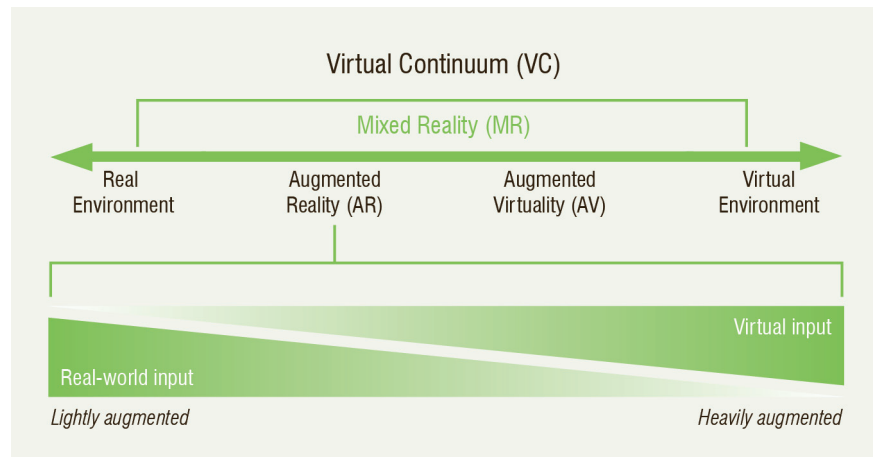


Fig. 6.1  
Virtuality Continuum (adapted from Milgram & Kishino, 1994).

ed reality games.

Hybrid reality games - HRGs - are consequently those games played in the hybrid space between reality and virtuality and that transform the city as well as our room or a grass field into a gaming board.

According to De Souza, HRGs can strongly enhance learning, and in particular social, experiential and situated learning, because they exploit three different sources of information: the physical space, the digital space and the mind of the users (De Souza e Silva, 2006). Furthermore they are location-based social activities that expand the classical game environment – the board or the screen – into the physical world.

HRGs are usually played with mobile devices but are not infrequent experiences that exploit head mounted display to layer 3D models on reality and enable a richer and more immersive experience (Squire, et al., 2007).

Within this group we can also cite mixed reality games (Montola, Stenros, & Waern, 2009), which according to Montola et al. are those games played in the mixed space between reality and virtuality, as in HRGs, but with some players moving in the real space and others playing only in the virtual space.

### 6.3.2. Alternate reality games.

*“Alternate Reality Games takes the substance of everyday life and weave it into narratives that layer additional meaning, depth, and interaction upon the real world. The contents of these narratives constantly intersect with actuality, but play and loose with fact, sometimes departing entirely from the actual or grossly warping it – yet remain inescapably interwoven. Twenty-four hours a day, seven days a week, everyone in the country can access these narratives through every available medium – at home, in the office, on the phones; in words, in images, in sound.”* (Martin, Thompson, & Chatfield,

2006)

The definition of ARGs proposed by Martin et al. and reported by Montola and colleagues (Montola, Stenros, & Waern, 2009, p. 38) defines them as something different from HGRs, something more pervasive that involve players in a full-day activity and through different media.

Usually these kind of games are organized by big TV networks, film producers, famous firms and involve a great number of people, asking for the collective intelligence to solve puzzles and riddles (Montola, Stenros, & Waern, 2009)

They are quite apart from the experiences described in this thesis but it's interesting to point out some useful hints: the mixed use of different media, the crossmediality (Giovagnoli, 2009), and among them mobile devices; the pervasive experience that ask for a twenty-four hours engagement and finally the need of strong collaboration and of collective intelligence to solve the game.

### **6.3.3. Pervasive games.**

Pervasive games are a particular kind of game which *"has one or more salient features the expand the contractual magic circle of play spatially, temporally and socially"*. (Montola, Stenros, & Waern, 2009, p. 12)

The traditional definitions of play discussed at the beginning of the chapter describe games as something that happens into well defined boundaries of time and space and that it's enacted by players who voluntarily accept to conform to rules. Pervasive games disrupt this definition, introducing on or more expansion in the domain of space, time and social relationships (Montola, Stenros, & Waern, 2009).

The magic circle is expanded spatially because it is taken wherever the players go, including the environment and the context in which they act and move: very often augmented reality is exploited to mix the main interface of the game, usually accessed through a mobile phone, with the environment. The simple combination of physical and virtual space does not make a game pervasive, it's required to take player to uncertain and undedicated areas (Montola, Stenros, & Waern, 2009).

Pervasive games expand the magic circle also in the temporal dimension, because they overcome the concept of play session towards a more interrelated experience between life and game: the temporal boundaries of game are uncertain and is not easy to distinguish life from play for the entire duration of the game. (Montola, Stenros, & Waern, 2009)

The last expansion of the magic circle induced by pervasive game is a



social expansion, because the loss of boundaries of time and space necessarily involve outsiders in the gaming experience, and bystanders can become unaware participants (Montola, Stenros, & Waern, 2009).

Looking at the technological side of pervasive games, Benford et al. suggest that they are enabled by three core technologies: displays that make contents available on the move, wireless communication (3G, Bluetooth, Wi-Fi networks ...) and sensing technologies able to capture players' context (Benford, Magerkurth, & Ljungstrand, 2005).

Mobile devices and in particular smartphones well suit within these requirements, making them the most suitable medium for pervasive games.

Despite very few pervasive games are related to the cultural heritage field, they are relevant to the research for two reasons: the concept of temporal, spatial and social expansion provides new useful dimensions to describe the projects in the case studies and secondly because the genres developed within the framework of pervasive games are very often employed by museums and cultural institution.

#### **6.4. Mobile gaming genres.**

This section discusses mobile games' genres that are commonly employed in cultural heritage field and those that are likely to be exploited.

In particular the section describes treasure hunt and its "by-products", urban adventure games, the collect & trade model and the possible use of mobile social software.

##### **6.4.1. Treasure Hunts.**

*"Treasure hunts are games where players try to find certain objects in an unlimited game-space. The target of the hunt may be to uncover a planted prize, find a certain location, take a photograph of a hunter performing a task, or even locate a very specific everyday object. [...] The discovery is a reward in itself."* (Montola, Stenros, & Waern, 2009, p. 32)

They can be competitive experiences in which individuals or teams challenge each other or can be solo mission in which the player, called the hunter, challenges him/herself.

Treasure hunts are widely employed in museums and cultural institutions and great part of the projects analyzed in the following chapters takes this form: museum visitors are for example asked to walk in the rooms to find a particular artwork and take a photo of a detail, or art cities visitor are guided towards specific location and asked to answer questions.

A variation of treasure hunt are scavenger hunts that ask players to hunt

not a treasure or a prize but something that nobody wants, such as a photo of the hunter performing a task.

Geocaching is another variation in which hunters are given GPS coordinates to find and substitute a trinket (Montola, Stenros, & Waern, 2009).

Treasure hunts can provide a story that involves players in a narrative experience and guide them through the plot but can be also characterized by a simple succession of points of interest.

Location-awareness is very often a plus offered by mobile devices to the traditional form of treasure hunts and the prizes in hybrid reality games can be virtual.

#### **6.4.2. Collect & Trade.**

The collect and trade model stems from treasure hunt but adds a mandatory social activity: the goods earned by players/hunters during the game must be also traded with other players in order to achieve the goal: if some objects are indeed totally useless for a player, they could be a treasure for others.

The social connection can happen both in a completely virtual way, for example between not co-located players, and through face-to-face exchanges: in the first case the prizes are necessarily virtual while in the latter they can be both physical or virtual.

The requirement of players' social engagement makes this genre suitable for cultural experiences based on a collaborative learning approach.

#### **6.4.3. Urban Adventure Games.**

In urban adventure games the city space is the playground for experiences that combine stories with puzzles and riddles (Montola, Stenros, & Waern, 2009).

They can be read as a subset of treasure hunts with specific features: they are usually addressed to tourists, they are played in urban scenarios and usually have a narrative basis.

Montola et al. refer to urban adventure games as an activity of putting together a story from fragments or as an "*hypertext manoeuvred in the physical space*" (Montola, Stenros, & Waern, 2009, p. 42).

#### **6.4.4. Check-in games.**

An emergent genre of mobile gaming is based on the use of mobile social networks with context-awareness capabilities: players use their mobile devices to check-in in particular locations in order to share their position with friends and to gain points.

Popular example are Foursquare<sup>1</sup> that gives badges to users who check-in

<sup>1</sup>  
<https://foursquare.com/>

several times till becoming the mayor of a place, Gowalla<sup>2</sup> which allow users to collect souvenirs and eventually redeem them as real prizes or SCVNGR<sup>3</sup> that involves users in challenges in order to get discounts and prizes.

The game is here fully integrated within a social network and every success can be immediately shared with friends.

Some cultural institution are beginning to take advantage of these mobile social software in order to gain new audience and retain visitors: the Van-Gogh Museum of Amsterdam, for example, offered a free entrance to the “Mayor” of Museumplein in Foursquare or a free drink at the bar for two check-in.

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## 7. Study of cases

*Chapter seven describes the study conducted on fourteen cases of employment of mobile technology and, in particular, of mobile gaming in museums and cultural institution at large.*

*Every case is analyzed following this schema: general info, time and place, contents, theoretical approach, sociality and social engagement, design mechanics and dynamics, technology, description and references.*

*The main aim is to understand which mechanics of interaction and game dynamics are employed, how they are applied, and how the mechanics and the dynamics are influenced by theoretical approaches and how they actively stimulate learning and social engagement.*

Chapter seven describes the study conducted on several cases in order to gain insights into the issue the thesis is dealing with, that is the use of mobile technology in museums and cultural institutions to enhance active learning and social engagement among visitors.

Following the categories proposed by Stake (1995) about different types of case study, the cases here described can be considered instrumental, because the aim of the study is to gain insights into issues related to mobile gaming, learning and sociality, helping to structure the general framework that is the final output of the research.

The analysis stems from and refers to a main proposition: a designed use of mobile gaming and game dynamics can stimulate active learning and social engagement during cultural visits.

The keyword of the statement is “designed” because it refers to the design-erly approach described in the introduction and includes the mechanics and the dynamics that are core to the experience and the subject of inquiry.

The questions that stem from the proposition are essentially two:

- What mechanics of interaction and game dynamics are employed and how are they applied?
- How the mechanics and the dynamics are influenced by theoretical approaches and how they actively stimulate learning and social engagement?

To answer these questions, multiple case study seems more suitable in order to find similarity and differences between the units of analysis.

For the study, fourteen cases have been studied and the selection has been made by time and activity (Stake, 1995): it looks at projects developed between 2000 and today which employ mobile technology and gaming activities to enhance the experience of visit.

The cases are described through singular records and for or each case the analysis follows this schema: description, general info, time and place, contents, theoretical approach, sociality and social engagement, design mechanics and dynamics, technology, results and references with the relative subsections.

These criteria will be described in detail in the next chapter, together with the discussion of results.

## 7.1. Archie Project

2005-2008

**Gallo-Roman Museum**, Tongeren, Province of Limburg, Belgium

Developers

**Expertise Centre for Digital Media**, Hasselt University

**Gallo-Roman Museum**, Tongeren, Province of Limburg, Belgium

### Keywords

mobile guides, design guidelines, heritage education, social interaction, games, personalization

### Abstract

*Archie project proposes a mobile museum game for youngsters visiting a museum during a school trip. The experience is designed to support collaborative learning and aims at stimulating social interaction.*

*The project is structured in three prototype games played in teams of three to four youngsters: a farming game, a trading game and a Roman game. These seemingly independent games are tied together by the overall museum story, which covers the history of people living in the local region from Neanderthal times up to the fall of the Roman Empire.*

*Large-scale evaluations have shown the potential power of the approach to increase the attractiveness of museum learning and heritage education for this target group.*



Fig. 7.1. Images and screenshots from Archie Project. (all the images are taken from the documents listed in the references).



# ARCHIE

<b>Target audience</b>
12 – 14 years old students in schooltrip
<b>Location</b>
Indoor/Museum
<b>Time of the experience</b>
Before visit   During visit   Post visit
<b>Kind of contents</b>
Collection   Building   External to collection   Intangible heritage
<b>Level of deepening</b>
Beginner   Amateur   Expert
<b>Contents edited by</b>
Curators/Experts   Users   Curator + User
<b>Declared theoretical approach</b>
Contextual model of learning (Falk & Dierking, 2000)
<b>Main learning approach</b>
Focused   Immersive   Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)
Spatial   Temporal   Social
<b>Model of sociality</b> (Debenedetti, 2003)
Fusion visit   Solitary visit
Pursuit of social relations   Separated visit
<b>Level of social engagement</b> (Simon, 2010)
1   2   3   4   5
<b>Rules</b>
Treasure Hunt / Collect and Trade
<b>Players</b>
Solo experience   Team experience
Roles   No roles
<b>Kind of conflict</b>
Collaboration   Competition
Collaboration and Competition
<b>Narrative model</b>
Sequence of targets   Background history
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)
Technology supported   Technology sustained
<b>Platform</b>
Off-the-shelf   Adapted   Ad-hoc

Tab. 7.1  
Analysis of Archie  
Project.

Archie is a project developed by the Expertise Centre of Digital Media of the Hasselt University together with the Gallo-roman museum of Limburg and aimed at developing a game based mobile guide.

The project is structured in three different mobile games based upon three museum narratives, covering the history of people living in the local region from Neanderthal times up to the fall of the Roman Empire: a farming game, a trading game and a Roman game.

The farming game is aimed at explaining the introduction of a sedentary lifestyle and players are divided by tasks: chop trees, build farm and place fields. Players are asked for an intensive face-to-face collaboration and the same approach is used in the Roman game where they must understand the basic functioning of an ancient Roman city.

The project is explicitly developed for the target group of youngsters on a school trip and pursues an high level of personalization, allowing each player to adapt his or her own personal avatar which accompanies him or her throughout the entire museum game.

The system is context-aware and is used to determine when all team members are near the physical presentation of the corresponding museum narrative. Users explore the museum environment with the support of mobile devices, in search of artefacts on display or to get detailed descriptions of these artefacts.

The games are played in teams and the members can converse through a communication service: when they are stimulated to split up to fulfil a specific task, they can communicate directly via the walkie-talkie system to negotiate about the appropriate solutions for their tasks and/or to help each other solve questions. Indirect communication is carried out by the exchange of game-related data between PDA's that stimulate for instance face-to-face communication and transfer of information, problem-solving strategies and division of tasks.

Developers report that about 90% of users enjoyed (a lot) the experience and that they were enthusiastic about the medium (PDA). Another remark noticed by the authors is that the combination of a personal avatar with a team experience was successful in order to stimulate social engagement and museum exploration.

## References

Luyten, K., Schroyen, J., Robert, K., Gabriels, K., Teunkens, D., Coninx, K., et al. (2008). Collaborative gaming in the Gallo-Roman Museum to increase attractiveness of learning cultural heritage for youngsters. *Proceedings of the International conference on Fun and Games 2008* (pp. 59-61). Eindhoven: Duncan Rowland.

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## 7.2. Brighton Fishing Museum

2006-2007

**Brighton Fishing Museum**, Brighton, UK

Developers

**University of Brighton**, Brighton, UK

**Brighton Fishing Museum**, Brighton, UK

### **Keywords**

interactive television, storytelling, cultural heritage, new learning, multimedia, user generated content

### **Abstract**

*The interactive exhibition created by post-graduate students for the Brighton Fishing Museum is based on a treasure hunt game with a strong background history. Visitors are asked to browse the museum's exhibits looking for hints and keys to solve a mystery.*

*At the end of the experience visitors get a printed paper with a record of their journey and the learning outcomes.*

*The authors refer that the project has been successful in fostering learning experiences both for developers and for visitors.*

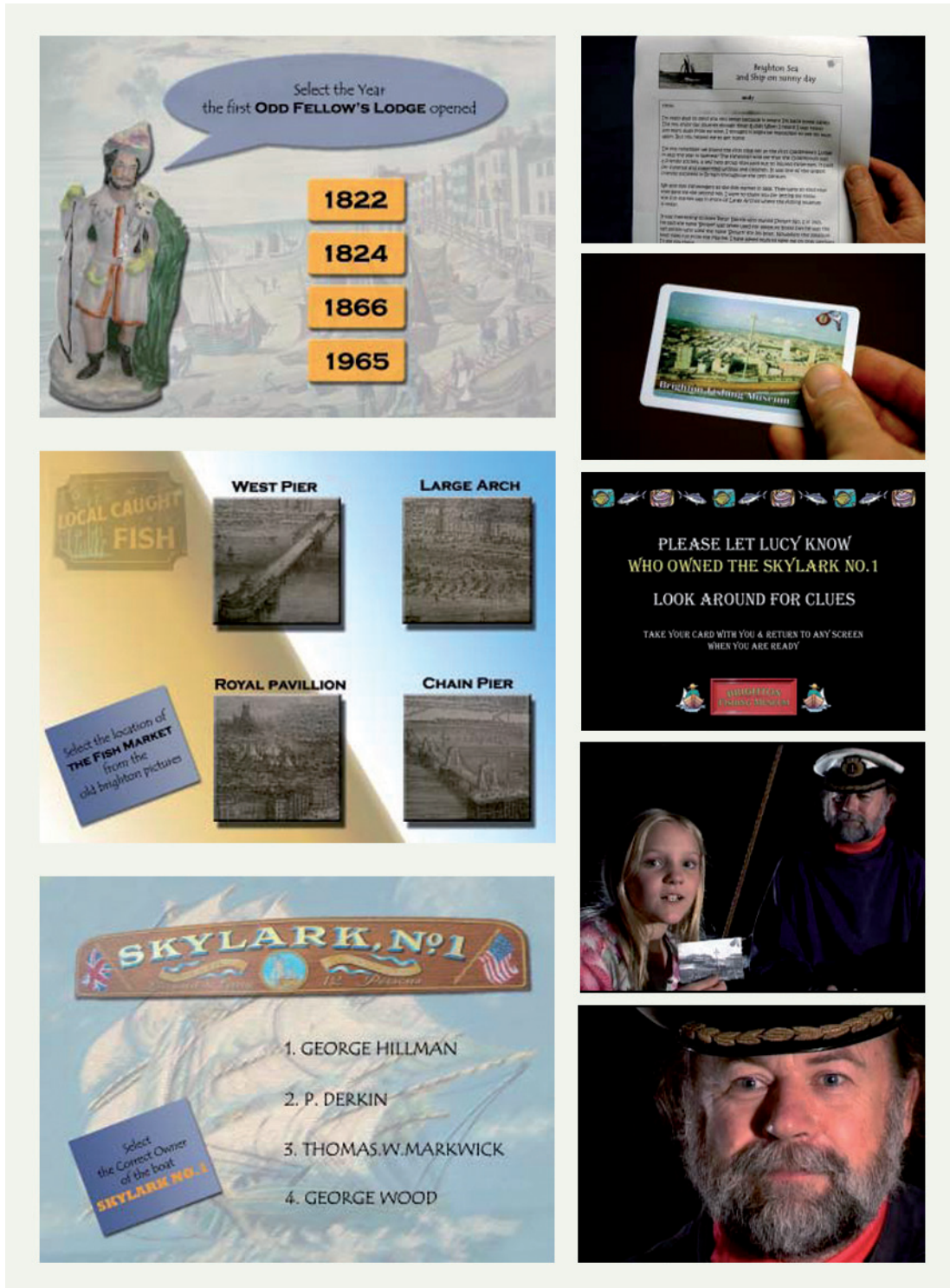


Fig. 7.2. Some images from the interactive experience at the Brighton Fishing Museum. (all the images are taken from Danks, 2007).

<b>Target audience</b>
Not defined but mainly addressed to children
<b>Location</b>
Indoor/Museum
<b>Time of the experience</b>
Before visit   During visit   Post visit
<b>Kind of contents</b>
Collection   Building   External to collection   Intangible heritage
<b>Level of deepening</b>
Beginner   Amateur   Expert
<b>Contents edited by</b>
Curators/Experts   Users   Curator + User
<b>Declared theoretical approach</b>
Not defined
<b>Main learning approach</b>
Focused   Immersive   Collaborative
<b>Models of expansion (Montola, Stenros, &amp; Waern, 2009)</b>
Spatial   Temporal   Social
<b>Model of sociality (Debenedetti, 2003)</b>
Fusion visit   Solitary visit
Pursuit of social relations   Separated visit
<b>Level of social engagement (Simon, 2010)</b>
1   2   3   4   5
<b>Rules</b>
Treasure Hunt
<b>Players</b>
Solo experience   Team experience
Roles   No roles
<b>Kind of conflict</b>
Collaboration   Competition
Collaboration and Competition
<b>Narrative model</b>
Sequence of targets   Background history
<b>Use of technology (Montola, Stenros, &amp; Waern, 2009)</b>
Technology supported   Technology sustained
<b>Platform</b>
Off-the-shelf   Adapted   Ad-hoc

BRIGHTON

Tab. 7.2  
Analysis of the inter-  
active experience at  
the Brighton Fishing  
Museum.

The project stems from a collaboration between the University of Brighton, The Interactive Studio and the Brighton Fishing Museum and it's aimed at creating an interactive storytelling mobile application.

The experience revolves around the story of a young girl called Lucy, trapped in a time trap, who needs the help of visitors to go back home.

Visitors start the experience by registering and gaining a personalised journey from the system and have to find keys related to different eras, interacting with an on-screen game and thus enabling Lucy to get home safely. A screen character addresses the visitors directly, asking them to move within the exhibition, and looking for information.

Completing the experience visitors get a personalised printed paper record of their journey, that highlights the learning outcomes.

The application has been developed with a user-centred approach by post-graduate students and the outcome is a mix of user generated multimedia content in relationship with the pre-existing live exhibition of artefacts housed in the museum.

The conclusions drawn by the authors highlight the importance and value of activity and game-based learning, demonstrating the power of media production in its creation and final implementation as a learning tool within a museum environment, as well as its ability to engage young audiences with Cultural Heritage.

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## 7.3. CityTreasure

2005-2008

**Lugano**, Switzerland

Developers

**Laboratorio Webatelier.net - USIUniversità della Svizzera  
Italiano**, Lugano, Switzerland

### **Keywords**

Game-based learning, mobile technologies, SMS, cultural heritage, K-12, informal learning, outdoor experience

### **Abstract**

*CityTreasure is a team-based city game addressed to primary and secondary school classes during a trip to Lugano (CH).*

*It's a treasure hunt based on the use of a paper map and a cell phone which receives hints from the system through SMS. Players are asked to answer questions about the city in order to proceed in the experience.*





Fig. 7.3. Students playing CityTreasure. (all the images are taken from Botturi et. al., 2009 and [www.etreasure.ch](http://www.etreasure.ch)).

<b>Target audience</b>
Primary and secondary schools
<b>Location</b>
Outdoor/City
<b>Time of the experience</b>
Before visit   During visit   Post visit
<b>Kind of contents</b>
Collection   Building   External to collection   Intangible heritage
<b>Level of deepening</b>
Beginner   Amateur   Expert
<b>Contents edited by</b>
Curators/Experts   Users   Curator + User
<b>Declared theoretical approach</b>
Informal/Situated learning
<b>Main learning approach</b>
Focused   Immersive   Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)
Spatial   Temporal   Social
<b>Model of sociality</b> (Debenedetti, 2003)
Fusion visit   Solitary visit
Pursuit of social relations   Separated visit
<b>Level of social engagement</b> (Simon, 2010)
1   2   3   4   5
<b>Rules</b>
Urban Adventure Game
<b>Players</b>
Solo experience   Team experience
Roles   No roles
<b>Kind of conflict</b>
Collaboration   Competition
Collaboration and Competition
<b>Narrative model</b>
Sequence of targets   Background history
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)
Technology supported   Technology sustained
<b>Platform</b>
Off-the-shelf   Adapted   Ad-hoc

CITY TREASURE

Tab. 7.3  
Analysis of City  
Treasure.

CityTreasure is team-based city game aimed at supporting informal learning for student on a trip.

Groups of students compete with each other in order to win the game, trying to get the highest score: the best observers of the city and of its cultural heritage win.

Each group is equipped with a city map and a cell phone and, through it, the system suggests particular locations in the city and asks them a question about it.

Students have to locate it on the map, walk towards the location in the city and find the solution to the riddle. Other two questions are then asked to visitors before indicating another location on the map. Every treasure hunt is composed by 4 or 5 PoIs, and at the end of the experience the system sends a message with the final score of the group.

The game is addressed to primary and secondary school classes and the evaluation highlights different results for the diverse age groups: children enjoyed more the experience than teenagers and gained better results in terms of learning.

Children's engagement in the experience was high and the adjectives most used to describe it were enthusiastic and happy.

Classes from primary and secondary schools showed strong differences in performance: secondary school students took more time to accomplish the experience and report less satisfaction. The developers explain this result with the lack of teachers to guide secondary school students.

### References

Botturi, L., & al. (2009). The City Treasure. Mobile Games for Learning Cultural Heritage. In D. Bearman, & J. Trent (Ed.), *Museums and the Web 2009: Proceedings*. Toronto: Archives & Museum Informatics.

<http://www.etreasure.ch/site/>

## 7.4. CoCicero

2004

**Museo del Marmo**, Carrara, Italy

Developers

**Laboratoire CLIPS-IMAG**, Grenoble, France

**CNR-ISTI**, Rome, Italy

**Museo del Marmo**, Carrara, Italy

### **Keywords**

Collaborative visit, collaborative game, mobile devices

### **Abstract**

*CoCicero is a single user application which provides contextual information to people visiting the Marble Museum of Carrara, allowing different levels of sociality during the visit.*

*The systems exploits palms and is aimed at fostering social engagement through social gaming.*

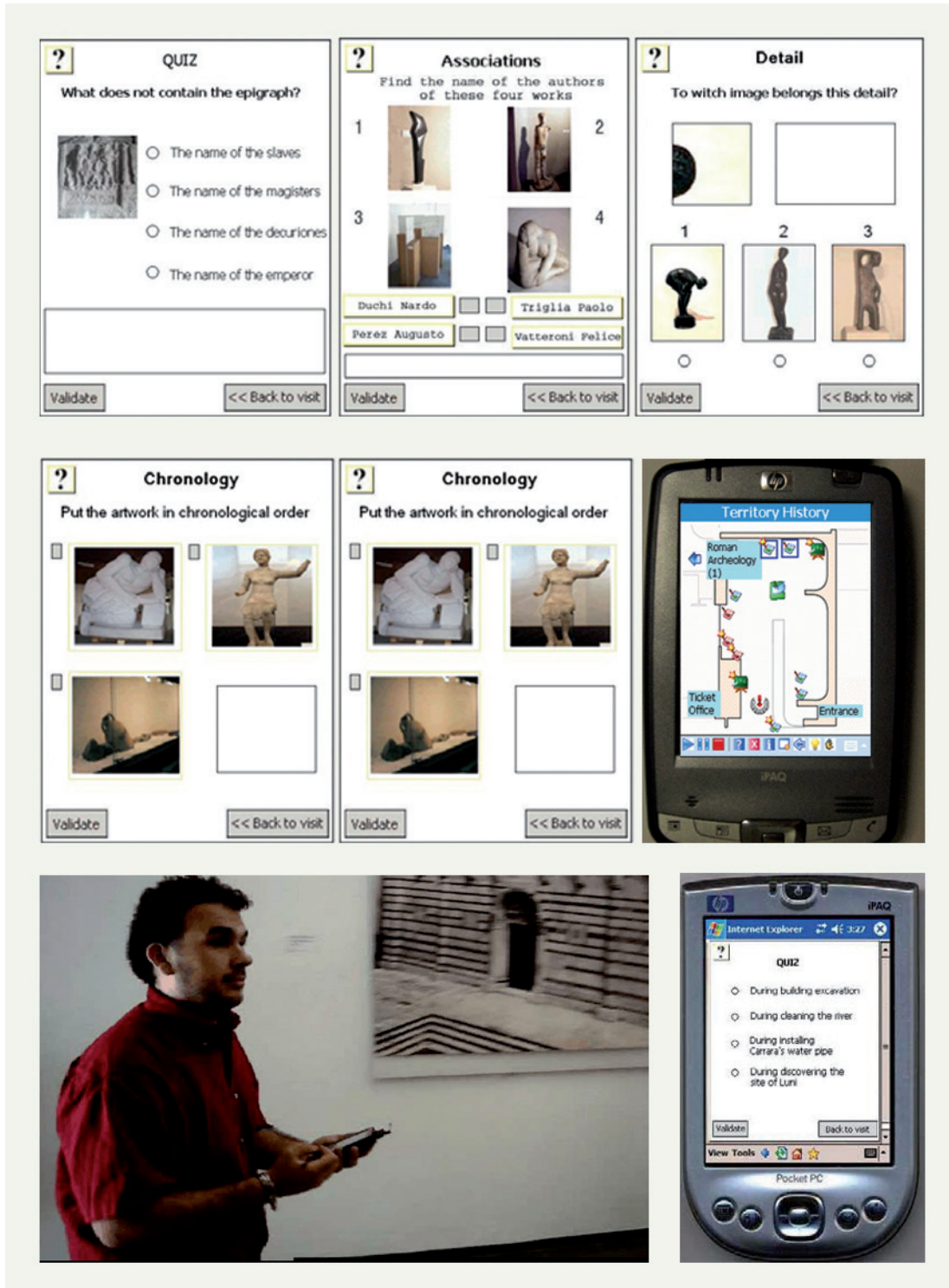


Fig. 7.4. Images and screenshots from Co-Cicero. (all the images are taken from the documents listed in the references).

<b>Target audience</b>				
Not defined – max 5 persons				
<b>Location</b>				
Indoor/Museum				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner	Amateur		Expert	
<b>Contents edited by</b>				
Curators/Experts	Users		Curator + User	
<b>Declared theoretical approach</b>				
Informal/Situated learning				
<b>Main learning approach</b>				
Focused	Immersive		Collaborative	
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial	Temporal		Social	
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Based on Treasure Hunt model plus puzzles				
<b>Players</b>				
Solo experience		Team experience		
		Roles	No roles	
<b>Kind of conflict</b>				
Collaboration		Competition		
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets		Background history		
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported		Technology sustained		
<b>Platform</b>				
Off-the-shelf	Adapted		Ad-hoc	

COICICERO

Tab. 7.4  
Analysis of CoCicero.

CoCicero is a single user application which provides contextual contents to visitors of Marble Museum of Carrara.

The system structures information according to three different levels of granularity (museum, section and piece) and the activities proposed are aimed at stimulating a social experience.

CoCicero provides four methods of engaging in the visit:

- independent user, that is not engaging in group experience
- following, that allow an individual to lead other visitors
- shared listening, that allow to a couple of visitors to share the audio contents. This model is drawn by Sottovoce project (Szymanski, Aoki, Grinter, Hurst, Thornton, & Woodruff, 2008)
- check-in, which allows members in a group to know how others are doing through voice communication while not being physically present. The check-in system, despite different in the technical solution, is conceptually similar to the Foursquare model described in the previous chapter.

The system provides also five different games that can be played alone or within a group of maximum five persons: quiz games, associations games, chronology games, details and hidden word games.

The social games are designed to stimulate interaction and cooperation among visitors, who have to work together in order to solve riddles and questions.

Despite the application and the games are designed for a generic user, the testers found them more suitable for children. The general feedback is positive: the games were judged amusing, intuitive, facilitating the learning process and stimulating socialization.

## References

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Santoro, C., Paternò, F., Ricci, G., & Leporini, B. (2007). A multimodal mobile museum guide for all. *Mobile Interaction with the Real World*.

## 7.5. Explore!

2008-2009

**Egnathia archaeological park**, Egnazia, Italy

Developers

**Dipartimento di Informatica**, Università di Bari, Italy

**Manchester Business School**, Manchester, UK

**Umea University**, Umea, Sweden

**Historia Ludens**, Bari, Italy

### **Keywords**

Mobile learning, children, digital augmentation, cooperative inquiry

### **Abstract**

*Explore! is mobile application structured as a role playing treasure hunt, designed to enhance young pupils' comprehension of the archaeological park of Egnathia, in southern Italy.*

*Middle school students are involved in a common day of the ancient Roman Gaius who asks them to accomplish missions and rewards them with additional contents.*





Fig. 7.5. Students playing Explore! (all the images are taken from the documents listed in the references).

<b>Target audience</b>				
Middle school students				
<b>Location</b>				
Outdoor/Archaeological park				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur	Expert	
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Constructivism				
<b>Main learning approach</b>				
Focused		Immersive	Collaborative	
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal	Social	
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Treasure Hunt				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted	Ad-hoc	

EXPLORE!

Tab. 7.5  
Analysis of Explore!

Explore! is a m-learning system developed to support middle school students during a visit to the archaeological park of Egnathia in Italy.

It's a treasure hunt games to be played in small groups, based on the day of the fictional ancient Roman Character, Gaius.

Students enter the experience with an introduction phase during which a game master explains the game and divides students in groups of 3-5 persons.

Each player assumes a role: the reader, who reads the challenge; the petitioner, who consults the glossary; the navigator, who carries the map and marks the identified places and the scouts who go on ahead to trace the places that are the targets of the mission.

Each group is given a map and a cell phone and is taken by the system to different points of interest in the park: solving missions students get bonuses such as additional info and 3D reconstruction of the site.

After the game players are collected again for the debriefing phase during which they are lead to reflect upon what they have learned.

The developers have tested the mobile system through field study and in comparison with a paper based version of the same game.

Results suggest that learning occurs with no significant differences in both the experiences but with some remarks: 3D reconstructions available on the mobile version add to the comprehension of the ruins, the paper version can be problematic during windy days and that the sequential nature of the mobile game limits users' choice and does not allow to make comparisons.

## References

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Costabile, M., De Angeli, A., Lanzillotti, R., Ardito, C., Buono, P., & Pederson, T. (2008). Explore! Possibilities and Challenges of Mobile Learning. *CHI 2008 Proceedings* (p. 145-154). New York: ACM.

## 7.6. Frequency1550

2008-2009

**Amsterdam**, The Netherland

Developers

**Waag Society**, Amsterdam, The Netherlands

**IVKO, Amsterdam**, The Netherlands

### **Keywords**

Game-based learning, location-based technology, narrative, storification, history education.

### **Abstract**

*Frequency1550 is a mobile game addressed to 12-14 years old pupils and aimed at enhancing their knowledge about the medieval Amsterdam. The students act as pilgrims in search of a lost relic and must overcome diverse difficulties to gain the citizenship. On-site groups with mobile devices and on-line groups behind a PC collaborate towards the solution of the enigma.*

FREQUENCY1550

<b>Target audience</b>				
12-14 years old pupils				
<b>Location</b>				
Outdoor/City				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur	Expert	
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Constructivism				
<b>Main learning approach</b>				
Focused		Immersive	Collaborative	
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal	Social	
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Based on Treasure Hunt				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted	Ad-hoc	

Tab. 7.6  
Analysis of  
Frequency1550.

Frequency1550 is a pilot project aimed at testing the use of GPS-enabled UMTS mobile phones as a means to involve 12-14 years old students in a learning experience about the medieval Amsterdam.

The experience is structured as a game with a background history: during network tests, a Waag Society development-team found that the Amsterdam UMTS-network is interfering with the medieval era. The medieval city's bailiff gets in contact with the here and now and mistakes the intruders to be pilgrims coming to 1550 Amsterdam to visit the special relic: the Holy Host associated with The Miracle of Amsterdam. He proposes them to find the holy relic that got lost, in exchange for the citizenship: the students in groups of four or five, take up their roles as competing pilgrims with assigned roles of beggar or merchant with related rights and status in the game.

Every group is guided by the headquarter, composed by other students that interact with the on-site players through a desktop pc.

The game revolves around six different themes: labour in the area called Lastage; trade in the area called de Kade; religion in the area called de Twee Zijden; rules and government in the area called die Plaets; knowledge in the area called de Kloosters; and defence in the area called de Verdediging.

The developers found that playing the game resulted in a better knowledge about medieval Amsterdam: those pupils who played the game generally obtained higher scores on the knowledge test when compared to those pupils who received a series of regular project based lessons.

Another remark is that pupils with a lower level of education benefited less from the Frequency 1550 game than those pupils with a higher level of education. Conversely, those pupils with an initially low History ability benefited more from playing the Frequency 1550 game than pupils with a higher level of initial History ability.

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<http://freq1550.waag.org/>

Fig. 7.6.  
Images from  
Frequency1550.  
(all the images are  
taken from the docu-  
ments listed in the  
references and from  
<http://freq1550.waag.org/>).



## 7.7. Kurio

2007-2008

**Surrey Museum**, Surrey, Canada

Developers

**Simon Fraser University**, Surrey, Canada

**Emily Carr University of Art and Design**, Vancouver, Canada

**Ubiquity Interactive**, Canada

**Surrey Museum**, Surrey, Canada

### **Keywords**

Tangible user interface, learning, social interaction, hybrid system, families, group interaction

### **Abstract**

*Kurio is an hybrid system (TUIs, PDA an tabletop pc) aimed at enhancing the learning experience at Surrey Museum and specifically addressed to family groups. Each family member impersonates a role and is involved in a game based experience and asked to accomplish diverse challenges. The system is structured to foster social engagement and collaboration among family members, allowing parents to support their children activities..*



# KURIO

<b>Target audience</b>
Family groups
<b>Location</b>
Indoor/Museum
<b>Time of the experience</b>
Before visit   During visit   Post visit
<b>Kind of contents</b>
Collection   Building   External to collection   Intangible heritage
<b>Level of deepening</b>
Beginner   Amateur   Expert
<b>Contents edited by</b>
Curators/Experts   Users   Curator + User
<b>Declared theoretical approach</b>
Constructivism
<b>Main learning approach</b>
Focused   Immersive   Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)
Spatial   Temporal   Social
<b>Model of sociality</b> (Debenedetti, 2003)
Fusion visit   Solitary visit
Pursuit of social relations   Separated visit
<b>Level of social engagement</b> (Simon, 2010)
1   2   3   4   5
<b>Rules</b>
Treasure Hunt
<b>Players</b>
Solo experience   Team experience
Roles   No roles
<b>Kind of conflict</b>
Collaboration   Competition
Collaboration and Competition
<b>Narrative model</b>
Sequence of targets   Background history
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)
Technology supported   Technology sustained
<b>Platform</b>
Off-the-shelf   Adapted   Ad-hoc

Tab. 7.7  
Analysis of  
Kurio.

Kurio project addresses issues of social engagement, play and learning for family groups in museums; it's an hybrid system which include several tangible computing devices, a PDA, and a tabletop display.

The experience is structured as a game with missions that the family has to accomplish in order to advance in the experience: each challenge requires to find historical information from the museum collection, using the PDA and the tangible interfaces.

Every family member plays a role and only collaborating they can manage to overcome the three challenges proposed by the system.

The tangible are the core of the system: a pointer, useful to select museum's artefacts; a reader, shaped as a magnifying glass, used to capture text from displays; a listener, which allows to listen to audio file at specific locations; and finally a dowsing rod.

The PDA is used to coordinate the family members, to receive the missions, and to monitor the progresses, while a tabletop pc works as rendez-vous place where the family members join to check the game status.

User studies conducted by the developers show that Kurio stimulated constant interaction among family members, allowing parents to support their children in explaining or contextualizing problems in solving the game. The high level of social interaction is achieved, according to Kurio designers, thanks to the distributed involvement of each family member with different roles.

An important role is also credited by designers to Tangible User Interfaces, considered very useful in naturalising technology within museum environment.

## References

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Fig. 7.7.  
Families playing in  
the museum and  
TUI. (all the images  
are taken from the  
documents listed in  
the references).



## 7.8. M@M. Mystery at the museum

2003

**Boston Science Museum**, Boston, USA

Developers

**MIT Teacher Education Program/The Education Arcade**,  
Cambridge, USA

**Boston Science Museum**, Boston, USA

### **Keywords**

Handhelds, games, simulations, role play, PDA, museum, wireless

### **Abstract**

*M@M is an interactive mystery game addressed to groups of parents and children visiting the Boston Science Museum. Players impersonate different roles trying to solve a mystery, retrieve a precious stolen artefact and arrest the criminals.*

*The aim is to engage visitors more deeply in the museum and more broadly across the exhibit, allowing family groups to collaborate in a learning experience.*

<b>Target audience</b>				
Family groups				
<b>Location</b>				
Indoor/Museum				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur	Expert	
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Constructivism				
<b>Main learning approach</b>				
Focused		Immersive	Collaborative	
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal	Social	
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Treasure Hunt + Collect and Trade				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted	Ad-hoc	

Tab. 7.8  
Analysis of  
Mystery at the  
Museum.

M@M is an interactive mystery game designed for synchronous play of groups of parents and children visiting the Boston Science Museum.

The experience is structured as a role playing game based on a fictitious mystery story: The Pink Flamingo Thieves, a band of thieves, had left their calling card (a pink flamingo) in an exhibit case indicating that they had stolen a priceless object from the museum and replaced it with a replica.

The players impersonate the roles of experts called to the museum to solve the crime, arrest the thieves, and identify the replica and retrieve the stolen artefact. Each player takes on one of three possible roles - a technologist, a biologist and a detective - each with special capabilities enabled by mobile devices.

Through wi-fi positioning, players are located in the right museum room and virtual data are delivered, in particular players can interact with virtual characters and virtual objects.

Players can interview virtual characters by clicking on them to gain a textual monologue often accompanied by pictures. The virtual characters move in the exhibit and give different information according to the different role of the interviewer. Every room contains also virtual objects players can pick up and examine and use to interact with virtual characters.

During the game, players in a team can exchange virtual objects and interview with each other, completing the game with the collection of enough clues to indentify the criminals and get an arrest warrant.

The feedback gained from participants showed that the combination of depth and breadth was effective in encouraging visitors/players to think actively about the museum's exhibits. The roles turned out to be effective in engaging pairs of participants with one another and parents reported a quite positive interaction with their children.

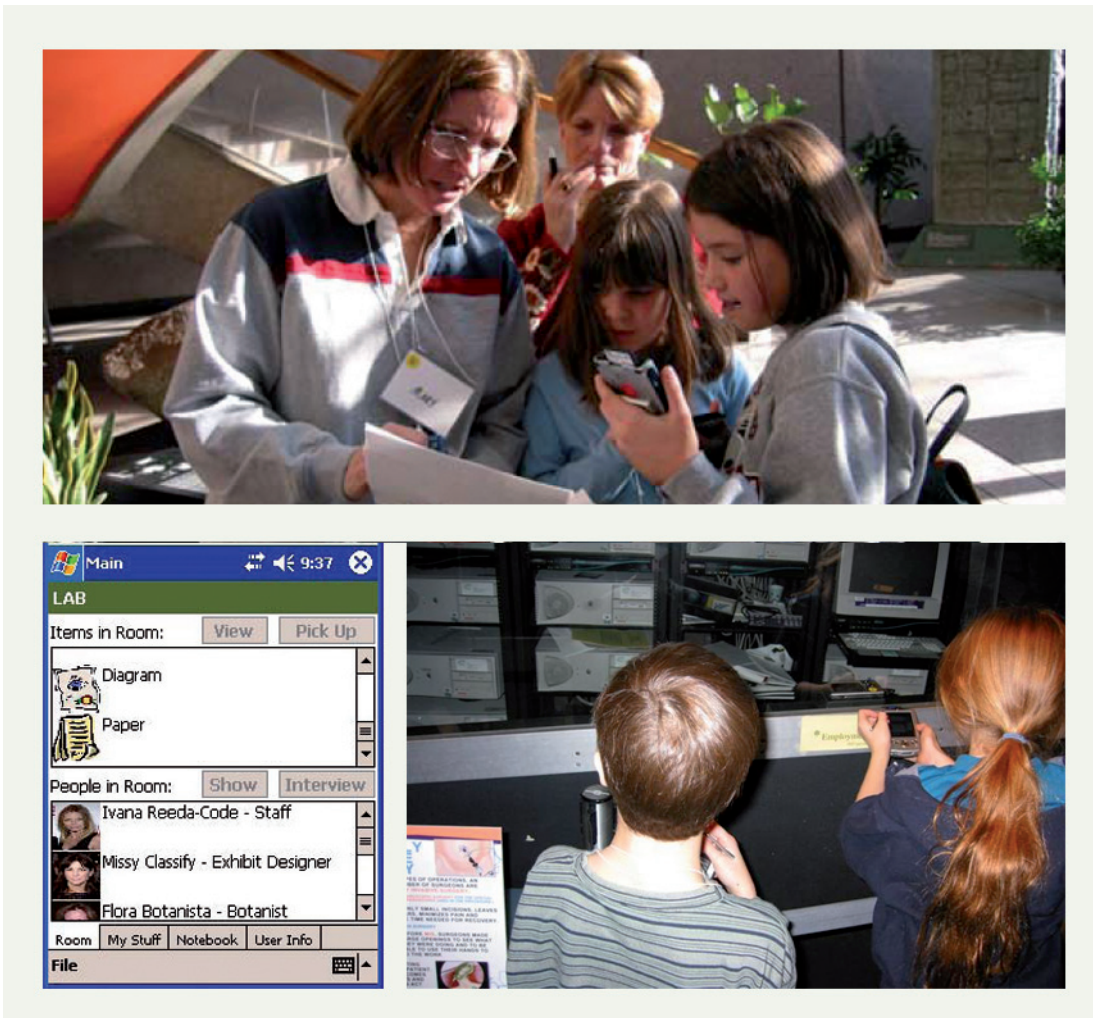
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Fig. 7.8.  
Children experiencing M@M and a screenshot (all the images are taken from Klopfer et al. (2005)  
and from <http://education.mit.edu/ar/matm.html>).



## 7.9. MiM. Mystery in the museum

2005

**Museum of Solomos**, Zakynthos, Greece

Developers

**University of Valladolid**, Valladolid, Spain

**University of Patras**, Patras, Greece

**Museum of Solomos**, Zakynthos, Greece

### **Keywords**

collaborative learning, mobile technologies, museums, cultural information rich environments, PDA

### **Abstract**

*MiM is a collaborative game, addressed to young visitors of the Museum of Solomon. Students are involved in puzzles with images and poems and have to collaborate in order to solve them.*

*The experience aims at making students learn about specific topics through a collaborative approach but the results show that students used exhibits only as auxiliary material.*





<b>Target audience</b>				
13 - 19 years old students				
<b>Location</b>				
Indoor/Museum				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur	Expert	
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Collaborative learning				
<b>Main learning approach</b>				
Focused		Immersive	Collaborative	
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal	Social	
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Based on Treasure Hunt model				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted	Ad-hoc	

Tab. 7.9  
Analysis of  
Mystery in the  
Museum.

MiM is a collaborative learning experience, based upon game mechanics and addressed to young visitors of the Museum of Solomos.

Small groups of students aged between 13-19 are given an handheld device and involved in two games: the TextGame and the ImageGame.

Each group of students receives some information through the devices and plays a role in the story: in both the experiences pieces of poems or images are spread among the devices forcing players to collaborate and share information in order to reconstruct the story and solve the mystery.

The experience aims at making students learn about specific topics through a collaborative approach: in puzzle activities (ImageGame) students have to work together in order to be able to solve them while in the TextGame the goal is to compose correctly a manuscript out of fragments of text, spread on different group members' PDAs.

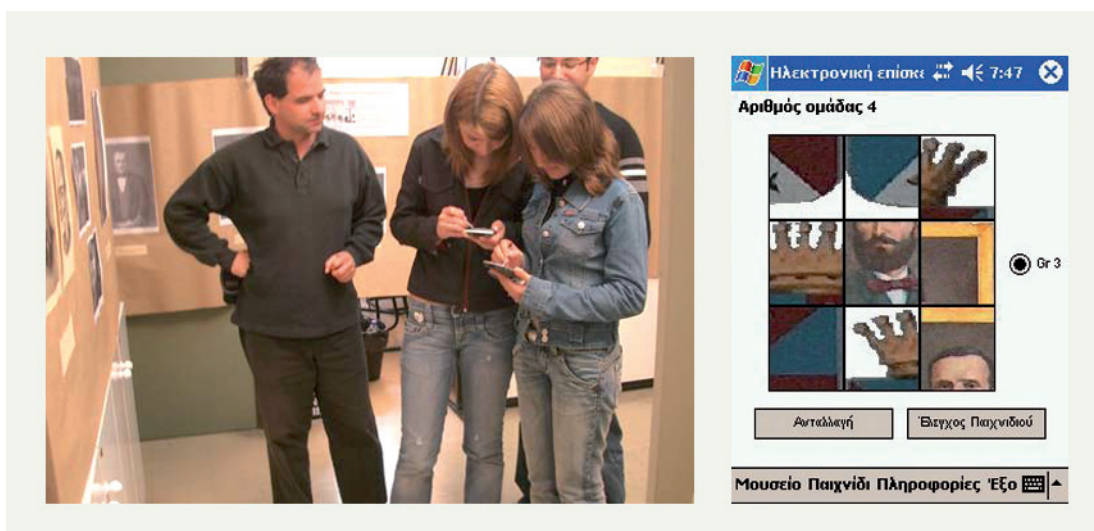
The developers report that the system was not invasive for the museum but that students used museum exhibits only as auxiliary material, paying more attention to the game and the mobile application.

## References

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Fig. 7.9.  
Students testing  
MiM. (all the images  
are taken from the  
documents listed in  
the references).



## 7.10. Plug.

# Secrets of the museum

2009

**Musée des arts et métiers**, Paris, France

Developers

**Institut TELECOM**, Paris, France

**Musée des arts et métiers**, Paris, France

**TETRAEDGE Games**, Montreuil, France

### **Keywords**

Mobile guides, design guidelines, heritage education, social interaction, games, personalization

### **Abstract**

*PSM is a mobile card game played in the Musée des arts et métiers of Paris and aimed at creating an educational but enjoying experience, addressed to different age groups, and to families, playable several times.*



Fig. 7.10. A session of Plug. (all the images are taken from <http://plug-futur-en-seine.it-sudparis.eu/en/>).

# PLUG

<b>Target audience</b>
Broad audience
<b>Location</b>
Indoor/Museum
<b>Time of the experience</b>
Before visit   During visit   Post visit
<b>Kind of contents</b>
Collection   Building   External to collection   Intangible heritage
<b>Level of deepening</b>
Beginner   Amateur   Expert
<b>Contents edited by</b>
Curators/Experts   Users   Curator + User
<b>Declared theoretical approach</b>
Not specified
<b>Main learning approach</b>
Focused   Immersive   Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)
Spatial   Temporal   Social
<b>Model of sociality</b> (Debenedetti, 2003)
Fusion visit   Solitary visit
Pursuit of social relations   Separated visit
<b>Level of social engagement</b> (Simon, 2010)
1   2   3   4   5
<b>Rules</b>
Card Game
<b>Players</b>
Solo experience   Team experience
Roles   No roles
<b>Kind of conflict</b>
Collaboration   Competition
Collaboration and Competition
<b>Narrative model</b>
Sequence of targets   Background history
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)
Technology supported   Technology sustained
<b>Platform</b>
Off-the-shelf   Adapted   Ad-hoc

Tab. 7.10  
Analysis of  
Plug.

PSM is a mobile game based on the use of NFC-enabled phones and played in the Musée des arts et métiers of Paris which contains dedicated RFID tags. The experience is structured as a card game and eight groups challenge exchanging cards with each other or with RFID tags.

The game revolves around 16 museum objects with an associated RFID card representing them or their creator: the tags are switched or hidden inside mobile phones and players have to find and collect them according to four collections (Ghost busters, Wonder creators, Trainers of elements, Time accelerators).

To win the game players have to get the best score and to gain points, the teams have to gather four cards of the same family, exchanging them or finding them; to store them to its referring RFID tag; exchanging cards with other teams and answering quiz related to the objects of the Museum.

Teams have to prove their collector's ability, their public spiritedness, their generosity and their curiosity.

PSM addresses different age groups thanks to the different ways of gaining points: while children enjoy collecting cards, adults prefer to answer quizzes. Family groups can decide to play in one team, collaborating in competition with other groups or to spread in different groups and compete.

The different strategies for gaining points can allow also to play several times without getting bored.

The study conducted on twelve public sessions showed that players explore the entire museum and that the game was successful in stimulating interest in museums exhibits.

## References

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<http://plug-futur-en-seine.it-sudparis.eu/en/>

## 7.11. REXplorer

2007

**Regensburg**, Germany

Developers

**RWTH Aachen University, Media Computing Group**,  
Aachen, Germany

**ETH Zurich, Computer Aided Architectural Design Group**,  
Zurich, Switzerland

### **Keywords**

Pervasive game, mobile phone, moblogs, location based services, persuasive technology

### **Abstract**

*REXplorer is a mobile spell-casting game, addressed to tourists visiting the city of Regensburg (D). Players are asked to use a special wand (mobile GPS-enabled phone) to wander in the city and cast spell in front of historical buildings in order to evoke the spirits of historical figures.*

*The game bring tourists on different paths within the medieval city, contextualizing buildings and historical facts in different time periods.*



Fig. 7.11. Screenshots and photos of REXplorer. (all the images are taken from the documents listed in the references).



## REXPLORER

<b>Target audience</b>				
15-30 years old tourists				
<b>Location</b>				
Outdoor/City				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur	Expert	
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Not specified				
<b>Main learning approach</b>				
Focused		Immersive	Collaborative	
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal	Social	
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Urban adventure game				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted	Ad-hoc	

Tab. 7.11  
Analysis of  
REXplorer.

REXplorer is a mobile spell-casting game designed for tourists of Regensburg, Germany. Tourists are guided towards historical buildings in the city where they cast spells in order to evoke fictional spirits of famous historical figures and communicate with them.

The game revolves around a really existing object, a gravestone conserved in the Regensburg cathedral, and inscribed with a not yet deciphered language. A new device created by REX Scientists (in the game fiction) can measure paranormal activity and drawing the gravestone symbols in the air using the device players can excite the four elements (wind, fire, earth, and water) and establishes a communication channel with the spiritual world.

Researching the link between the symbols and the paranormal activity and collecting data throughout the city, players can help scientists to discover the true meaning of the gravestone symbols.

Evoking the spirits in front of historical buildings tourists get to know their stories, usually related to significant events and periods in the history of the city, and get hints for the new mission. Completing quests and encountering new characters players are rewarded with points.

The background history is specifically designed to justify the choice of gestures as interface model, to engage players in a long quest, to bring together several historical contexts under one coherent storyline, to allow players to create a mental map of the city and to justify renting a special device.

During game sessions developers noted that very often players got so immersed in the game to forget the normal safety issues and suggest to avoid time constraints in order to overcome this problem. They also noticed that the use of the two tools, a mobile device and a paper map, naturally brought players to divide roles and exchange them during the game.

## References

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## 7.12. Tate Trumps

2010

**Tate Modern**, London, UK

Developers

**Hide&Seek**, London, UK

**Tate Media**, London, UK

**Play Nicely**, Bristol, UK

**Mobile Pie**, Bristol, UK

### **Keywords**

Mobile gaming, contemporary art, new interpretations

### **Abstract**

*Tate Trumps is a mobile game developed for the Tate Modern that allows single users or teams to engage in a game in three different modes: Battle, Mood, Collector. Players are invited to think about artworks as a tool to fight, as a catalyst of mood or as something to be collected.*

<b>Target audience</b>				
Broad audience				
<b>Location</b>				
Indoor/Museum				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur		Expert
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Not specified				
<b>Main learning approach</b>				
Focused		Immersive		Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal		Social
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Trumps card game				
<b>Players</b>				
Solo experience		Team experience		
		Roles	No roles	
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted		Ad-hoc

TATE TRUMPS

Tab. 7.12  
Analysis of  
Tate Trumps.

Tate Trumps is a mobile application developed for the Tate Modern which involves visitors in three different game experiences based upon the permanent collection. Visitors are asked to join in a team and enter one of the game modes: Battle, Mood or Collector. In Battle mode players are asked to imagine what would happen if the artworks would come alive and attack each other; Mood mode proposes a contemplative approach, asking players to look for artworks they feel exhilarating, menacing or absurd; Collector mode allows players to construct their own art gallery, learning about the history and curatorial challenges of housing certain works.

In all the modes a player can collect a roster of artworks and then join with other players to play a fast competitive card game and discover which artwork is more powerful.

The system is not based upon context awareness and players select artworks by simply entering codes retrieved beside the artworks in the gallery.

The aim of the game is to make visitors think about the artworks of the permanent collection in a different way and enjoy the visit experience.

### References

Fig. 7.12.  
Tate Trumps. Images  
from <http://www.tate.org.uk/modern/information/tatetrumps.shtm>  
and <http://www.hideandseek.net/projects/tate-trumps/>

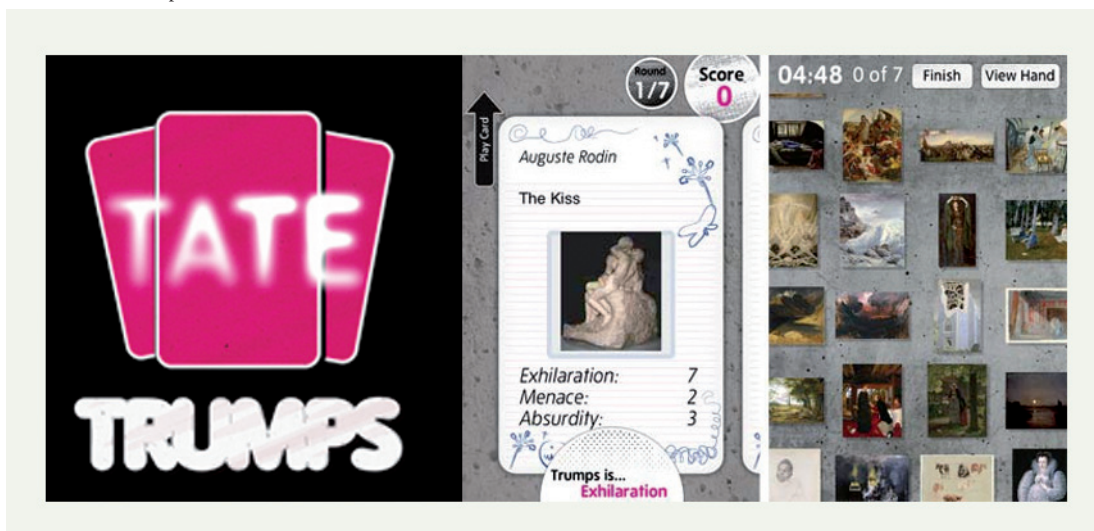
<http://www.tate.org.uk/modern/information/tatetrumps.shtm>

<http://www.hideandseek.net/projects/tate-trumps/>

<http://playnicely.co.uk/content/tate-trumps>

<http://moma.org/interactives/exhibitions/2011/talktome/objects/140016/>

<http://itunes.apple.com/us/app/tate-trumps/id371670940?mt=8>



## 7.13. Via Mineralia

2007

**Terra Mineralia Museum**, Freiberg, Germany

Developers

**Virtual Reality and Multimedia Group**, Technical University of Freiberg, Germany

**Department of Aerospace Engineering, University of the Federal Armed Forces**, Munich, Germany

### **Keywords**

Mobile gaming, contemporary art, new interpretations

### **Abstract**

*Via Mineralia is a mobile treasure hunt, based upon the use of RFID tags, and aimed at providing visitors of a minerals museum with an enjoying learning experience.*

*Players are provided with a NF-enabled PDA which gives them hints to find exhibit and allow to buy additional hints using game points.*

<b>Target audience</b>				
14-19 years old visitors				
<b>Location</b>				
Indoor/Museum				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur		Expert
<b>Contents edited by</b>				
Curators/Experts		Users		Curator + User
<b>Declared theoretical approach</b>				
Not specified				
<b>Main learning approach</b>				
Focused		Immersive		Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal		Social
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Treasure Hunt				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted		Ad-hoc

Tab. 7.13  
Analysis of  
Via Mineralia.

Via Mineralia is a classical treasure hunt played with mobile devices in the Terra Mineralia Museum and aimed at capturing the attention of the visitors, at conveying knowledge about the exhibits, and at providing them with a guided path around the museum in a playful way.

Players are provided with a NF-enabled PDA which gives them hints to find exhibit and allow to buy additional hints using game points.

When visitors think to have found the correct exhibit they scan a RFID label attached to or close to it: if the object is the correct one, the system ask visitors some questions and reward them for every correct answers. After answering all questions, the search for a new exhibit is started, repeating the process.

The objects are disposed in different successions according to the chosen tour, e.g. “colour tour”, “treasure tour”, “local minerals tour”, etc.

After the completion of the tour, the system communicate the score and if high enough, it is then logged in a high-score list on the game server together with the player’s name and ranking.

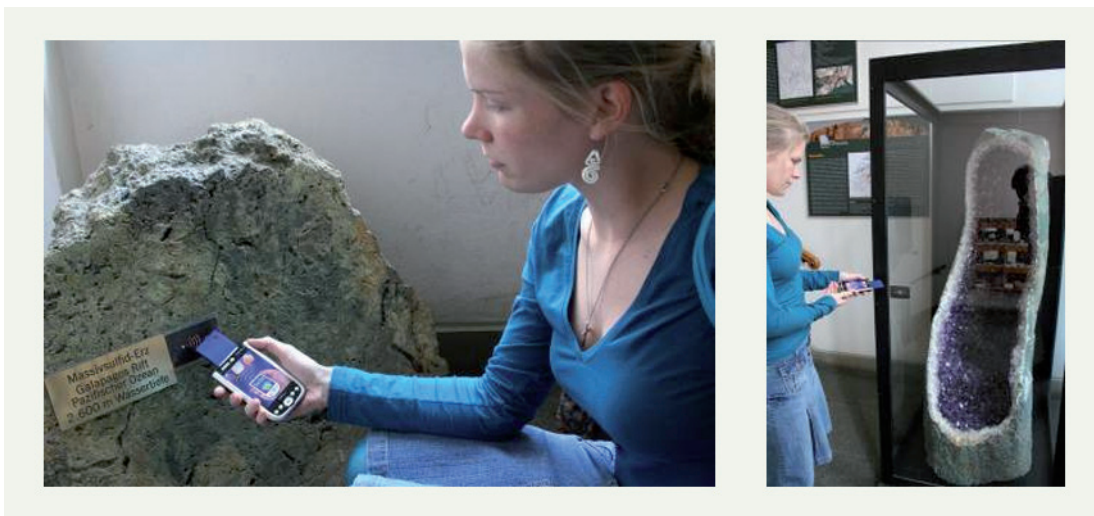
Developers notice that the system stimulate visitors/players to actively explore all the museum and read with attention all the labels and the informative materials.

## References

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<http://vr.tu-freiberg.de/viamineralia/>

Fig. 7.13.  
A user of Via Mineralia (all the images are taken from Heumer et al., 2007).





## 7.14. WhaiWhai

2009

**Milan, Rome, Florence, Venice, Verona**, Italy  
**New York**, USA

Developers

**Log607**, Roncade (Treviso), Italy

### **Keywords**

Touristic guide, mobile gaming, city tale

### **Abstract**

*WhaiWhai is a not conventional touristic guide based upon a book with messed up pages and a cellphone, available for six cities: Milan, Rome, Florence, Venice, Verona, NewYork. Players are involved in a scavenger hunt activity, following the stories and solving enigmas.*



Fig. 7.14. Images of WhaiWhai (all the images are taken from <http://www.whaiwhai.com/>).

<b>Target audience</b>				
Broad audience				
<b>Location</b>				
Outdoor/City				
<b>Time of the experience</b>				
Before visit		During visit		Post visit
<b>Kind of contents</b>				
Collection	Building	External to collection	Intangible heritage	
<b>Level of deepening</b>				
Beginner		Amateur		Expert
<b>Contents edited by</b>				
Curators/Experts		Users	Curator + User	
<b>Declared theoretical approach</b>				
Not specified				
<b>Main learning approach</b>				
Focused		Immersive		Collaborative
<b>Models of expansion</b> (Montola, Stenros, & Waern, 2009)				
Spatial		Temporal		Social
<b>Model of sociality</b> (Debenedetti, 2003)				
Fusion visit			Solitary visit	
Pursuit of social relations			Separated visit	
<b>Level of social engagement</b> (Simon, 2010)				
1	2	3	4	5
<b>Rules</b>				
Urban adventure game / Scavenger hunt				
<b>Players</b>				
Solo experience			Team experience	
			Roles	No roles
<b>Kind of conflict</b>				
Collaboration			Competition	
Collaboration and Competition				
<b>Narrative model</b>				
Sequence of targets			Background history	
<b>Use of technology</b> (Montola, Stenros, & Waern, 2009)				
Technology supported			Technology sustained	
<b>Platform</b>				
Off-the-shelf		Adapted		Ad-hoc

Tab. 7.14  
Analysis of  
WhaiWhai.

WhaiWhai is an unconventional touristic guide based upon a book and a cellphone (Milan, Rome, Florence, Venice, Verona, NewYork) or an iPhone App (New York).

To play WhaiWhai visitors need to buy the guide in a bookshop and start the experience by sending a SMS with a code retrievable in the guide. A SMS gives back some codes useful to order the pages of the book: each page is indeed cut in three parts and all the pages are messed up, and readable only with the hints.

Ordering the pages visitors are able to read the first story and start the game: the stories are about legends, historical anecdotes and peculiar events that have happened in the city and describe a place towards which visitors must head.

While walking visitors receive an enigma via SMS and they have to explore the location looking for the solution: once visitors solve the riddle and send back the answer via SMS they get new codes for a new story. Every game session include normally six stories related to six different places in the city and every book includes two game sessions.

The plots are written by famed writers and are different for every city, these are the teasers:

***Milan - The Diamond*** by Paolo Roversi

*Searching for a stolen diamond in some of the most haunting corners of Milan: from the dark lady on the spires of the Duomo, to the Devil's Horns at Saint Ambrose's, from the nocturnal spectres of the Sforza Castle to the murders of Stretta Bagnera. 45 stories tell you 45 places in Milan. Discover history of the city, her music and design tradition. Milan The Diamond is an itinerary lined with enigmas to uncover the secrets and learn about the most fascinating places of the city. You can be the hero of the story.*

***Rome - The Ruyi*** by Alberto Toso Fei

*Sixty stories about sixty places in Rome. Having long been the centre stage of world history, Rome has countless stories to tell about emperors, popes, artists, talking statues, magicians and much more. As you learn about the affairs of the noble Borgia family and about the misadventures of Virgil the Magician, as you pass by the Colosseum, the popular Trastevere neighborhood and many other places, you'll discover Rome's fantastic secrets. Rome the Ruyi is an itinerary lined with enigmas to unlock the mysteries and discover the most fascinating corners of the eternal city. You can be the hero of the story.*

***Florence - 2054*** by Luciano Artusi

*Forty-five stories about forty-five places in Florence. Learn about the unique, fascinating mysteries of the city that gave birth to the Italian lan-*

*guage, inspired Dante's cantos and the grand works of Leonardo da Vinci and Brunelleschi. Florence 2054 is an itinerary lined with enigmas to uncover the mysteries and discover the extraordinary beauty of the capital of the Renaissance. You can be the hero of the story.*

**Venice - The Ruyi** by Alberto Toso Fei

*Sixty stories about sixty different places in Venice. From the myth of the sad fairy to the legend of the column that disappeared, from the lone cannon that stopped an entire armada to the mermaid who married a fisherman. Searching for a magical scepter, you can discover the city that lies on the water. Venice The Ruyi is an itinerary lined with enigmas to uncover the mysteries and learn about the most enchanting places of Venice. You can be the hero of the story.*

**Verona - Amor** by Francesco Mazzai

*Thirty-five stories about thirty-five places in the city of lovers. From behind the scenes of the tragic love story of Romeo and Juliet to a tale about Alboino and Rosamunda, from the story of the villain Bertoldo to the intriguing secrets surrounding the city's Roman theatres. Verona Amor is an itinerary lined with enigmas to unlock the mysteries and discover the most charming corners of the city of lovers.*

**New York - The Pegleg** by Timothy Speed Levitch

*In 1647 A.D, a particular pegleg, a prosthesis with mystical powers, appeared on Manhattan Island. In that year, Peter Stuyvesant, stepped ashore and planted his wooden leg, which was covered with bands of silver, firmly on this soil. After Stuyvesant's death, the magical limb lay hidden with him in his family's crypt in the east village, but right before the crypt was permanently sealed, the peg leg vanished and has been missing ever since.*

WhaiWhai New York is available also as an iPhone app which avoids visitors to buying the book.

All the games can be played alone or in group or challenging other individuals or groups.

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<http://www.whaiwhai.com/>

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## 8. Data analysis

*Chapter eight discusses the data collected through the analysis of the cases, schematically represented by the charts. All the data collected analysing the cases are converged in the graphic representation proposed along the chapter in order to facilitate the analysis and support the discussion.*

*The discussion is firstly addressed in an ordered manner, analysing all the remarkable criteria and making sense of the results, while the last section proposes a more integrated analysis of the data, making results overlap in order to answer the questions posed in the previous chapter and get insights.*

### 8.1. Who, why and for whom.

The first cluster of analysis outlines the cases with raw lines but it's useful to answer who and why questions.

Looking at the actors usually involved in the deployment of the projects three remarkable facts can be noticed: universities and research centres are the most active in the field; cultural institutions are not always involved in the project development; private societies and foundations have a prominent role.

Universities are quite always involved in the projects described for two reasons: first, the advanced use of mobile technology in museums and cultural institution is still a complex issue that needs research to be developed and understood and second, the tools used to find and select cases could have influenced the results (scientific web search engines, conference proceedings).

More surprising is the fact that the institutions for which the projects are developed are not always involved in the design of the experience, but looking more in detail we can also notice that very often this condition is verified when projects involve the urban space and not museums. In this light the results seem more comprehensible but anyway they very often highlight a lack of strategic vision on the projects and this result could mean that several projects have been developed in order to test technological potentialities rather than offer a really meaningful experience for museums.

Private societies and foundations have a paramount role and are particularly active in providing those competences (programming, developing, interaction design ...) hard to be found in cultural institution and universities.

These remarks partially address who questions but why these applications have been developed?

Looking at the documentation produced by developers and researchers who took part in the projects it results that for quite all the applications, the first aim is to create an educational experience able to amuse visitors, that is conveying knowledge in an entertaining way.

This result is consistent with the declared aims of museums and cultural institutions (ICOM, 2007) and is in line with the targets mostly addressed by the projects, middle and high school students and family groups.

If we look indeed at the stated targets of the projects it emerges that teenagers are considered the most appropriate audience for such applications and that smaller children are addressed only within a family group where parents can take control of the experience and make use of mobile technology (e.g. M@M and Kurio).

Some projects, such as PSM, voluntarily address a broad audience intro-



ducing different game mechanics which can fit all age groups while others, such as Tate Trumps, propose very simple activities that can easily fit with different targets.

Those projects with a more touristic vocation such as REXplorer and WhaiWhai look, voluntarily or not, at young couples or small groups of friends visiting cities.

The target is certainly one of the main constraints to be carefully considered while developing mobile experiences and designing for a generic audience can result in frustration for some groups: in CoCicero, for example, adult testers report the experience as amusing but frustrating in terms of contents and dynamics and more suitable for children (Dini, Paternò, & Santoro, 2007).

## **8.2. Where and when.**

Other two constraints that heavily influence the nature of the projects are place and time, namely the location in which the experience takes place and the time of the experience related to the visit.

From the charts it emerges that most of the experiences described (9 out of 14) take place indoor, usually within a museum, while only four relates to the urban space and one to an open-air archaeological park.

This result is not surprising: museums are traditionally places of election for mobile interpretation and offer a limited and constrained space for experimentation. Most of the projects are indeed pilot experiences that need careful settings and heavy user tests and museums allow developers to easily operate, implementing for example a wireless network or placing RFID tags.

On the contrary, the urban space can be too wide to be monitored or controlled and quite all the projects implemented for a urban experience employ a less complex technological system.

Frequency1550 is the only game played in the urban space which explores the use of front end technologies (for 2005) and not by chance users' tests report frequent technical problems related mainly to the loss of GPS or 3G signal (Huizenga, Admiraal, Akkerman, & Dam, 2009).

The choice of the location is then not only influential on the kind of experience to be designed but also on the technological platform and system to be implemented.

The second criterion used in this cluster to analyse the projects it's aimed at understanding whether the use of mobile technology and games mechanics can expand the experience beyond the visit or not.

Looking at the results the answer seems to be that they can enhance the

visit experience but they do not expand it beyond its temporal limits.

Only one project - Explore! - provides visitors with pre and post-visit experiences aimed at presenting the game and then debriefing it: however it should be noted that these two phases are not based on mobile technologies even if they refer to the mobile experience to be done or just done.

This result is quite unexpected, especially for those projects heavily relying on a constructivist approach, that suggests to provide visitors with time to prepare the learning experience and time to reflect about it (Hein, 1998).

The game model on which all the projects are based is very likely the reason for this limitation: the magic circle (Huizinga, 2002; Salen & Zimmerman, 2004), with its spatial and temporal constraints and dedicated rules, limits the experience to the visit in itself.

Another reason can be identified in the portability of mobile devices that well suits with a nomadic and kinaesthetic experience (Dexter Lord, 2007) such as visiting a museum or a city, but is less appropriate to plan an experience or to rethink about it.

It does not follow that all mobile gaming activities must be constrained within the temporal limits of the visit: pervasive game indeed and in particular alternate reality games demonstrate that the magic circle can be expanded far beyond its limits, till a perfect mix of game with the real life (Montola, Stenros, & Waern, 2009).

The time of the experience is then another constraint to be early addressed while designing a mobile application because it can influence several factors such as the game genre, the actors to be involved and the technology to be employed.

### **8.3. What do they talk about?**

The cluster dealing with the contents of the mobile experience is aimed at understanding what are the contents, what level of deepening they reach and who are their creators/editors.

The first chart highlights that all the projects described present contents referred to the collection, the objects and exhibits exposed in the museums or the points of interest scattered in the city. Some others provide visitors also with contents related to the case (e. g. the museum building or the city as a whole) fostering knowledge deeply about the case and broadly among the exhibits (Klopfer, 2008).

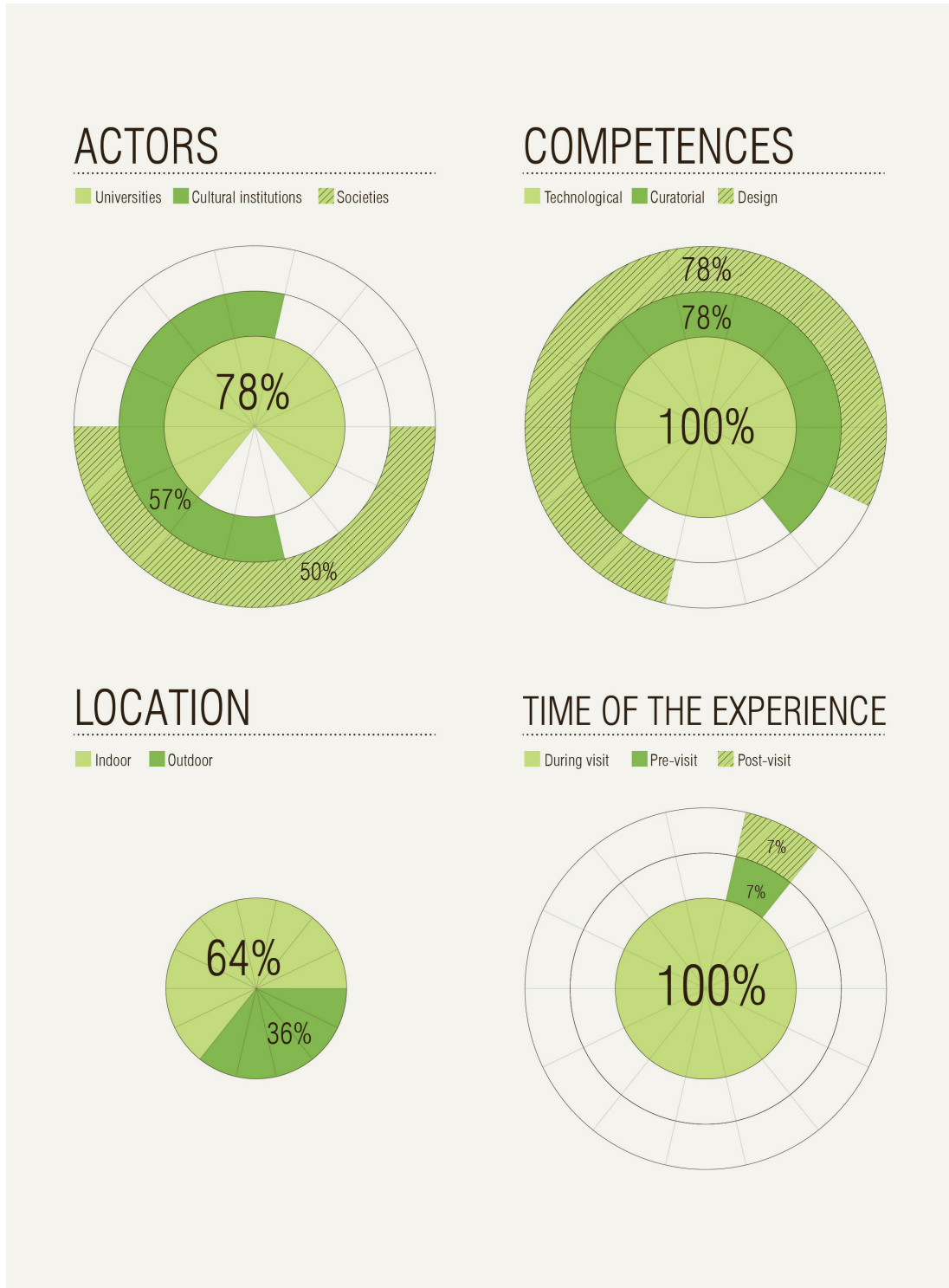


Fig. 8.1. The charts represent data gained by the analysis of the 14 case studies, regarding the actors and the competences involved, the location and the time of the experience.

Surprisingly there isn't any project which relates the collection with similar or different collections of other museums or cities, allowing visitors to make comparisons and contextualize the works, an opportunity easily exploitable with mobile technology.

The projects with a strong narrative structure very often provide visitors also with contents that relate to the history of a place, or to the daily life of historical figures or to famous legends: these contents are described in the chart as intangible.

If we look at the level of deepening of contents, here roughly defined for beginners, amateurs and experts we notice that all the projects propose very basic contents, suitable for children or teenagers or people without any knowledge of the subject.

This result is in line with the targets identified by the different projects but can be also explained with the choice of a game approach: design mechanics and games dynamics indeed very hardly allow to go deep into contents, using basic information easy to be read or retrieved.

This remark opens to important challenges for designers and developers who want to engage visitors in a game experience but not simplifying contents: only two projects WhaiWhai and PSM follow this approach.

WhaiWhai solved the problem introducing very basic game mechanics, quizzes, and using mystery stories to convey contents; PSM instead proposes different ways to gain points, some addressed to young visitors, such as collecting cards, and some suitable also for adults, such as answering questions.

The last criterion used in this cluster tries to understand who are the creators of contents: experts or curators, users or both. This criterion is useful in the light of the progressive shifting in content creation from experts to users (Simon, 2010) that are getting more and more involved by institutions in the creative process.

Looking at the analysed projects it emerges that quite all the applications are structured around contents edited by curators or experts and that only one project - Brighton Fishing Museum - proposes contents edited by users together with experts with a user centred approach.

This result is in line with the idea of Silverman (1999) that maintains that curators' voice must provide an excellent and well-researched interpretation and that visitors' voice is in addition to and not instead of the main exhibit message.

The game approach and in particular the widely adopted treasure hunt rules may also have influenced the choice, requiring a rigid structure of contents linked to specific places and not living space to visitors' voice.

Of course this remark does not explain why users haven't been involved in

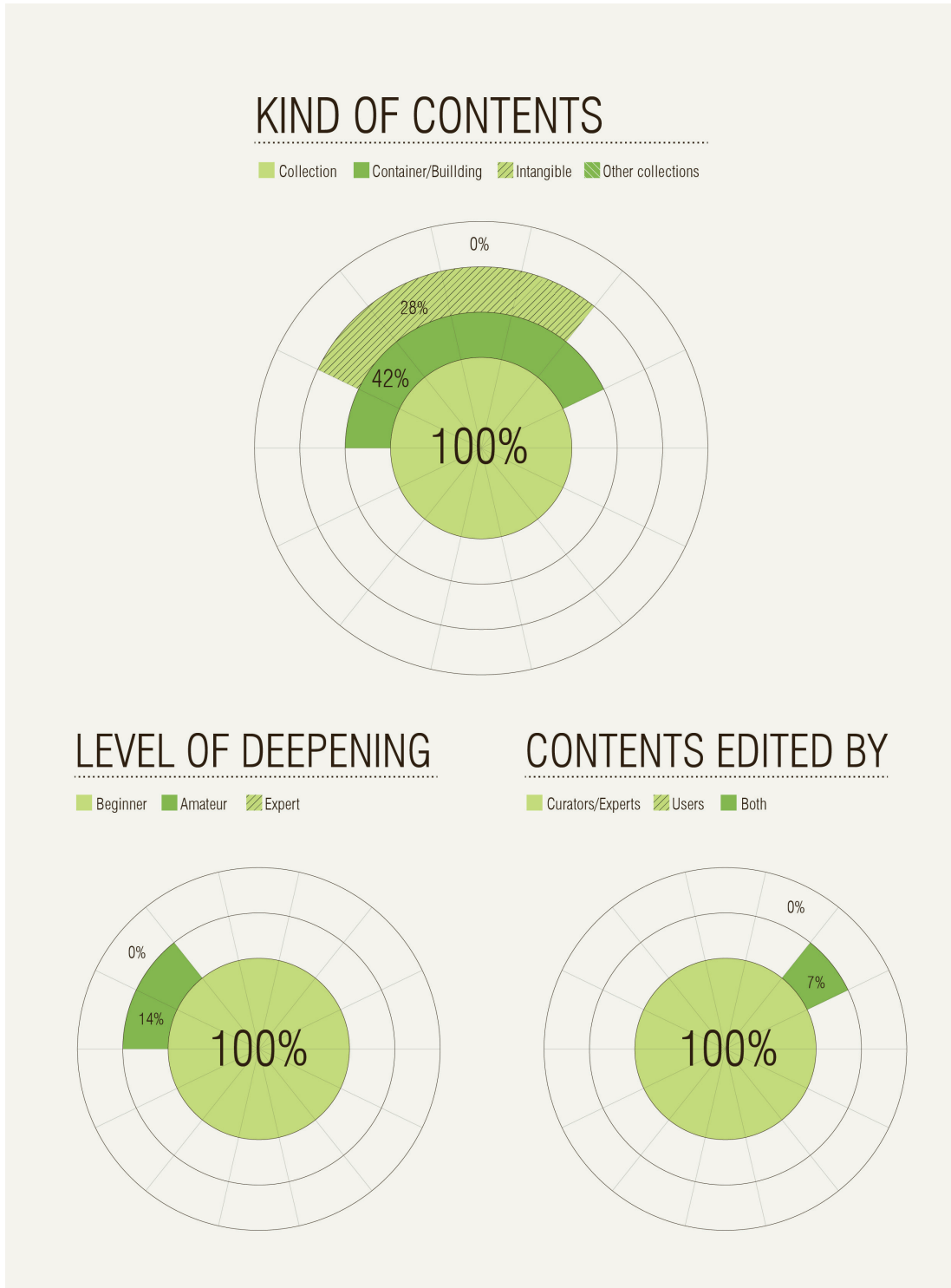


Fig. 8.2. The charts represent data about contents.

the design of the projects, like for the Brighton Fishing Museum: the experimental nature of several projects together with a still growing awareness of the possible role of users can be at the basis of this choice.

#### **8.4. Theoretical approach.**

The fourth cluster analyses the theoretical framework of the projects on the basis of three learning approaches identified in chapter three and of the model of expansion proposed by Montola et al. about pervasive games (Montola, Stenros, & Waern, 2009).

The projects are clustered within three categories - focused, immersive and collaborative - according to the main approach they follow: more focalised on learning outcomes, on involving visitors as character of a story or aimed at stimulating socialization among visitors.

Looking at the results it emerges that the focused approach is dominant, followed by the immersive and by the collaborative approach.

This means that several experiences (6 out of 14) are strictly aimed at making visitors learn something about the exhibits and the game mechanics are usually employed to make people notice some details and verify they have gotten the key message.

Other projects (5 out of 14) attach less importance to the acquisition of specific notions and are aimed at involving visitors in simulations: users play roles and are called to act as if they were pilgrims in the middle ages, or detectives looking for clues, ghost hunters or characters of mystery stories.

Very often these experiences include game mechanics common to the focused approach: what changes is that they haven't an end in themselves but are fully integrated into a plot.

The third approach, the collaborative, includes those projects (3 out of 14) that employ game mechanics to stimulate social engagement: the final aim is very often to make people acquire new knowledge but it happens through social activities and collaborative gaming.

The other criterion proposed in this cluster is adapted by the concept of expansion proposed by Montola et al. and referred to pervasive games (Montola, Stenros, & Waern, 2009): spatial, temporal and social.

This categories have been already described in chapter 7, but are here interpreted in a slightly different way.

Spatial expansion does not only mean the inclusion in the magic circle of uncommon places of the urban space, but also the layering of the real and the virtual space through augmented reality or location based contents.

For temporal expansion it's not necessarily intended the complete overlap-

ping round-the-clock of life and game but rather the mixing of different time periods and social expansion here means the result of design mechanics aimed at making visitors meet and interact with strangers and not only, as postulated by Montola et al., the involvement of unaware bystanders in the experience (Montola, Stenros, & Waern, 2009).

Looking at the chart which depicts the different models of expansions pursued in the projects we find a quite perfect equilibrium: what emerges is that only four projects, and in particular, those with a strong narrative structure, expand the experience in more than one dimension, usually mixing spatial and temporal expansion.

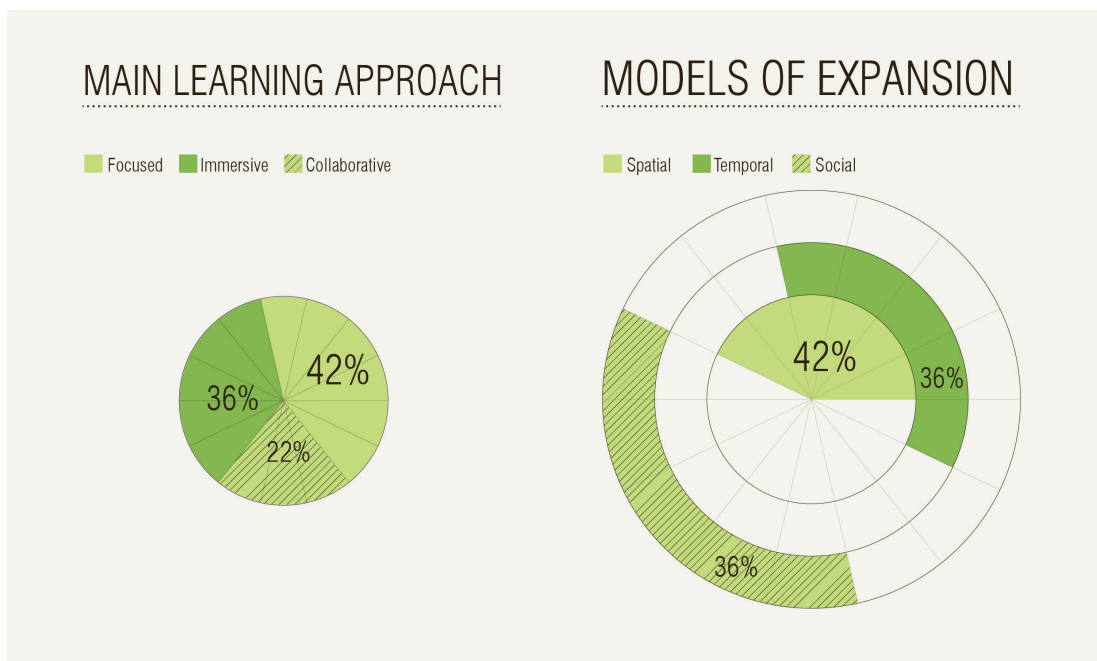
This result could mean that projects aimed at making visitors socialize with strangers or involving them at an high level of social engagement are normally linked to the *hinc et nunc* while structured stories are likely to bring users in a mixed temporal and spatial experience.

**8.5. Sociality & social engagement.**

This cluster is aimed at analyzing the projects from the point of view of sociality and social engagement and the categories used to depict the projects are based upon the semiotic square proposed by Debenedetti (2003) and the five steps of social engagement described by Simon (2010).

The first chart categorizes the projects according to the models of sociality

Fig. 8.3  
The two charts represent the main learning approach of the analyzed project and the model of expansion they propose.



they enable: fusion visit, that is a visit done by a group of people together; solitary visit is the exact opposite, the visit of a singleton; the separated visit is carried out by companions or a group who experience the visit together but in a personal way, with an alternation of solitary and fusion visit; the pursuit of social engagement is instead that of a singleton looking for dialogue and sociality (Debenedetti, 2003).

From the chart it emerges that most of the experiences analyzed (9 out of 14) enable a fusion visit: in this cluster there are quite all projects based upon a role-playing game and those addressed to families.

The separated visit is allowed by those experiences designed to guarantee an high level of personalization together with a constant sense of social presence: visitors play alone or in small groups but in continuous contact (direct or indirect) with other singletons or groups, collaborating or competing with them.

Solitary visit is the model of sociality usually enabled by audio guides and in this analysis it collects all those projects that support solo games, such as Tate Trumps, Via Mineralia or WhaiWhai: surprisingly this model is not highly represented in the projects analyzed, and from this result we can infer that the game structure easily overcome the limitation usually linked to the audio guides.

The pursuit of social engagement is allowed only by the PSM project which rewards players with points if they get in contact with other players or groups of players, stimulating information sharing and new social relationships.

Of course a single project can enable different models of sociality: Frequency1550, for example, enables a fusion visit among the members of the on-site team and among those of the on-line team, but in the same time the two teams conduct a separated experience.

The second chart describes the levels of social engagement enabled by the projects: the level five, direct social engagement, is by far the most represented. This result is consistent with the previous chart, because all the projects that enables a fusion visit necessarily allow direct social relationships.

The indirect social engagement is usually fostered by those game experiences that allow communications among different players or group of players, for example via chat, or data exchange or walkie-talkie (Archie, CoCicero, Frequency1550, PSM).

Among those analyzed, there aren't experiences at the third level, personal interests in a wider context: this group should encompass projects that support web 2.0 dynamics, such as creating contents and sharing them with friends, making comments, linking information and so on.

The first two levels are characterized by a personal experience, and include



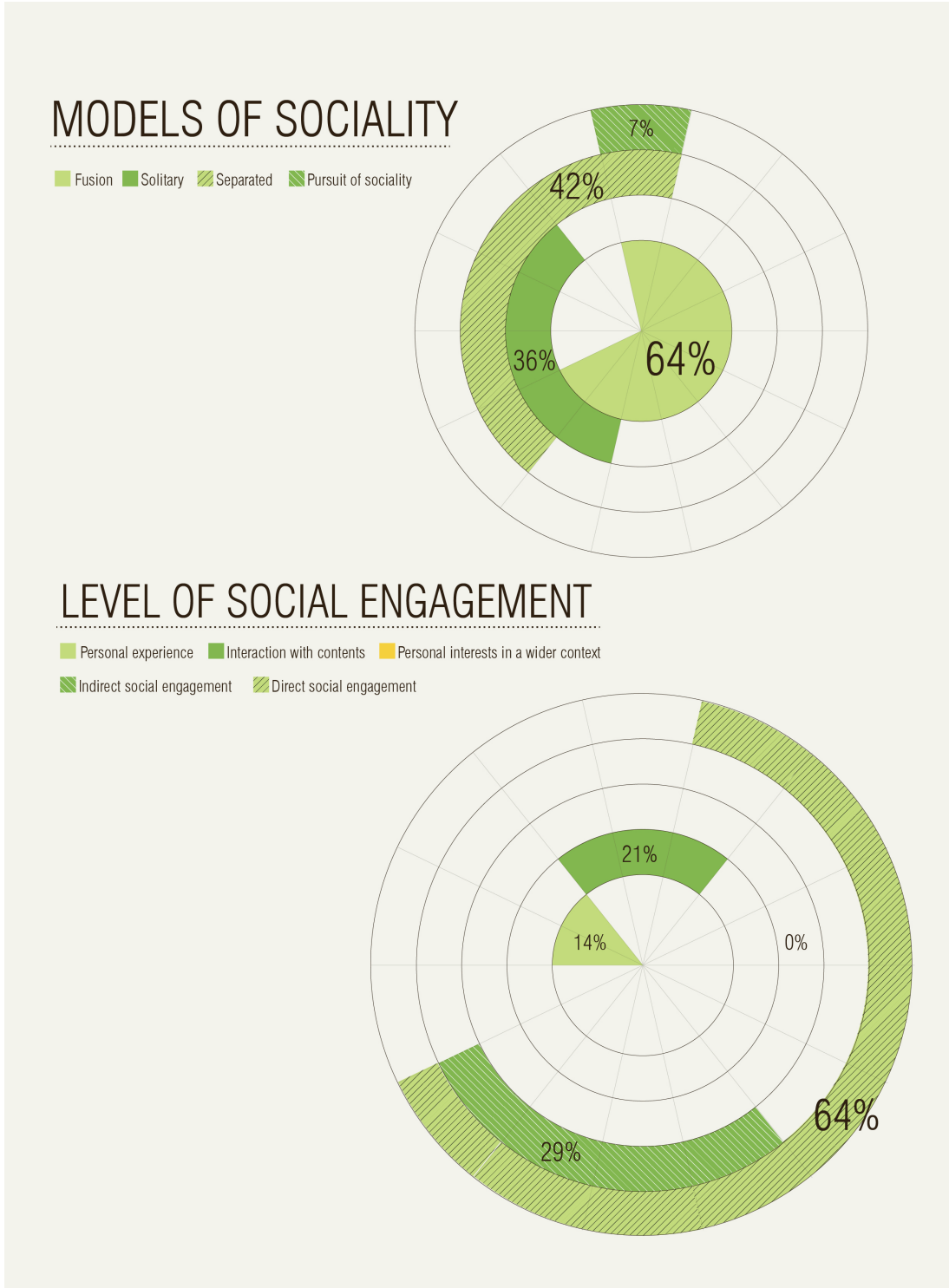


Fig. 8.4. The two charts show the approach to sociability issues in the analyzed cases: above the models of sociability proposed and below the pursued level of social engagement.

the same projects encompassed in the solitary group of the previous chart.

**8.6. Game characteristics.**

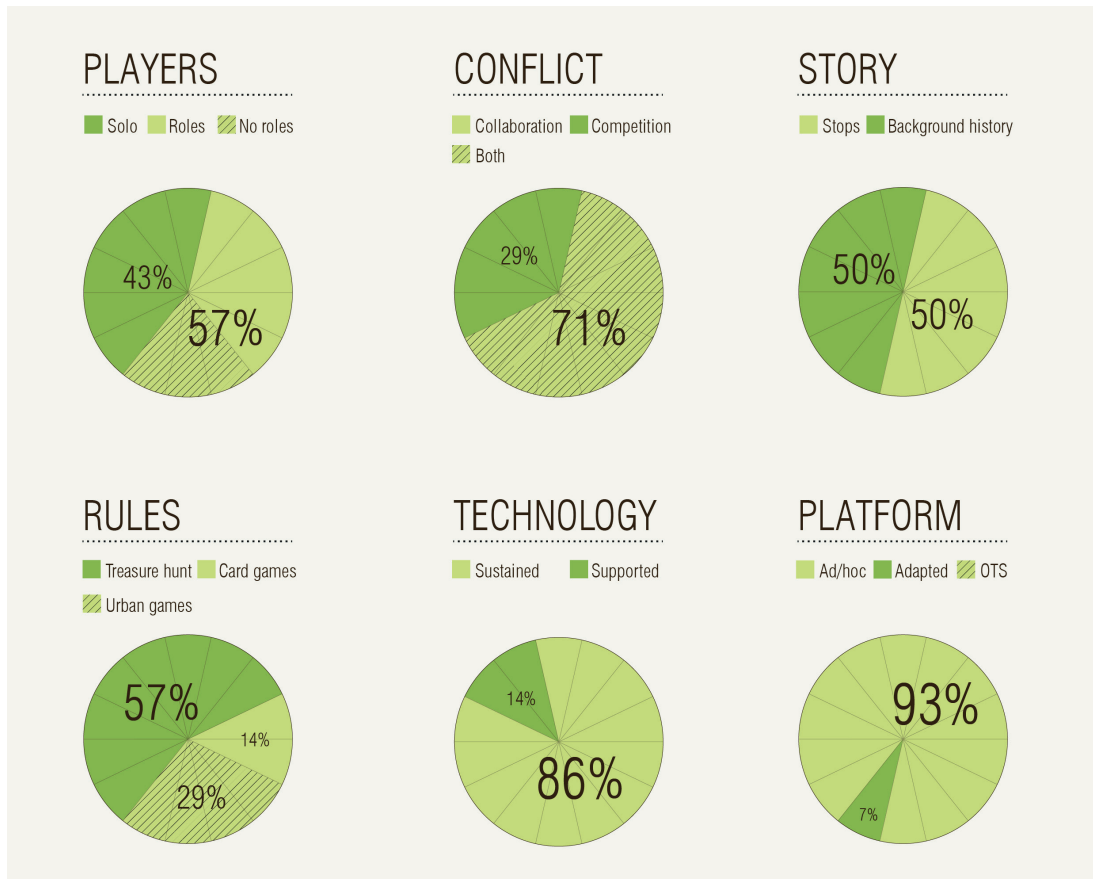
Four defining characteristics of games are here employed to categorize the projects: players, conflict, rules and story.

The first chart highlights that less than half of the projects proposes a solo game, an experience played by a singular visitor while the other half is structured upon a team game.

Among the team games the majority (5 out of 8) is structured as a role play experience: every visitor/player within a group embodies a character with particular gifts and duties and needs to collaborate with others in order to complete tasks and missions.

Of course collaboration is required also among members of a team involved in experiences not based on role playing, as shown by the second chart which describes the kind of conflict embodied in the game activities.

Fig. 8.5  
The first four charts (players, conflict, story and rules) refer to gaming while the last two refer to the employment of technology.



From the chart it results that collaboration is never employed as the only conflict model but only associated with competition: in other words the most common conflict model is a competition among groups within whom members collaborate.

The competition is without collaboration when the game is played by only one visitor and the competition can be against other players/visitors or against the system. What emerges is that competition is employed in every project as a means to stimulate visitors' engagement, as the stimulus that makes users desire to play/visit.

Competition is indeed pointed by several authors as a defining characteristic of games (Costikyan, 1994; Huizinga, 2002; Juul, 2005; Prensky, 2001; Salen & Zimmerman, 2004; Suits, 1990) and the only cooperation is maybe not seen as a sufficient stimulus for the game experience.

Broadening the concept of collaboration, it can also refer to a tour not based on game, in which contents are offered to visitors without any sort of challenge.

Looking at the game rules that govern the experiences it results that the majority of them (8 out of 14) are based upon treasure hunt and similar models (like scavenger hunt, geocaching), few are based upon the urban adventure game model and only two employ a card game model.

Urban adventure games are essentially treasure hunts and counting them together it results that this model is definitively paramount: this result indicates that curators and developers are closely tied to a tour model with stops (Proctor, 2010). Treasure hunts indeed well suit with museums and cities because the objects to be discovered can easily coincide with museum exhibits or points of interest in the city and the game mechanics are employed to stimulate interest and to verify the acquisition of knowledge.

This result is very meaningful because it indicates clearly two things: the tour model is at the basis of these experiences and at the same time it indicates that there is space for introduction of other game mechanics and rules.

The card game model proposed by PSM and Tate Trumps are based upon the idea of collection, and virtual/physical cards represents works of art or exhibit that can be collected, exchanged and played.

Story is the last characteristic to be considered in the analysis of projects: from the chart it emerges that half of the projects are based upon a strong background history while the other half is structured as a sequence of targets to be accomplished.

Background history is usually employed to give contextual information to visitors and when the application is not developed to obtain specific and quantifiable learning outcomes. Conversely the projects structured as series

of targets usually have a more defined learning aim and the sequential steps give visitors new knowledge and verify its acquisition through game mechanics.

### **8.7. Role of technology and platforms.**

This last cluster is more technical and is aimed at understanding what is the role of technology within the analyzed projects and what kind of platform they use. The first question is answered with the two categories proposed by Montola et al. (2009): technology sustained applications and technology supported. The first category encompasses all the experiences which heavily rely on technology and that could not be carried out without mobile devices or a structures technological framework, while the latter includes all those projects that use technology as something that add to the experience.

Analyzing the results it emerges that the great majority of the projects are technology sustained, and that only two of them are technology supported.

This outcome can be explained with two motivations: first of all mobile games in museums and cultural institutions are frequently developed by research centres and universities who use this applications to test systems and software and secondly because they employ game mechanics that require the use of technology (augmented reality, RFID tags ...). Technology supported projects, like City Treasure and WhaiWhai, employed mobile devices only as a drill-and-feedback system that can be easily replaced with other systems: in other words the core of the experience is not the mobile device.

The results that emerge from the last chart partially confirm the remarks just written: quite all the projects employ a platform developed ad hoc for the experience, only one adapts an existing one and none employs off-the-shelf solutions.

### **8.8. Convergence of data.**

The data collected through cases' analysis have been discussed in the previous sections but what still lacks is their convergence and a more integrated discussion.

If the analysis has indeed answered the first question posed at the beginning of the previous chapter (what design mechanics and game dynamics are employed?) it's necessary to make data converge in order to gain further insights.

In particular it's useful to understand what influences or governs what, how all the criteria are interrelated and how they can be arranged within a general framework.

A first question to be answered is whether the theoretical approach of the projects influences or not the choices of contents, mechanics and dynamics of interaction.

Crossing data about the theoretical approach and the kinds of content, it emerges that projects developed with an immersive approach usually convey more varied kinds of content than others; crossing data about the theoretical approach and the story (within the game cluster) it results that the same projects based on an immersive approach are all structured through a strong background history.

From this evidence we can infer a direct relation between an immersive approach, with a solid background history and the variety of contents: a story can indeed include detailed information about an artefact, contextual data and intangible info, such as the story of a painting or the daily life of a city in historical times.

Intangible contents are never addressed by projects developed with a focused approach: they are usually developed around the collection, be it that of a museum or points of interest in a city, or around the case (building/city). These data confirm once again that the narrative approach is useful to convey varied contents although less detailed.

The theoretical approach seems to influence the choice and nature of contents but, of course, it could be true the contrary, namely that the available contents strongly influence the approach to be chosen.

Contents are indeed the core of museums and cultural institutions, around which it's usually built the experience: in this light contents can be intended as constraints, able to influence the strategy to convey knowledge, or better as an issue to be considered early in the design process.

The analysis therefore shows a tricky relation between the theoretical approach and the contents but, as stated before, contents are at the very basis of cultural institutions and, together with the fostered learning model, are able to govern the approach and the choice of narratives.

Analysing the relationship between the three theoretical approaches and the levels of social engagement it emerges that the collaborative approach has a natural direct connection with the level of social engagement: the projects clustered within this approach indeed totalize the highest scores in Simon's scale of social engagement (Simon, 2010).

On the contrary most of the projects included in the focused approach achieve lower scores in the same scale, proposing very often personal experiences.

The focused approach is undeniably strongly committed to the learning outcomes and fits better with a personal experience as demonstrated by Paris

and Debenedetti (Paris, 1997; Debenedetti, 2003).

As a result, social engagement seems to be partially influenced by the chosen theoretical approach together with the other constraints analyzed before.

Other data to be converged are those emerging by the study of the addressed target and the levels of deepening of contents: teenagers are the most common target declared by developers and unsurprisingly quite all the projects convey very basic contents.

Teenagers are indeed seen as the most appropriate target for mobile gaming experiences and only two projects (WhaiWhai and PSM) propose topics and dynamics that can fit with an older target, typically young couples and groups of friends.

The choice of the target is also in line with the final aims declared by developers that quite accordingly refer to a learning and engaging experience.

The target to which address the project, together with the time and the place of the experience, can be seen as basic constraint for the project development, because they can influence the mechanics, the dynamics and also the contents.

Another strong constraint to be early addressed in the development of the project is the role of technology and the choice of the platform: as discussed in the previous section project developers can decide whether technology must sustain or only support the experience and what kind of platform employ (existing or ad hoc).

The choice of technology is a critical point in project development: an early decision about the platform can indeed limit or influence too much the choice of contents, mechanics and narratives but on the contrary a later choice can determine high development costs and very specific competences.

Quite all the analyzed projects heavily rely on technology and employ ad hoc platforms: this choice may suggest a process where the development of the technological system follows the creation of a scenario or, on the contrary, an early development of a platform and its test with cultural institutions.

The designerly approach that informs this thesis and the aim of creating a general framework and a process to be employed in museum and cultural institution to create scenarios for mobile experiences, necessarily asks for an early choice of technology or, at least, an early consciousness of related issues.

Technology is consequently here introduced as an issue to be addressed very early in the project development.

Trying to summarize and structure the points here merged we can identify as constraints for the creation of a project the target, the time, the place and technology.

Contents, sociality and the theoretical approach as well, cannot be con-

sidered as constraints of the project but as three interrelated issues to be addressed very early, in order to define the mechanics and the narrative of the experience.

The criteria discussed till now can answer several questions: who is the project for? When and where does it happen? What technology support it? What contents are conveyed? What is the model of sociality fostered and what is the main theoretical learning approach?

From the answers to these questions stem the boundaries of the experience and the mechanics of interaction between visitors and contents and among visitors themselves but still lacks a definition of the quality of the enabled relationships.

The constraints together with the fostered model of sociality and the theoretical approach can indeed define the boundaries of the experience and how people relate with exhibits and other visitors but they still not define on what basis visitors are linked to contents or to other visitors: a definition of the kinds and of the attributes of the relationship is required to guide the definition of the models of interaction between people/contents.

The rules of the game/experience, the configuration of visitors (group/solo) and the kind of conflict can be then deduced and inform the models of interaction together with the story.

The analyzed projects, indeed, show that the rules of the game together with the configuration of players (group/solo) highly influence the way visitors act during the experience while the conflict is employed to stimulate people to keep on the experience.

### **8.9. Mobile gaming: pros and cons.**

The previous chapter and the sections included in this chapter have broken the experiences into their basic units and the interrelations among them have been highlighted.

It's useful now to critically analyze and discuss the advantages and the disadvantages of the game approach in order to consciously structure the framework and the process in support of the design action.

Starting from the cons of the game based experiences the first observable disadvantage is a strong limitation in the addressed audience: most of the experiences analyzed are indeed developed for teenagers and very few look at an older audience. This limitation has a strong influence on the level of deepening of contents, usually very basic and aimed at conveying few clear notions.

An aspect to be clarified is whether this choice stems from a misconception of developers who automatically associate games with teenagers or if

the choice of the target audience follows an educative aim and the choice of game approach follows then the target.

Anyway the outcome is the same: game based experience are usually addressed to teenagers and do not take into account that several game experiences, such as pervasive games (Montola, Stenros, & Waern, 2009) look also at older players.

Another disadvantage reported in the projects' analysis is a limitation in terms of time: quite all the games discussed propose a "during visit" experience and only the Explore! project introduce pre and post visit activities, although not strictly related to the game itself.

Pervasive games and in particular alternate reality games show that the boundaries of time can be easily broken (Montola, Stenros, & Waern, 2009) and the success of projects such as Ghost of a chance<sup>1</sup> at the Smithsonian Art Museum (not included among the cases) let infer that this limitation is not directly related to the game approach but rather to a voluntary choice of developers.

Pre and post visit experiences are indeed pointed as highly educative especially by theorists of constructivist school whose instances are here encompassed in the immersive and partially in the collaborative approach.

An additional limitation can be found in the fostered models of sociality: the experiences discussed promote quite equally a social and a solitary visit but only one project include game mechanics aimed at the pursuit of social engagement, namely a relationship with unknown people, strangers. Also group game are mainly played exploiting pre-existing social relationships (families, groups of friends, school classes ...).

This restraint can be partially explained as a consequence of the nature of games itself that tend to create a closed group of people who share attitudes and rules (Huizinga, 2002) but once again pervasive games show that the game mechanics can include in the experience unaware bystanders or other participants (Montola, Stenros, & Waern, 2009).

Mobile games require often a very careful direction and specific competences: as a result quite all the experiences discussed do not involve users and public in the project development and participation is more frequently a result of the game rather than a starting point.

Looking at the advantages of a game based approach the first to be highlighted is an high level of involvement of visitors: they are indeed asked to reflect about contents but also to interact with them, to walk, to search, to compete with others players or to collaborate within a groups, talking and giving reasons for their choices.

The active visitors' involvement is indeed strongly advocated by the latest

1  
<http://www.ghostsofchance.com/>



museum learning theories (Hooper-Greenhill, 2007; Lord, 2007) and the experiences analyzed show good results in terms of learning.

Another evident advantage is the ability to motivate visitors/players to carry out and complete the visit, paying more attention to exhibits: competition, on which games are based, is seen as a powerful stimulus for visitors.

Game based experiences are then useful to stimulate active involvement and learning but they seem to be useful also to foster social engagement: from the cases' analysis based upon the five levels of social engagement (Simon, 2010) it emerges that game approach can enhance social relations.

Most of the projects indeed foster direct sociality among visitors especially through group games: role playing or simply group experiences ask visitors to engage socially with other visitors, be they companions, relatives, friends or strangers. The game acts as a catalyst of sociality because the game mechanics themselves can require interaction among visitors.

Role playing experiences in particular seem to be particularly useful in stimulating active participation because they give a role to each player with particular "powers" and duties and ask for collaboration between the different roles in order to accomplish tasks.

Summarizing, game based experiences can easily control the behaviour of visitors introducing game mechanics but can have limitations in terms of deepening of contents and time of the experience, and require a careful design in order to be successful.

These limitations, highlighted by the analysis of cases, come also with advantages mostly related to learning and social engagement: the main proposition from which stemmed the analysis of cases is then confirmed, because from the analysis it results that a designed use of mobile gaming and game dynamics can stimulate active learning and social engagement during cultural visits.

The analysis carried out in this sections has broken down the experiences proposed by the several projects into basic units, have discussed how these units are reciprocally interrelated and confirmed that a game-like experience can stimulate active learning and social engagement: the next chapter will propose a general design framework and a process to compose the units in order to design a mobile experience.

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# PART III

results and discussion



## 9. Design framework and process. Detailed description

*Chapter nine opens the third part of this thesis, and provides a detailed description of the design framework and process here proposed as a support tool for the design of mobile experiences for museums and cultural institutions at large.*

*The first part explains the general process through its main phases and steps while the rest of the chapter describes in detail every single unit encompassed within the framework.*

This chapter starts the third part of the thesis, describing the general design framework and process aimed at supporting the use of mobile technology and mobile gaming for museums and cultural institutions.

As already stated, the aim of the framework is to provide a tool that supports the design process, allowing developers to control the most critical issues related to a mobile project. The process is a design tool as well, that relates the basic units of the framework into a sequence of interdependent actions and choices. The tools are necessarily strictly linked and are grounded in the cases' analysis and literature review.

The attempt to build a tool to support the design of mobile experiences is not completely new in cultural field: Nancy Proctor in a paper presented at MW2010 conference (Proctor, 2010) lists six guiding questions developers have to ask themselves in order to design a meaningful mobile experience.

1. Who is your target audience?
2. What do they want to know?
3. Where do you want to take them?
4. Soundtracks, soundbites: both or more?
5. How will you tell the story?
6. What platform(s)?

They do not assume the actual role of a supporting tool but make developers reflect on five basic features of a mobile experience: audience, contents, space, narrative model and technology.

What lack to be a meta-design tool are the interconnections among the units and a process to be followed in order to optimize the process of decision making.

A design process is indeed a sequence of decisions to be taken, in which every decisions necessarily affect the others and the question-like model proposed by Proctor (2010) may support the design activity.

The system here proposed incorporates Proctor's questions, framing them into a wider structure, that adds features and organize them in a sequential process.

The general structure is here described with two different levels of details: a first description of the general frame - the macro-structure - is addressed in this section while a more detailed analysis of each framework's unit and its relations - the micro-structure - is presented in the next sections of the chapter.

The choice to describe the system with two different levels of detail aims at making readers understand both the general structure in its essential components and the diverse units and sub-units that populate and inform the design framework.

The picture (fig. 9.1) shows the four main steps of the design process: analytic phase, creative phase, implementation phase and testing phase.

The four steps are those of a common design process: brief and analysis, concept/design, implementation and evaluation plus some iterations through a recursive process of corrections and tests.

The outcome of the process, indeed, should be a mobile experience and the common interaction design process seems to fit well: definition of needs and requirements, concepts' development, mock-up and evaluation, plus an iterative process of review between the mock-up and the evaluation till the final delivery of a working product.

The four steps process is therefore a transposition in the mobile field of the widely diffused design process but it is also grounded in the analysis of the cases.

Although the documentation available about the different projects, upon which the study has been mainly conducted, rarely describes the process

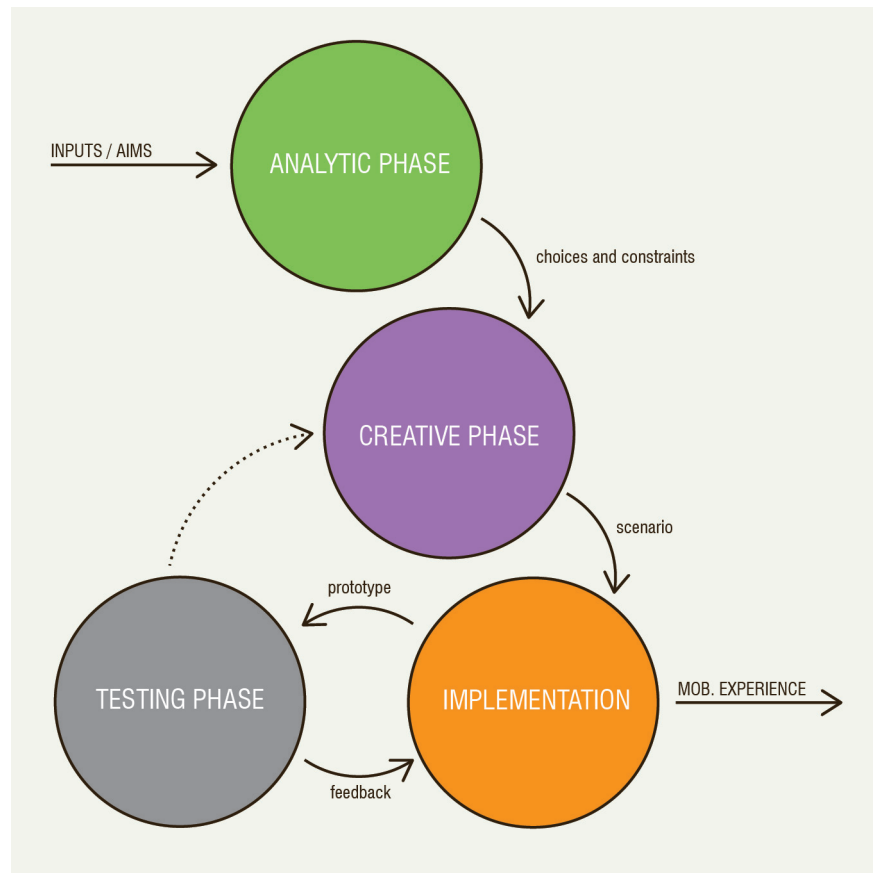


Fig. 9.1.  
General design process through its main steps.

followed by developers, two experiences (Brighton Fishing Museum, Kurio) document in detail all the steps while for the other it's possible to recognize some common points.

The process followed to develop the interactive experience for the Brighton Fishing Museum can be described in a simplified way as: data mining through interview with curators and visitors; writing of the story and game-play scenario; two draft iterations; implementation and evaluation (Danks, 2007).

The process described for Kurio is similar but introduces participatory workshops: definition of requirements through literature review, interviews and field observation; participatory workshops; storyboard of the scenario; implementation and evaluation (Wakkary, Hatala, Muise, Tanenbaum, & Corness, 2007; Muise, Tanenbaum, Wakkary, & Hatala, 2008).

The two processes described here in a simplified way follow the already cited design process that starts with an analytic phase, proceeds with a creative step, followed by an iterative process of implementation and testing.

The documentation retrieved about the other twelve analyzed projects does not report the process of development in a detailed way but several projects describe the scenario on which the system has been implemented: the scenario necessarily implies a creative process of interpretation of requirements and constraints into a model of interaction with contents and among visitors.

This process of creative interpretation of requirements and constraints into a story, models of interaction and finally into a scenario is the focus of the framework here proposed, that aims at giving developers a supporting tool for the design process. Implementation and test are important as well but the core of the framework is played between the analytic and the creative phase.

Without diminishing the role of the actual development of the system and of its evaluation, the designerly approach that informs the thesis necessarily shifts the attention towards the first two steps that are those that differentiate one experience from the others and interpret the richness and the peculiarity usually connected to every museum and cultural institution into a feasible scenario of mobile interpretation.

For this reason the research does not address these last two steps that are only described in a very synthetic way in this section.

The first step, the analytic phase, is aimed at retrieving all the information that could be useful for the development of the project and to take all the necessary decisions in order to structure the experience.

Compared to the common design process it encompasses the brief and the research: it captures indeed an aim as input and support developers to detail the brief, namely the requirements and needs, and to retrieve all the neces-



sary data, that is the research.

In the framework the analytic phase is structured in five main units (fig. 9.2): constraints, learning approach, sociality, relationship and contents.

The second step, the creative phase, is the most articulated and receives as input the outputs of the analytic phase. It aims at interpreting all data received from the previous phase and transform them into models of interaction and story and finally into a feasible scenario.

An intermediate step between the analytic phase and the creative phase is the definition of the mechanics of interaction with contents, that is informed mainly by the constraints, the learning approaches and sociality issues.

This in-between step is not exactly an analytic one because it elaborates contents, constraints and decisions but it is not a fully creative one because, as the next sections will describe, it suggests a defined set of mechanics, although expandable.

The image (fig. 9.2) shows the main components of this phase and their general relations: mechanics of interaction (in-between), models of interaction, story and scenario building.

A detailed project scenario ends the creative phase and could go through a refinement process, with an iterative progression of testing and implementation, in order to create a scenario that satisfy the requirements and all the involved actors and stakeholders.

The project scenario is the input for the implementation phase that, relying on it, can create directly the actual system or ever more realistic mock-ups and simulations in order to avoid unnecessary expenses and correct pos-

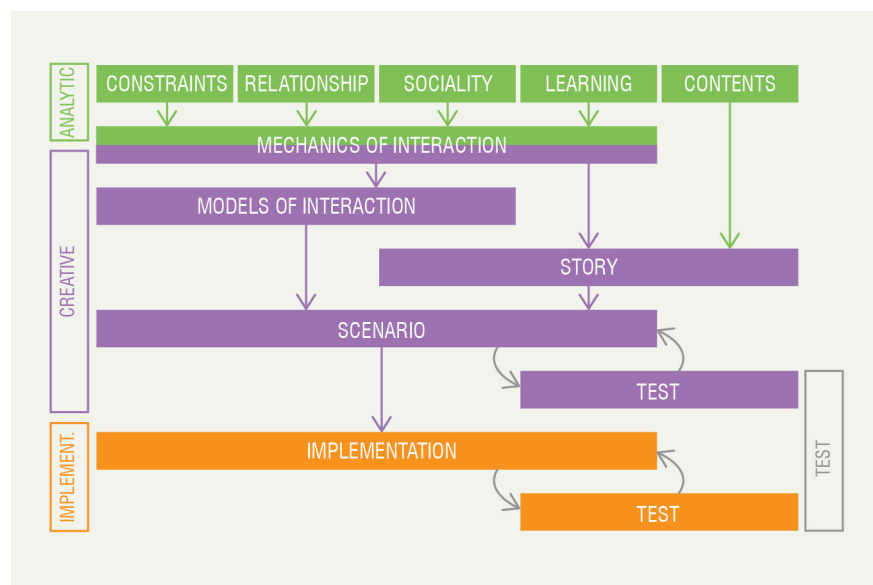


Fig. 9.2.  
General design  
framework described  
through its main  
phases.

sible mistakes early.

The implementation is therefore strictly interconnected with the testing phase through an iterative process that tests the system, debugs it, corrects problems and tests the system again.

From the analysis of cases does not emerge a preferred method to implement and test the system but it's possible to argue that it depends on the chosen platform, on the competences available in the team of developers and on several other endogenous and exogenous factors not taken into account in this thesis.

### **9.1. Actors and roles. Building the team.**

The previous section has outlined the general design framework and the process proposed for the implementation of mobile experiences but has not detailed who are likely to be the actors involved in such a process.

Looking back at the analysis of cases it emerges that most of the projects (10 out of 14) involve more than one actor and frequently a multidisciplinary team.

As already highlighted the most frequent actors are universities and research centres that typically promote and manage the projects; private societies, are involved in half the experiences while quite surprisingly not all the projects involve the interested institution. The result is unexpected because the institution may have an important role in the definition of requirements, in contents' creation as well as in the implementation and testing phase.

Analyzing more in detail what are the competences employed in the project development it emerges that the great majority (10 out 14) of the teams encompass three different competences: contents' creation, design and technological skills.

Not surprisingly only two projects (CityTreasure, ViaMineralia) are entirely developed by only one actor with technical competences.

Crossing data about the actors and the competences it results that when the project is developed by only one private society it's likely to encompass all the competences while the projects developed by only one research group within universities usually encompass only technical competences.

Contents' creation, design and technical skills are therefore the competences required to develop mobile experiences for museums and cultural institutions and they can be employed in different ways during the project development.

Usually the early involvement of actors with all the required skills can result in a faster and better implementation of the actual system but it's not

mandatory: using an off-the-shelf platform can indeed avoid the involvement of technical skills while projects that rely on already existing contents could not require contents' editing skills.

In the proposed design framework what is mandatory is the presence of design skills, not because they are considered more important than others, but because the framework is intended to be used by designers or by developers with this kind skills.

It requires indeed the knowledge of the design process as well as competences that usually belong to designers, such as the ability to creatively work on constraints, to build feasible scenarios and to facilitate the communication between distant domains, like cultural heritage and technology.

Another issue to be considered while designing for visitors' engagement is whether involve them directly or not and in which phase.

Only few of the analyzed experiences report users involvement in the design process: among those, most of them use visitors' interviews to define needs and requirements, very few involve them in the creative phase (e.g. Kurio) while users are massively employed in the testing phase.

Discussing about visitors' engagement Nina Simon distinguishes three main participatory models (Simon, 2010): contributory projects that ask visitors for precise and controlled contribution; in collaborative projects visitors are actively involved in processes started and controlled by the institutions while co-creative projects ask visitors to work with the institutions and other partners from the beginning in order to define the goal and set up the

Fig. 9.3  
Main framework of  
the analytic phase.

ANALYTIC PHASE					
constraints				relationship	
target	time	space	technology	criteria of relationship	kind of relationship
socio-demographic profile	when	indoor	platform	profile	homophily
interests	before the visit	outdoor	existing	visiting behaviour	heterophily
level of knowledge	during the visit	remote	ad hoc	needs & requirements	
	after the visit	on-site	adapted	position	
	duration of the experience	near the exhibits	kind of media	randomness	
	dedicated sessions or not	dedicated areas	temporal horizon		
			kind of device		

ANALYTIC PHASE					
contents			sociality		learning
kinds of content	level of deepening	edited by	social engagement	models of sociality	learning approach
collection (content)	beginner	experts	1. contents consumption	fusion visit	focused approach
building (container)	amateur	users	2. interaction with contents	personal visit	immersive approach
from outside	expert	experts + users	3. personal interests in a wider context	separated visit	collaborative approach
intangible			4. indirect social engagement	pursuit of social engagement	
			5. direct social engagement		

project.

The choice of the actors to be involved and consequently of the competences and whether to engage users or not and at what level is preliminary to the process here described and may influence the successive choices.

## 9.2. Defining the constraints.

This section starts the detailed analysis of the framework through a description of each unit and sub-unit and of its possible links with other units.

The analytic phase, as mentioned above, is composed by five basic components (constraints, learning approaches, sociality, quality of relationship and contents) plus their corresponding sub-units.

The section addresses the first unit, that encompasses the main constraints identified during the analysis of data: target, time, space and technology.

Constraints are here intended as very basic decisions that can strongly influence the projects, and from which, obviously, the process must start.

### 9.2.1. Who is your target audience?

The first sub-unit is the target, that answer to the question: who is the intended target of the project?

This choice can be sometimes oriented directly by the defined aim of the project (e.g. creating a learning application for a children museum or to engage families in collaborative learning activities) or can be deduced from a

constraints		
time	space	technology
when	indoor	platform
before the visit	outdoor	existing
during the visit	remote	ad hoc
after the visit	on-site	adapted
duration of the experience	near the exhibits	kind of media
dedicated sessions or not	dedicated areas	temporal horizon
<b>target</b>		kind of device
socio-demographic profile		
interests		
level of knowledge		

Fig. 9.4.  
Analytic phase:  
constraints.

careful analysis of visitors' data or considering both the instances.

Visitors can be clustered on the basis of several issues according to the final aim: they can be categorized on the basis of demographic and social profiles (the most common is age); according to their interests (e.g. modern art, epigraphy, musical instruments...) or to their experience on the topic (beginners, amateurs, experts); according to the level of technology adoption (Rogers, 1962) and so on.

Every choice made in this phase has a strong influence on other units within the framework: two examples can clarify the concept.

Addressing children requires not thorough contents, simple narratives, a limited duration of the experience and possibly a safe space or, failing it, the presence of an adult: the target has therefore influence on the level of deepening of contents, on the story, on the time and space and eventually on the model of sociality.

A project developed for families may instead provide contents at different levels of deepening to engage all the family members, a mobile device or a technological support for each member, a space to allow them to interact without disturbing other visitors or dedicated sessions and eventually a story with diverse characters: the target is therefore influential on contents, technology, space and time, story and models of sociality.

The examples demonstrate that the choice of the target audience plays an important role in the set up of the project and consequently it requires the mandatory participation of the institution, who owns data about visitors and can directly act on the exhibits' space and on their planning, but can preferably involve other competences, such as design and technology, and eventually final users.

### **9.2.2. When does it happen and how long does it last?**

Time in a mobile experience for cultural heritage field can have at least three different meanings: when the experience happens, how long it lasts and finally when it takes place in the overall planning of the institution.

Taking the visit as the reference point, the mobile experience can happen before, during and after the visit: the analysis conducted in the previous chapters has highlighted that all the experiences take place during the visit and that very few provide pre and post visit experiences.

The explanation given for this result is that the game approach with its "magic circle" tends to create strict temporal constraints and that mobile devices, for their intrinsic characteristics, well suit with the nomadic experience of visit but not with planning activities and re-visiting actions.

This remark suggests that the choice of the time of the experience is in-

fluenced but also influences the rules and the technology to be employed. A treasure hunt or a geocaching, for example, can imply a preventive study of the map to find out possible hotspots (pre-visit activity) while a collect&trade experience can easily provide a post visit experience.

At the same time pre and post visit activities can imply the usage of different media or devices, such as a video-streaming through the web or a simple website, an online forum, an interactive kiosk and so on.

The learning approach can also guide the time of the experience: a focused approach with its behaviourist model can easily fit with a “during-visit experience”, using for example the exhibits to convey very precise and constrained contents; on the contrary the constructivist model that governs the immersive approach is more likely to provide a pre-during-post visit experience that involves visitors in a structured story.

Story is therefore another unit of the framework to be influenced by the choice of the time of the experience.

The second meaning attached to the time is the duration of the experience: it largely depends on when it takes place (pre-during-post) but it is also defined by the chosen target.

An experience designed for children should not last several hours, as well as a project addressed to expert visitors can instead provide a longer experience. The duration has therefore a role in defining the level of deepening of contents and, of course, the contrary is also true.

The last feature to be considered is when the experience occurs in relation to the overall planning of the institution, namely if it takes place in dedicated sessions or during the opening hours.

This last issue can again be influenced by the target - an experience for families is more likely to occur during special events in the weekend - but also by the chosen rules – a time based treasure hunts can be hardly played in a crowded museum.

The place can also play an important role in defining when the experience should take place: for a museum all the remarks cited above are true but could not apply for a city or a natural park, just to name a few.

The units within the framework that can influence or be influenced by the time are several (target, contents, story, technology, place, rules, learning approach) and decisions about this issue should be taken in primis by the institution but the participation of other competences are suggested.

### **9.2.3. Where does it happen?**

With the term space it's here intended a group of issues related to the location of visitors during the experience. This unit answers essentially the

question: where does the experience take place?

Visitors can indeed be involved in a on site or remote experience, it can happen indoor or outdoor, just near the exhibit (be it an object in a museum or a point of interest in the city) or diffused along the museum floors or the city, or in specific areas and so on.

Regarding the first feature - on site or remote - it must be observed that the core of the experience should happen on site because the value of mobile technology, as stated several times, relies mainly in its ability to allow experiences on the move.

Taking into account this milestone it's also true that part of the experience can happen not on site, especially for those which provide pre and post visit activities.

This choice affects directly technology issues, is strongly connected to the time of the experience and can be influenced by the chosen learning model; the immersive approach for example encompasses several instances of the situated learning model requiring therefore an on-site experience. Certainly, as all the constraints, it affects contents and the story.

The second feature - indoor or outdoor - is necessarily strictly linked to the kind of institution the project is addressed to (museum, gallery, city, natural park) but the choice is not so obvious: a city museum could for example organize a mobile experience in the urban space or conversely the municipality can create a mobile tour that brings visitors within several museums, without taking for granted the association museum-indoor, city-outdoor.

Furthermore indoor/outdoor is not a dichotomy, because the same experience can easily encompass both the possibilities.

The most evident influence of this choice is on technology: just to make an example, if the experience is based upon location awareness the methods to trigger visitors' position can differ between an indoor and an outdoor experience.

The target together with the models of sociality can affect this choice: an indoor experience can be played, with due cautions, by a not supervised child but the same condition is necessarily not valuable for an outdoor experience.

The last feature that can be discussed about space is where exactly it takes place, if right near the exhibits or around the exhibition space or in specific areas.

These conditions can of course be valid together at different steps of an experience but each of them has different implications.

If contents are delivered right near an exhibit or a building they are likely to be focused on specific issues, usually precise and constrained information that add to the comprehension of that object: this model is heavily employed

in the focused approach.

An experience structured with an immersive approach could instead mix contents referred to specific objects, delivered right near them, with more contextual information, conveyed for example while visitors are walking, or with texts, videos that users can consume wherever they prefer.

The two examples suggest that the learning approach as well as the kind of contents can influence this choice but the model of sociality can be influential too: an experience designed for families or for groups could require interaction among the members and consequently a space where they can stop and talk without annoying other visitors.

The choices in this field could be limitless and heavily rely on the kind of institutions, on their physical spaces and their conformation: for this reason is highly recommended that the institution is directly involved in the choice.

#### **9.2.4. Technological issues.**

The choice of including technology within the group of constraints has already been explained in the previous chapter and the aim of this sub-section is to synthetically describe what are the choices that can be made and how they can influence or be influenced by other factors.

The first important choice to be made is what kind of platform will be employed in the project, if an existing one with or without adjustments or a specifically designed system.

This choice is highly influenced by the competences available in the development team and of course by the funding: a team composed only by curators and designers is very likely to employ existing solutions or adapted ones, while teams that encompass technological skill very often prefer to develop new tools.

The analyzed projects for example are quite all based upon an ad hoc system, condition that can be explained both because of the presence of technological skills within the teams and for the still limited number of platforms that allow the creation of customized experiences.

Using an existing platform can shorten the “time to market” reducing the developing times and the debugging phase and has the advantage of guiding the design process but it can heavily limit other choices, such as the kind of media, the kind of devices, the rules that govern the experience, time and space, as well as the model of sociality.

An intermediate choice is the use of a mix of different existing applications/software within a structured experience to allow developers a greater freedom.

Both the solutions can however strongly affect the project scenario because



in this case the choice of technology precedes its definition.

If the system is designed specifically on the basis of the project's requirements, its implementation necessarily follows the scenario definition.

Other issues to be considered are the kind of media, the time horizon and the type of device.

The media chosen are strictly linked to the contents and to the overall experience: a video for example can easily present an historical reconstruction, texts or audio contributions can be employed to add to the comprehension of an artwork or to propose hints in a game based experience.

Media can therefore modify contents and the way they are presented but the available contents may in turn define the kind of media: drawings and paintings will very probably require media not suitable for intangible cultural heritage, such as a folk dance.

The third issue to be addressed when defining the technological part of the experience is the time horizon of the project: technological development is indeed very fast and developers must decide if the project they are going to set up should employ only off-the-shelf technology or solutions that are very likely to be diffused in short time.

In the first case developers assume very limited risks but the project may run into an early obsolescence while the second solution is of course more risky.

Reports and forecasts on technological development can support this choice: the Horizon report on museums (Johnson, Witchev, Smith, Levine, & Haywood, 2010) for example suggests which technology will more likely spread in cultural heritage field, within different time horizons.

The last issue that can be discussed about technology is the more simple and concrete: what devices will be employed during the experience?

Mobile technology is the focus of the research and consequently smartphones and tablets are firstly addressed, but other devices can also be employed within the experience, such as interactive walls or table PCs, desktop computer and so on.

Again the contents, the time and the space as well as the model of sociality influence this choice.

Looking more precisely at mobile devices developers could also decide what features they should have, such as geolocation, wi-fi or 3G connectivity, operating system (iOS, android, windows, palm, blackberry ...) and so on.

Another choice is whether to use visitors' own device or to "borrow" them with the experience, an option mostly related to the business model and therefore quite apart from the aim of this thesis, but whose choice can affect directly the scenario of use.

The remarks here briefly discussed show how technology issues are problematic and need careful evaluation: the joined effort of all the competences within the development team is strongly required in order to effectively consider all the implications.

### 9.3. Defining how people relate with contents and other visitors.

This part of the analytic phase is aimed at defining how visitors are associated with contents and eventually with other visitors.

It answers the questions: what are the criteria used to relate visitors and contents or visitors with other visitors? Are these relationships based upon similarity or diversity?

These aspects of a relation visitor-contents and visitor-visitor are frequently disregarded in cultural heritage field, especially when the experience is played without a technological support: visitors enter museums they like, look at exhibits they prefer, talk with people or ask questions if they want.

In technology supported experiences the issue is more tricky, especially for those with a well defined structure and not based upon a free choice of the path.

The next two sub-sections illustrate the structure of this framework unit.

#### 9.3.1. Criteria of the relationship.

Visitors can be coupled with contents and/or with other visitors on the basis of several features. The five attributes identified as important are: visitors' profile, visiting behaviour, needs and requirements, reciprocal position and finally randomness.

The first attribute, profile, is maybe the most common and is based on the characteristics of visitors, be they demographic or more related to personal interests.

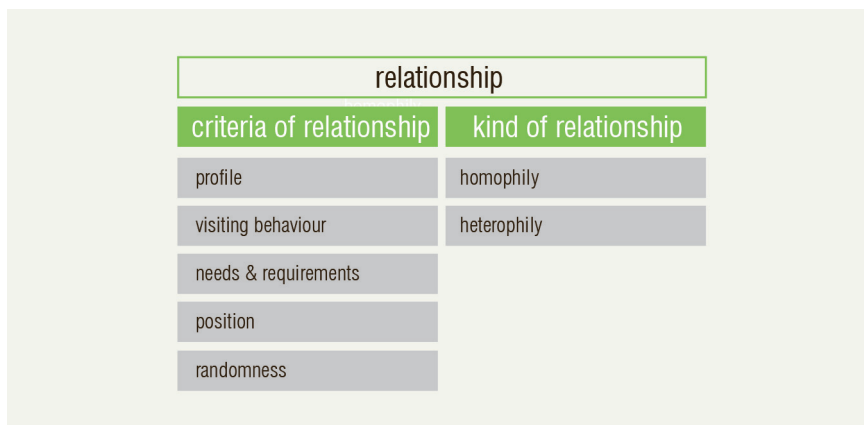


Fig. 9.5.  
Analytic phase:  
relationship.

This means that visitors are related with contents and other visitors according for example to their age, education or on the basis of their interests: children can be coupled with simple contents or with other children or, conversely, with elderly visitors in order to stimulate intergenerational exchange. Profiling is normally based upon voluntary choices of visitors that declare their age, education, social status, personal interests and so on.

Another approach consists in coupling visitors and contents on the basis of their visit behaviour: mobile technology is therefore employed to trigger visitors' position and path and consequently adapt the system to make them meet particular exhibits or other visitors.

The level of technological complexity is naturally higher and several researches are addressing this topic: the Kubadji Project (Baldwin & Kuriakose, 2009) for example aimed at triggering visitors location through RFID tags while other platforms, such as 7scenes<sup>1</sup>, exploit GPS enabled smartphones to trace visitors paths.

Visitors and contents can also be related on the basis of particular needs or requirements: as happens for profiles in this case too, users have to make explicit their wants, but in a more specific way.

An example can be a novice in history of art that wants to know more about Italian Renaissance: he/she could be taken near artworks of that artistic period, receive additional information or eventually meet an expert eager to share his/her knowledge.

Reciprocal location becomes relevant since we are discussing about mobile technology and the use of mobile devices that usually encompass location awareness capabilities: a criterion to associate visitors with contents and visitors with other visitors could therefore easily be their position in the space.

The last attribute can be the chance, namely the system can couple visitors with contents or other visitors in a purely random way following an approach "let's see what happens".

Chance can be seen as an odd attribute but it's not so uncommon if we consider a traditional visit to museums or cities without a map or a guide.

The four attributes, or better the first three, describe different criteria to relate people with contents but they do not define if they are coupled for similarity or diversity.

### **9.3.2. Kinds of relationship**

This sub-unit is exactly aimed at making developers consider if the new relationships must be based upon similarity or diversity, in other words homophily and heterophily.

Homophily means that people/contents are coupled for similarity while on

<sup>1</sup>  
<http://7scenes.com/>

the contrary heterophily correlates them on the basis of diversity.

Homophily is more likely to foster strong ties, both between people and contents and between visitors themselves, while on the contrary heterophily can foster weak ties (Granovetter, 1973).

Developers must consider carefully this issue in relation to the final aim of the project: a focused approach, strictly finalized at giving visitors new and quantifiable knowledge, could rely on homophily, facilitating in this way the learning process; a collaborative approach, could instead employ heterophily as a way to stimulate confrontation and broaden visitors' perspective.

This choice can therefore affect or be affected by the learning model but also the chosen model of sociality can play a role in the choice: the fusion visit is more likely to require homophily (people who already know each other with probably strong ties) while the pursuit of social contact can be based both on homophily (people with common profile, shared interests...) or heterophily.

An interesting example to clarify the concept is provided by Simon (2010). LibraryThing is a social networks used to get recommendation for books to read: on the basis of the already read books it suggests further readings user may like and connect him/her with other users with a similar pattern; but it also includes the "unsuggester" section which, on the contrary, suggests books very different from those user usually reads.

LibraryThing powerfully exemplifies what can be homophily (books you may like) and heterophily (books you may hate): in the first case readers/visitors keep strong ties with contents, and are quite sure to be satisfied with them; in the latter readers/visitors establish new weak ties that can make them discover new things, a new passion or, on the contrary, dislike the change.

#### **9.4. Defining the contents: what do you want visitors know?**

Cultural contents are necessarily the core of every experience developed for cultural institution and in this framework they are paramount as well.

The description of the constraints has indeed highlighted that the choice of contents is affected and affects the target, the time and the space of the experience, as well as the technology in a mutual correlation.

This section aims at defining the three main choices about contents that could be made when planning a mobile experience: the kind of contents to be conveyed, their level of deepening and who edits them.

The proposed categories are inevitably wide because the framework does not address only one type of cultural institutions, such as art galleries, but a

generic and wide range of them.

The categories need therefore to be interpreted and refined by developers according to the peculiarities of each institution: an art gallery and a city (here intended as a diffused museum) will be the examples used to clarify the categories.

#### 9.4.1. Kind of contents.

What kind of contents will be conveyed to visitors is the first choice to be made.

Every cultural institution, be it a science museum, an art gallery, a botanic garden or an art city can display contents referred to their collection, to the building itself, contents from other institutions and finally contents drawn from their intangible heritage.

The collection has always been the heart of every museum or cultural heritage organization, be it a collection of paintings, ruins of ancient cities, buildings within a city and unsurprisingly the study of cases showed that all the analyzed experiences provide insights about the collection.

Just to make two examples: a mobile experience developed for an art gallery could include insights about the artworks or groups of artworks while an experience developed for the downtown of an ancient Italian city could present contents about medieval churches, squares, and buildings. What changes is the scale.

The choice of which artwork or building to include in the experience is of course the next step, but it's essentially a curatorial choice that goes beyond the structure of the framework.

The collection is just one of the possible kind of contents: the "container" could be of interest as well.

Using the same examples: the building that houses the art gallery could be designed by a famed architect or be an ancient building and the mobile experience could include a description of the building, its history and eventually

contents		
kinds of content	level of deepening	edited by
collection (content)	beginner	experts
building (container)	amateur	users
from outside	expert	experts + users
intangible		

Fig. 9.6.  
Analytic phase:  
contents.

past uses, as well as contextual information about the layout of exhibitions or permanent collection, curatorial choices and so on.

The “container” in the case of an art city could be the city itself or a district: the contents could refer to the history of the city or of the district, information about how the city changed over times, drawings, paintings, photos from the past.

The term “container” encompasses all those information that do not refer specifically to the collection but to the case of the collection, be it a museum building or a natural park.

They are typically contextual information useful to provide visitors with a broader understanding of what they are looking at and to situate the collection in a wider milieu.

Another choice could be to use mobile devices to relate the collection and the container to other external collections or containers.

A painting by Titian conserved at Louvre can easily be related with other paintings by the same author exposed in other museums and the floor plan of the Louvre as well as its way of exposing paintings can be compared with those of Uffizi Galleries.

The high pillars of Milan Cathedral, Duomo, could be compared in height and section with those of the Cathedral of Palma de Mallorca, and its Gothic façade analyzed in respect to other coeval European churches.

The last kind of contents that could be conveyed is immaterial: they are costumes and habits, daily life, traditional dances, stories and fairy tales, rumours, and everything that could refer to less established interpretation.

The daily life of apprentices in Michelangelo’s workshop, rumours that accompanied his life but also how much he was paid by the pope for the Sistine Chapel and the strong arguments that followed could be considered intangible contents within the framework.

They are mainly stories, narrations, maybe not essential for the comprehension of the artworks but they can capture and keep visitors’ attention and add to the general understanding.

Of course all the four kinds of contents can coexist within the same experience but the choice of the learning approach can affect the balance between them.

The study of cases highlighted that those projects developed with an immersive approach and consequently with a strong narrative structure are more likely to include all the kinds of contents; the focused approach instead fits better with contents related to the collection.

#### **9.4.2. Levels of deepening.**

The second choice to be made about contents is the level of deepening, that is how much the topics are detailed. The framework proposes only three wide categories: beginner, amateur and expert.

They are not meaningful in themselves, because they are de-contextualised and too generic but they could be useful for developers to reflect about the expected users and their needs.

Contents developed for beginners may address complete novices in the field, for example with a language purged of technical words or with information that do not rely on particular previous knowledge. Very simple contents could also be addressed to children together with an appropriate language and narrative structure.

Contents developed for amateurs can give for granted a basic knowledge of the topic while experts may require very precise and rich contents.

The study of cases has highlighted that all the experiences propose very simple contents (for beginners) and very often the choice is made on the basis of the target, teenagers and students.

The association teenagers-beginners is maybe very simplistic but it's also true that the game based experience they are based upon maybe could not be of interest for experts.

Despite this remark it seems useful to include this choice within the framework, first of all because the output of the framework is not necessarily a game based experience addressed to children or teenagers and secondly to stimulate developers to reflect upon this issues, avoiding easy clichés.

The target is certainly the most influent factor on this choice, based for example on the age of visitors, their personal interests and previous knowledge but the relationship must be carefully considered: a children is quite surely a beginner but not necessarily an adult is an expert.

The learning approach can also affect the choice: in-depth contents can be employed in a collaborative approach to stimulate social activities and the active involvement of several visitors; the immersive approach could instead include structured narratives that provide both basic and more in-depth contents; a family experience based on collaboration may require all the three levels of deepening to engage all the family members. Different levels of deepening could indeed be included within the same experience and narrative or be chosen by visitors themselves at the beginning of the experience or adapted during the visit.

#### **9.4.3. Who edits the contents?**

The last point to be discussed about contents is who is the editor.

Few years ago this choice wouldn't have been necessary. The contents were created and edited by museum curators and experts, but web 2.0 and social networks have increasingly aroused the need of participation also for museum visitors who are (or can be) now eager to create and share their own contents (Simon, 2010).

Experiences that ask for visitors' active participation are even more diffused and, consequently, to the conventional model of content creation other two models can be added: contents created by users and contents created by experts and users together.

The first case is the most common, as emerges by the study of cases: experts and curators create and edit contents or, at least, follow directly their edition.

The discussion proposed at the beginning of the chapter about actors and roles becomes here relevant because developers must decide whether visitors can contribute in the creations of contents or not.

Despite the second model, based upon the only participation of users to the creation of contents, is the less frequent, it could be employed when the creation of contents coincides with the learning activities, and the output is not delivered to other visitors.

Precise and well structured contents, created by experts are indeed still considered the core of a cultural experience and user generated contents may add to them (Silverman, 1999): a wiki model could be at the basis of a system only fed by end users, which add diverse interpretations to the institutional one.

The already cited categories of visitors' participation proposed by Simon (2010) - contributory, collaborative and co-creative - suit with the third category of the framework that is based upon a collaboration between experts and users.

This third model, the hybrid, opens to completely new scenarios for contents creation, proposing for example a core narrative developed by curators and experts enriched by different levels of users' participation.

The collaborative learning approach could benefit from an hybrid model of participation, stimulating visitors to engage socially through a participatory contents creation that adds to the main narrative.

This choice has therefore a direct influence over the mechanics of interaction and necessarily on the overall narrative of the experience, that derives directly from contents.

### **9.5. Addressing sociality issues.**

This section addresses the issue of sociality within the framework, that



proposes two main questions to developers: what level of social engagement will be fostered during the experience? what is/are the model/s of sociality proposed?

The answers are given through the two theoretical models discussed in chapter four: the five levels of social engagement proposed by Nina Simon (2010) and the four models of sociality presented by Debenedetti (2003).

The value of the two models relies in their ability to synthesize people's social behaviour within an exhibition space and can be useful to stimulate reflection about sociality issues while developing a mobile experience.

As all the models included in the framework, the two here discussed shouldn't be intended as strict categories but rather as opportunities to include sociality issues within the experience and actively reflect upon them.

#### **9.5.1. Levels of social engagement.**

The "me-to-we" process proposed by Nina Simon (2010) is here employed to define the level of social engagement to be fostered within a mobile experience.

The five steps are delimited by a completely personal experience and a direct social engagement through other three intermediate steps, namely interaction with contents, personal interests in a wider context and indirect social engagement. It's important to notice that the level five is not better than level four or three but every level could include the previous ones.

Just to make an example the third level, that asks visitor to set their personal interests in a wider context, necessarily include the first level, that is the contents consumption as well as the interaction with contents, that is the second step.

The five steps shouldn't be intended as a value scale where the last level is better than previous but rather as an opportunity to reflect on what kind of social experience will be fostered and which actions are necessary to get there.

Not every institution indeed is likely to engage visitors in a direct social experience and the last level is not necessarily an aim but only one out of five.

Referring to the analysis of cases the results highlight that the majority of the projects provide a direct social engagement (level five) but it should be noticed that for quite all the projects the direct sociality happens among already known people and not with strangers.

In this sense the "me-to-we" process is not exactly fulfilled because the direct social engagement is more a matter of fact rather than a step to be reached going through the other four.

Despite this remark it's also true that great part of the projects are struc-

tured as role playing experiences that ask team members to differently collaborate according to their role, avoiding in this way completely identical activities.

The level of social engagement is necessarily related to other units/issues within the frameworks but in particular to the space available for the experience as well as to the chosen learning model: a project designed to make people interact face-to-face may be proposed only if the institution has enough space to let people meet and talk and a collaborative learning approach may provide experiences encompassed in the fourth and fifth level of the scale.

The contents play of course a paramount role, being always the basis upon which the different social experiences are played: all the steps indeed involve contents whether they are consumed or used to stimulate comments or face-to-face activities. Moreover the collaborative content creation could be a useful means to stimulate indirect and direct sociality.

#### **9.5.2. Models of sociality.**

The four models of sociality proposed by Debenedetti (2003) are here used to make developers answer the questions: are visitors alone or in group while experiencing the exhibition space? how the dynamics between the two conditions are played?

The two main conditions proposed by the theoretical model are static: alone Vs together.

The first model does not provide any direct form of sociality with other visitors but can encompass the first four levels of social engagement: a mobile experience can therefore offer a completely solitary experience but allow users to share contents through their social networks or be engaged in an indirect social experience.

The models of sociality are therefore strictly linked to the levels of social engagement but more focalized on how visitors are configured while visiting.

The fusion visit provides a completely shared experience: two or more visitors go through the exhibition space together without significant differences in what they see or experience: this is the most common condition, as it emerges from the study of cases.

Of course the remarks discussed in the previous sub-sections are valid: a group experience can encompass all the five levels of social engagement and provide different role and activities for each team member.

The other two models are more dynamic and presuppose a shifting from one condition to the other: the separated visit is indeed a fusion visit transformed into a solitary one while the pursuit of social engagement on the contrary is an attempt to transform a solitary into a fusion visit.

The separated visit can be pursued when developers want to provide a more dynamic mobile experience during which visitors can have both personal and group activities: this model is usually employed in those experiences that provide a very structured game that asks visitors to accomplish personal and team tasks.

The pursuit of sociality is less frequent in the cases analyzed (just 1 out of 14) but it can be supported with mechanics of interaction aimed at making people (relatives, friends, acquaintances or strangers) meet directly or indirectly: the collaborative learning approach could make large use of these mechanics using learning as a stimulus to foster social engagement.

The four models of sociality here discussed can in some way coexist within the same mobile experience: the separated visit can for example match the solitary and the fusion visit and the solitary visit could provide mechanics that stimulates direct social engagement.

The links between the models of sociality and other units within the framework are several and mostly already discussed.

The target affects directly the choice as well as the learning approach: children are more likely to be engaged in a fusion experience as well as novices, while experts could for example prefer a separated visit; at the same time a collaborative approach will foster a fusion visit or at least a separated one while a focused approach may prefer a personal reflective activity.

Technology, contents and story are in turn affected by the chosen model of sociality: a separated visit may require technological tool to keep visitors in contact, while a fusion visit without roles could require a device with a wide monitor which allow different visitors to be engaged. The contents and consequently the story are also influenced by the chosen model of sociality: a separated visit can for example encompass different versions of the same interpretation to let visitors live a different experience, and the story, the plot should justify both the separation and the diversity of contents.

sociality		learning
social engagement	models of sociality	learning approach
1. contents consumption	fusion visit	focused approach
2. interaction with contents	personal visit	immersive approach
3. personal interests in a wider context	separated visit	collaborative approach
4. indirect social engagement	pursuit of social engagement	
5. direct social engagement		

Fig. 9.7. Analytic phase: sociality models and learning approaches.

### **9.6. How do visitors learn: defining the learning approach.**

The last unit encompassed within the analytic phase of the framework is the learning approach to be fostered within the project.

The three models here proposed are those described in chapter three and deduced from literature analysis: focused approach, immersive approach and collaborative approach.

Learning is identified by quite all the analyzed project as the main objective and literature about mobile interpretation accordingly refers to learning as a desirable outcome: the choice of the learning approach is therefore not surprisingly an important part of the framework that can affect several other units.

Just to recall the main features of each approach: the focused approach is mostly based upon behaviourist instances, providing very precise and constrained contents to be assimilated by visitors, whose knowledge is then tested through drill and feedback activities; the immersive approach stems from a constructivist learning model, based upon a learner-centred approach and usually structured around strong narrative in which visitors are engaged; the last model, the collaborative gives equal importance to learning and sociality making them coincide within collaborative learning activities.

The study of cases has highlighted that the focused approach is the most frequent together with the immersive that follows closely, while the collaborative is by far the less frequent.

The choice of the learning model can be considered the most tricky within the analytic phase of the framework because it affects and is affected by almost all the other units.

Just to make an example the immersive approach may look at visitors with basic or amateur knowledge about the topics, that are involved in a quite long experience before during and post visit, and taken to different places both within and outside the museum. The story could include contents referred to the collection and to the building as well as rumours and mythological stories edited by curators together with a professional writer. Visitors are divided into group and asked to share contents with other teams that followed a completely different path.

The long example shows that the learning models are strictly connected to all the other units, be they constraints, relationships, contents and sociality.

This last choice demonstrates once again that the definition of the basic units within the analytic phase is a strongly interconnected action that requires continuous adjustments and the collaborations of all the actors and consequently of all the competences available in the development team.

The analytic phase is indeed the most important part for the set up of the projects and the choices here made are very hardly modified during the construction of the scenario or the following phases: they stem in fact from informed choices and constitute the so called brief of the projects on which the creative phase is grafted.

The iterative process of test and correction is foreseen only for following phases, starting with scenario development till the project's conclusion.

The data collected in the analytic phase partially converge directly to the creative phase and partially are employed to define the mechanics of interaction, an in-between phase that is not completely analytic nor creative.

The next section describes in detail some mechanics of interaction visitor/contents and visitor/visitor and how they can be matched with the results of the analytic phase.

### **9.7. Half analytic, half creative: defining the mechanics of interaction.**

This in-between phase is aimed at defining what are the mechanics of interaction between visitor and contents and between visitors and visitors.

The choices are here partially informed by the diverse outputs of the analytic phase and partially due to a more creative approach that imagine people's behaviour during the experience: for this reason this phase is set apart from both the phases but strictly connected with them.

The term mechanics of interaction here indicates the basic unit of interaction between visitor and contents and between visitors and visitors through mobile technology. It's indeed important to notice that all the mechanics here described are limited to the exploitation of mobile technology and do not take into account other possible mechanics not based on mobile devices: it's an intentional limitation that does not mean that other kinds of mechanics couldn't be used within a mobile experience.

They should be thought of as the basic bricks on which the models or dynamics of interaction are constructed, using the same bricks or composing them: different mechanics can indeed be employed within the same mobile experience.

The list here presented is not exhaustive and new ones can be easily added by developers according to their needs: the aim is to provide developers with a flexible tool capable of suggesting possible mechanics but also to leave them free to add new ones or modify them.

A methodological remark is here due to explain from where these mechanics stem, how they are deduced and how they are presented.

Most of the mechanics here listed stem from the analysis of the fourteen cases described in this thesis while many others derive from analysis of cases that are not included within this work or simply from mobile apps or projects that do not refer specifically to cultural heritage field.

The choice has been indeed to get stimuli not only from projects designed for museums and cultural institutions but also from other distant fields and from the ever growing world of mobile apps: cross-fertilization is therefore a means to get new mechanics of interaction to be included in a mobile experience for cultural heritage.

The aim is double: first of all it widens the numbers of mechanics, giving more choice to developers, and secondly it brings mechanics widely diffused in the “outside world” within cultural heritage field.

Cross-fertilization, a typical creative tool, is however subdued within the framework because all the mechanics are analyzed according to the diverse units of the previous phase in order to let developers decide coherently with the choices previously made.

Each mechanic is indeed crossed with quite all the features discussed in the previous sections (time, place, sociality, ...) in order to understand whether a mechanics suits or not with the outputs of the analytic phase: the same process can be applied by developers to new mechanics in order to fully understand their potentialities and implications.

The next subsections describe all the mechanics proposed within this thesis.

### **9.7.1. Mechanics’ list and description.**

This subsection list all the mechanics encompassed within the thesis following the order presented in the overview chart (fig. 9.8), that organizes them on the basis of the fostered level of social engagement, from the lowest to the highest.

For each mechanic it’s provided a short description of the foreseen visitors’ behaviour, some references and a chart which synthetically analyzes the mechanic on the basis of the analytic units.

The chart summarizes the relationship between the mechanics and the analytic units of the framework

The section “time” addresses both the time of the experience (pre/during/post visit) and when it could happen, if during special events or always; space explains if the mechanic could be used only on site or remotely too, while the section technology is focused on the platform, clarifying if an existing one could be used or if it needs to be adapted or completely designed by new.



Fig. 9.8. Mechanics of interaction with mobile technology arranged by level of social engagement.

For those mechanics that could be easily implemented with existing solutions or are inspired by them, references and links are provided in order to clarify the enabled behaviour.

Criteria of relationship suggests which criteria could be employed to stimulate the relationship fostered by the mechanic while the last two sections are addressed to sociality issues: models of sociality relates the mechanic with four models proposed by Debenedetti (2003) while the level of social engagement is modelled on Nina Simon's (2010) the five steps - 1. personal experience. 2. interaction with contents. 3. personal interests in a wider context. 4. indirect social engagement. 5. direct social engagement.

### Contents' consumption

Contents' consumption is the most basic form of interaction between visitors and contents: mobile devices provide users with information, be it an audio commentary, a video, a slideshow or a mix of them.

Visitor is therefore a passive receiver of contents and cannot choose them: this mechanic is typical of the guided tour that takes visitors from one stop the next, following a strict plot.

What changes with respect to the traditional guided tour is the absence of the human guide and a richer multimedia experience enabled by mobile technology.

It allows an interaction between a visitor and contents but not with other visitor and fosters a personal relationship: even if a group of people stares at the same mobile screen the relationship is in any case personal.

This mechanic is so basic that it is usually exploited by several experiences to provide visitors with information, be it a simple instruction or a detailed description of an artwork.

The StoryLine and MysteryTour models of the Dutch mobile storytelling platform 7scenes<sup>2</sup> are an example of this mechanic guiding visitors through a defined sequence of PoIs.

Contents' consumption				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance

Tab. 9.1  
Analysis of mechanic  
Contents' consumption.

<sup>2</sup>  
see note 1.



Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Contents’ selection**

This mechanic is very similar to the previous but adds choice: contents’ consumption is indeed the result of a voluntary choice made by visitors who decide what to see and in what order.

The relationship enabled is still only between visitors and contents but is no more only personal, because the choice of the points of interest to be seen could be shared with companions.

Mobile devices can provide visitors with a map of the museum/city with nearest points of interest and a brief preview or description in order to allow them to choose (criterion: position) or a list of them divided by theme or typology (criterion: target-interests) and so on.

Location awareness is for sure a plus for this mechanic but it’s not mandatory the use of mobile devices for the choice, because a paper map can fulfil the same function.

The same platform cited above, 7scenes, provides also the Sightseeing model, a free format that locate visitors through GPS on a map and shows the points of interest users can freely choose.

Tab. 9.2  
Analysis of mechanic  
Contents’ selection.

Contents’ selection				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Hypertext**

This mechanic stems from the encyclopaedia and, of course, from the web, proposing the conventional browsing method through links.

With respects to the previous mechanics it adds one or more links between different exhibits, artworks, points of interests, creating a web of connections based upon different criteria or simple references.

What changes from a traditional web browsing is the use of physical exhibits to which mobile technology adds links and contents: a description of a painting by Cimabue may link to other works of the same artist in the same institution or in a near church or it may highlight the contribution of Giotto within the painting and link to his work and so on.

This mechanic encompasses the previous two but adds choices to visitors who can follow links and consequently move within the space.

A simple way to obtain this result with off-the-shelf mobile technologies is to include links within the description of the audio/multimedia guides. An example for audio could be: if you are interested in other painting by Cimabue go the room six, if you want more information about Giotto head to room seven. In a multimedia guide for example some words of a text or an image could be selected by visitors to link to the related contents or direct links could be displayed at the end of a video or a slideshow.

A little more sophisticated model of interaction could be enabled by RFID tags or QRcodes attached to exhibits or points of interests that once scanned activate links on mobile devices.

From the point of view of sociality this mechanic is likely to support a personal visit but specially the separated visit, because every user is led to follow diverse links and consequently a personal path.

Hypertext				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.3  
Analysis of mechanic  
Hypertext.

### Contents' handling

This mechanics is the epitome of the second level of social engagement, interaction with contents, because it proposes their manipulation from visi-

tors, who can use them as a rough material to be transformed and used.

Images and photos are the more suitable to lend themselves to elaboration, as allowed by the project Just Add Art of the Bonnefanten Museum of Maastricht<sup>3</sup>, a mobile app that let users play with the artworks, adding details taken from the paintings to their own photos.

Without discussing the usefulness of this app, it's important to notice how contents from the museum's collection, in this case paintings, become rough material actively used by visitors to create something new.

Not only images could be used: just think about a museum of musical instruments that could allow visitors to mix, through mobile devices, the sound of different instruments to create new melodies or a museum of cinema that allows visitors to change the soundtracks and so on.

The key is therefore the manipulation that, if smartly designed, could also stimulate reflection about contents and led to the next step, the sharing of the new contents.

Tab. 9.4  
Analysis of mechanic  
Contents' handling.

Contents' handling				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Folksonomy**

This is the first mechanic that reaches the level three on the scale of social engagement (personal interests, interpretation in a wider context), because it is based upon the free tagging of information and objects by several users.

Mobile devices can allow visitors to add their own tags to artworks, exhibits, points of interest, relying on existing services, such as Flickr or Facebook or with dedicated systems.

The Steve Museum<sup>4</sup> project, for example, is based upon social tagging and the software (Steve Tagger) which scaffold the website is open source, that is it can be downloaded and modified.

A tag can help visitors to find an exhibit but could also convey a sense of

3  
<http://itunes.apple.com/us/app/just-add-art/id455654095?mt=8>

4  
<http://www.steve.museum/>

social presence as suggested by Cosley et al. discussing about their pilot project MobiTags (Cosley, et al., 2009):

*“Tags which connected one piece of art to another also served as ties to connect visitors. Twenty of the 23 participants reported feeling a sense of social presence through seeing others’ tags. Although participants thought that descriptive tags were useful to search for art, they found that subjective tags (such as “beautiful” and “scary”) made them feel connections to earlier visitors.”* (Cosley, et al., 2009, p. 1958)

Folksonomy				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.5  
Analysis of mechanic Folksonomy.

**Comments**

Making comments and reading those of other visitors is a simple mechanic that can convey the sense of social presences, like folksonomy, but also act as a stimulus for reflection.

A comment could indeed be the famous “like it” that is less meaningful than a tag, but it could also be a detailed analysis of an artwork that starts an interesting discussion.

This mechanic can therefore foster a sense of social presence for newcomers who read the comments of earlier visitors but could also be the basis for indirect social relationships with other visitors.

Making comments on the go, while visiting, can be supported by dedicated mobile software such as Disqus or by diffused social networking software like Twitter that with a simple hashtag<sup>5</sup> can refer the comments, the tweets to a specific exhibit.

5  
[http://en.wikipedia.org/wiki/Tag\\_\(metadata\)#Hashtags](http://en.wikipedia.org/wiki/Tag_(metadata)#Hashtags)

Tab. 9.6  
Analysis of mechanic  
Comments.

Comments				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

### TwoPointO

This mechanic is clearly inspired by the web 2.0 and social software and is based on the ability of commenting, creating and sharing contents.

The theory of John Falk that museum's visitors are motivated by the wish to fulfil an identity-related need (Falk, 2009) finds in social software for cultural institutions a great exemplification: by sharing with friends our comments on a painting, for example, we let them know that we visited a museum and, at the same time, we say something more about ourselves.

Without getting to the heart of the matter, that is widely addressed in literature, the aim is to focus on the use of this mechanic on the go, that means through mobile devices during the visit.

It encompasses all the mechanics previously discussed and a typical application could be to take a photo of an artwork, upload it with comments on a social software such as Facebook and share with friends: this is for example the mechanics proposed by the ARTeMuse project (Shaer, Olson, MaCheire, & Valdes, 2011).

This mechanic can be based on existing social software but it could rely on ad hoc systems that exploit for example existing profiles (fb, twitter, MSN...) to create dedicated networks: a visitor can log with his/her facebook profile to the social software of people visiting Rome, and share comments and suggestions in real time with other visitors in the network (look at the photo: the line is short now at Musei Vaticani!).

The use of existing social networks means exploiting strong (existing) ties while a solution like that described above is more likely to rely upon weak ties (Granovetter, 1973).

TwoPointO				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.7  
Analysis of mechanic  
TwoPointO.

### Profile

This mechanic is based on showing visitors' own profile to other visitors, on letting them know that you're visiting a museum, a gallery or a city.

The profile could include personal information (arousing several privacy issues) or interests and needs, or even only anonymous tracking of the path or be based upon existing ones.

The use of profile as mechanic can have a threefold aim: conveying a sense of social presence but also stimulating possible direct social engagement and finally allowing very personalized contents' delivery. The fostered interaction is therefore between visitors and contents as well as between visitors and visitors.

Mobile devices can be useful to create the profile and to share it through specific applications or thanks to Near Field Communication: for example a visitor could create his/her own profile and take the devices near an exhibit in order to get customized contents, or his/her profile could be visible to all the actual visitors.

The use of profile not only in the backstage but as something to be shown is not new in museum field: Nina Simon in her renowned essay/handbook on participatory museums (Simon, 2010) lists several examples.

The Apartheid Museum of Johannesburg<sup>6</sup> provides visitors with two diverse experiences depending on whether they enter the museum as white or not-white; the exhibition A Matter of Faith at the Stapferhaus of Lenzberg asked visitor to enter the exhibitions as believer or not-believer and to wear a USB stick to show their choice (Simon, 2010, p. 52-53); at the Walters Art Museum of Baltimore the exhibition Heroes: Mortals and Myths in the Ancient Greece<sup>7</sup> asked visitors to make a fast quiz in order to be classified as hero, god or monster of the ancient Greece (Achilles, Polyphemos, Amazons)

<sup>6</sup> <http://www.apartheidmuseum.org/>

<sup>7</sup> <http://thewalters.org/exhibitions/heroes/the-heroes.htm>

and to take a card and a brooch of the corresponding hero (Simon, 2010, p. 42-43).

Profile can therefore be real or fictional and fantasy profiles are usually at the basis of role playing experiences.

Tab. 9.8  
Analysis of mechanic  
Profile.

Profile				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Vanity**

The mechanic refers essentially to reputation games such as MMORPG, whose success is explained by Ducheneaut et al. with an addiction to the image of myself from the others (Ducheneaut, Yee, Nickell, & Moore, 2006): showing a brand new shining armour in World of Warcraft means that you have accomplished several tasks and being the mayor of a place in Foursquare means that you were there several times.

It's essentially a game mechanic which just adds vanity to the previous one, profile, playing with visitors' desire of self-affirmation: it can be at the basis or several games dynamics, and useful to encourage visitors to "collect" more exhibits or points of interest they can.

Vanity heavily relies on confrontation and could be used as a means of conflict within a game based experience.

Tab. 9.9  
Analysis of mechanic  
Vanity.

Vanity				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance

Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	

Level of Social Engagement				
1	2	3	4	5

### Storytelling

This mechanic is inspired by the several collaborative storytelling platforms available on the web, that with some differences share a common function: people can add to an existing story writing a finite number of words and eventually following other constraints, such as not modifying the plot or the characters and so on.

Flicly<sup>8</sup> for example asks users to collaborate to a micro-fiction with 1024 characters; Fabulate<sup>9</sup> is more ambitious and aims at creating a real book with the help of users who can write till 500 words, keeping the overall theme of the book; Folding Story is instead a writing game that give “I like-based” points for each contribution of 120 words.

Storytelling is at the core of several experiences analyzed in the previous chapters (just think about WhaiWhai) and this mechanic can be used to stimulate visitors active reflection on what they are looking at.

Mobile devices can indeed allow visitors to add a constrained contribution to a story regarding a painting, a square, a building or a mysterious object (Bannon, Benford, Bowers, & Heath, 2005) and the action requires them firstly to read the story (what earlier visitors have written) then to reflect and finally to write a coherent contribution. At the same time the collaborative action returns the presence of others and their totally personal interpretation.

The result could be one or more collaborative stories about the exposed objects in a museum, no matter if it a fantasy story about a Roman amphora or a famous painting; what matters is that visitors are encouraged to reflect about the objects.

This mechanic could be obtained through specifically designed technological solutions or working on existing ones such as Twitter, Foursquare, Facebook and so on. The stories could be also recorded using free application such as Audioboo<sup>10</sup> that allows users to upload personal voice recordings and link them to a place.

<sup>8</sup> <http://flicly.com/>

<sup>9</sup> <http://www.fabulate.co.uk/>

<sup>10</sup> <http://audioboo.fm/>

Storytelling				
Time				
Pre-visit	During	Post-visit	Event	Always

Tab. 9.10  
Analysis of mechanic  
Storytelling.



Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Interpretation**

Interpretation is a more focused version of storytelling and is more committed to serious criticism and therefore addressed to critics and serious amateurs.

It asks visitors to give a personal and “signed” interpretation of a particular artworks, object, building, arranging it as a professional commentary.

This mechanic has been used at Centre Pompidou in Paris, as reported by Walker (2008): committed visitors were asked to record their impressions about artworks through voice mail, and then to edit them on a website in order to create a “signed viewing”.

The result is therefore a rich description of every work from different points of view, a multiple interpretation by a “diffused” curator.

The tools that could be employed to enact this mechanics are the same described for storytelling, namely ad hoc mobile systems derived from online collaborative storytelling platforms, or platforms that exploits existing applications such as Twitter, Audioboo and others.

Tab. 9.11  
Analysis of mechanic  
Interpretation.

Interpretation				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

## Gift

The mechanic is based on gifts made by the system to visitors or by visitors to other visitors: in both the cases we are talking about virtual or, better, digital gifts.

A gift must not be confused with a prize because it isn't the reward for a successful activity but rather an unexpected event aimed at gratifying those who receive it.

In addition to gratifying, a gift can also play other roles: a gift from the system, be it an high resolution image of a painting or a bonus video of the artist, can add the comprehension of an artwork; the same gift from an unknown visitor adds to the comprehension but can also stimulate curiosity and interest.

Learning and social engagement are therefore two possible outcomes of gift mechanic which could be enhanced by trading, the next mechanic.

An example of use of this mechanic through mobile technology is the app iSocialize<sup>11</sup> which allows users to exchange gifts with their friends, feeding in several social networks.

Gift				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.12  
Analysis of mechanic  
Gift.

## Trade

This mechanic can be based upon the previous, allowing visitors to trade the received gifts or be independent from it, allowing them to trade other digital contents (e.g. diverse for visitors, because based on profiles).

What changes from the previous mechanic is that it introduces mandatory indirect social engagement between visitors: the "goods" need in fact to be exchanged with other persons that are visiting the same museum or city, establishing a connection, a form of communication, despite only indirect.

11  
<http://www.sivola.com/>

Trading a good requires also a reflection on its value and what it could be asked in exchange: we can imagine to trade a video commentary of an artwork because we don't like it and in order to get a better one, or simply because we have already seen it and we don't want to keep it in our device.

Trading could also mean exchanging contents created by visitors themselves, like interpretations, stories, modified contents and so on.

This mechanic is therefore in the fourth level of social engagement that encompasses mechanics and experiences based on indirect social engagement, that means in this case social relationship through mobile devices.

The exchange could also happen with the system but is much less interesting, because, while it can somehow facilitate learning, it does not foster social engagement.

All the experiences based upon a collect&trade model encompass this mechanic: the Archie project, one of the units of analysis, includes a trade game and the already cited 7scenes platform can be used to develop a collect&trade experience.

Tab. 9.13  
Analysis of mechanic  
Trade.

Trade				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Questions**

The mechanics consists of bi-directional process of questions and answers: visitors are asked questions from the "system" and visitors can, in turn, ask questions to the systems and to other users.

Asking visitors questions is a common technique to stimulate discussion about objects, according to Simon and the main reasons are three: to encourage visitors to engage deeply and personally with a specific object, to motivate interpersonal dialogue among visitors around a particular object or idea and to provide feedback or useful information to staff about the object or exhibition (Simon, 2010, p. 139).

Questions from the system could be very specific, in order to make visitors notice some details or to test their knowledge (focused approach) but could also be open to a diversity of responses (Simon, 2010) to stimulate dialogue and confrontation (immersive/collaborative approach).

Questions from visitors can not be controlled but, designing an experience, we can decide if the answer can come from curators and experts within the institution, from co-present visitors, from a restricted network or from crowdsourcing, depending on what is the aim.

If we are committed to the learning outcomes we are likely to ask visitors very precise and detailed questions and let experts answer visitors' question; if we are instead most committed to social engagement and collaboration we better ask open questions and let everyone answer questions from visitors.

Questions are frequently asked by the system to visitors in game based experiences: players must answer correctly to multiple choice questions in order to gain points or/and advance in the experience. The experiences that instead allow visitors to ask question through mobile technology are not so diffused.

From a technological point of view such a mechanic could be implemented with specifically designed systems but could also rely on or adapt off-the-shelf solutions or applications such as Yobongo<sup>12</sup> that allows to chat with people nearby.

Questions				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.14  
Analysis of mechanic Questions.

**Chat**

The name of the mechanic describes perfectly the behaviour it enables, a chat through mobile devices among visitors and eventually with curators or staff of the institution.

To structure this mechanic could useful to keep in mind the three kind of

12  
<http://yobongo.com/>

chat described by Ducheneaut (2004) analysing MMORPG: the say mode in which the typed sentences are visible to anyone nearby; the tell mode, that is a private message from one user to the other, and the group mode in which messages are sent only at a subset of users who grouped together.

These three models translated into cultural institutions could mean a chat system that allows visitors to share impressions with other co-visitors and start a conversation, or to say something directly to his/her companions that are maybe in other rooms (separated visit) or using the chat to stimulate discussion within closed groups, such as a forum.

In this system curators and institutions' staff could play a role, stimulating interest, asking and answering questions, and keeping the collaboration high.

One of the pilot projects of MOBIlearn at Uffizi is an example of chat mechanics and Sharples et al. reports of great satisfaction from users (Sharples, Taylor, & Vavoula, 2005).

The app Yobongo, cited above, is based on the "say mode" allowing users to chat with nearby people, the localised tweets of Twitter could play the same role, while the chat systems integrated within the most common social software allow both the "tell" and the "group" mode.

Tab. 9.15  
Analysis of mechanic  
Chat.

Chat				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Voice**

Voice mechanic is very similar to the chat because it allows real time communication but using sounds, namely the voice, instead of text messages.

The two models encompassed within this mechanics can be summarized as walkie-talkie and police radio: the first is a voice communication between a restricted number of nearby but not close persons while the second does not necessarily involve a direct communication (the radio is crackling something

but not necessarily is talking to us).

The Sottovoce project (Szymanski, Aoki, Grinter, Hurst, Thornton, & Woodruff, 2008) with its eavesdropping method is the forerunner of this mechanic, later improved by CoCicero (Dini, Paternò, & Santoro, 2007).

The first model, the walkie-talkie, well suits with the separated visit allowing to share impressions with companions while the police radio model is more likely to be employed in the fourth model of sociality, that is the pursuit of sociality by a singleton.

These remarks could be valid for the chat mechanic about respectively the tell/group mode and the say mode but what changes is a more intimate relation that stems from the use of voice instead of text.

This aspect also implies a different management of this mechanic in terms of place and time: speaking loud while visiting a city or an archaeological park is normal but is not common within a museum where it can bother other visitors.

This means that voice mechanic can be employed if the experience is played outdoor or during special events, such as the loud hours (Simon, 2010, p. 282).

Specifically designed system can allow voice communication according to the two proposed modes but some application are already available: the Hey-Tell<sup>13</sup> and Voxer<sup>14</sup> apps, for example, allow people to talk in a walkie-talkie way through mobile devices and can be employed or adapted to enact this mechanic.

Voice				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.16  
Analysis of mechanic  
Voice.

**Meeting points**

This mechanic transforms exhibits and points of interest in places of social molecularization: the system can for example suggest to all visitors an inter-

13  
<http://heyteell.com/>

14  
<http://voxer.com/>

esting artwork to be seen in order to make some of them converge there, or visitors themselves can report of an abject, place to be seen.

The aim is twofold: the visitor is taken in front of an interesting or discussed or usually neglected object, building (learning) and once there he/she can meet other visitors and start a conversation (sociality).

The check-in model used in CoCicero and now widely diffused in systems like Foursquare can work in this direction, exploiting for example a common way of reasoning: if so many people checked-in there, it means that there is something worth to be seen.

Tab. 9.17  
Analysis of mechanic  
Meeting Points.

Meeting points				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Serendipity**

Serendipity is finding something we didn't expect to find and while visiting a museum or a city we could meet unexpected objects or people.

This mechanic implies the existence of a profile, because it makes visitors aware of possible buddies nearby: buddy means a person with a similar profile or shared interests, or on the contrary a person very far from us in terms of profile and interests (homophily/heterophily); but a buddy could also be an object very similar or very distant from what we are looking for or, through the objects, we could find again a human buddy.

It's aimed at letting visitors know that possible meaningful interactions are just there, what his/her buddies have visited and what they liked: it could foster direct sociality (pursuit of) but it could also be used as a source of information and suggestions.

The surprise is a main trait to be pursuit with this mechanic, surprise in finding so similar/dissimilar to whom we can be introduced directly through mobile technology: the BlueAware project developed at MIT (Eagle & Pentland, 2005) exploits the concept of serendipity to match nearby people with

similar profiles through handhelds.

Contents are necessarily the basis for serendipity in cultural institutions and this mechanic fits well in the collaborative learning approach in which contents are both argument of conversation/collaboration and the means to stimulate teamwork.

Serendipity				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.18  
Analysis of mechanic  
Serendipity.

**Adaptive path**

This mechanic is based on system’s ability to modify in real time the suggested path for visitors, in order to make them meet works or persons they may like/dislike on the basis of their profile, their visiting behaviour, of the works they have appreciated and of their eventual requests.

The enabled interaction is therefore both with contents and with other users and the decision to enhance the first or the latter is dependent on the chosen learning approach.

The technological complexity of this mechanic is naturally higher than that of previous mechanics and requires the design of a dedicated platform in order to be enacted.

Adaptive path				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance

Tab. 9.19  
Analysis of mechanic  
Adaptive path.



Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Bump**

With this mechanic starts the fifth level of social engagement based on a direct social relationship: all the mechanics encompassed in this group are indeed aimed at making people, especially strangers, meet and perform actions together.

This mechanic asks visitors to “bump” their mobile devices in order to get a benefit, such as a bonus content: it’s inferred by numerous mobile apps that requires users to make their mobile phones gently collide in order to exchange private information, such as their phone number and email address or to instantly become “friends” on Facebook and so on (the Bump app<sup>15</sup> is an example).

It aimed at making visitors that don’t know each other meet and eventually start talking encouraged by the contents they get; it doesn’t still require them to perform actions together, as suggested by the collaborative learning approach, but it could encourage direct social engagement.

Tab. 9.20  
Analysis of mechanic  
Bump.

Bump				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Tasks**

If the previous mechanic does not require people to perform complex actions, the mechanic “tasks” is indeed aimed at making people perform collaborative actions.

15  
<http://bu.mp/>

Learning as well as social engagement are the intended outcomes of this

mechanic: collaboration could indeed mean creating a shared interpretation of an artwork and post it on line or virtually mix diverse chemical elements and look at the reaction.

Strangers but also people engaged in a fusion or separated visit may be asked to join at a particular exhibit in order to accomplish the task or another criterion to establish the relation could be their proximity.

An ad hoc platform is required to allow this mechanic.

Tasks				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

Tab. 9.21  
Analysis of mechanic  
Tasks.

### Prizes

The mechanic called “prizes” is inspired by the diffused “groupon business model<sup>16</sup>”: if a minimum number of people sign up for an offer, then the deal becomes available for all, on the contrary if the number is not met, no one gets the deal.

Translating the model in cultural heritage field it could open new models of interaction: if at least three visitors meet in front of an artwork and perform a collaborative (learning) action, then they all get a prize, be it an e-book which deals with concerning topics or a free drink at the museum cafeteria, an high resolution image of that painting and so on.

The collaborative learning approach can highly benefit from this mechanic, requiring direct social engagement on the promise of a prize.

The groupon model is frequently exploited with mobile technologies, linking the offers to the current position of users: the Groupon<sup>17</sup> app shows for example the nearest available offer, and several other apps exploit very similar mechanics.

To be fully employed within cultural heritage field this mechanic needs of course an ad hoc platform.

16  
<http://en.wikipedia.org/wiki/Groupon>

17  
<http://www.groupon.com/mobile>

Tab. 9.22  
Analysis of mechanic  
Prizes.

Prizes				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted
Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

**Smart/Flash mobs**

Rheingold claims that mobile technology can enrich the informal exchanges of information as well as modify the position of users and the thresholds for participation to social actions (Rheingold, 2004, p. 282).

On these remarks and on Rheingold’s famed theory of smart mobs is grafted the last mechanic here discussed that employs mobile devices to make people/visitors gather in specific places at a defined time in order to participate in a social learning activity.

Our mobile phone could indeed suggest to gather in ten minutes in the room 6 in order to attend a public lesson of a famed art historian, or to gain a digital copy of the museum catalogue, or to participate in a collaborative learning session.

The same mechanic could be also employed in the urban space in order to take people to unusual or disregarded places or to an ancient clock when it performs its spectacular action and so on.

Mobile devices are therefore only the means to make people aware that something interesting is going to happen, but it could also have a more important role, for example receiving additional digital contents or allowing people to collaborate through shared applications.

Tab. 9.23  
Analysis of mechanic  
Smart Mob.

Smart/Flash Mobs				
Time				
Pre-visit	During	Post-visit	Event	Always
Space		Technology / Applications		
On site	Remote	Existing	Ad hoc	Adapted

Criteria of Relationship				
Profile	Behaviour	Needs	Position	Chance
Models of sociality				
Fusion	Solitary	Separated	Pursuit of sociality	
Level of Social Engagement				
1	2	3	4	5

### 9.8. Defining the models of interaction.

This section describes the second phase within the process, the creative one, which gathers inputs from the analytic phase and from the mechanics of interaction in order to build a feasible scenario which depicts the mobile experience.

It consists of three main units organized in two consecutive steps, the models or dynamic of interaction with contents/people and the story, which together converge within the scenario: the first unit collects data from the analytic phase and the mechanics of interaction and merges them with rules, configuration and conflict in order to define the models and dynamics of interaction; the second unit defines what kind of story will govern the experience integrating contents with the models of interaction; the scenario is a mock-up of the experience which describes it in order to get feedback and inform the implementation of the system.

This phase can be defined creative because all the steps described are somehow grounded in a detailed and coherent analysis of the aims, needs, constraints but they are creatively interpreted in order to generate a new mobile experience.

If the results of the analytic phase could be somehow considered quite independent from who conducts the analysis, the creative phase heavily relies on the personal choices of developers and requires skills that are typical of designers.

#### 9.8.1. How is the experience structured: defining the rules.

The term “rules” is taken from the game world (chapter six) and is used here to indicate the main structure of the experience and how it develops: this choice does not mean that the mobile experience that stems from the framework should inevitably be a mobile game.

An example of rule is the traditional tour composed by diverse stops (Proctor, 2010) but it could also be a treasure hunt and other codified games or it could be designed specifically for a particular experience.

This view defines the three main units encompassed within the rules: tour

model, game's rules and *ad hoc*.

The first unit, tour, refers to all those experiences based upon stops, points of interests or soundbites to quote Proctor (2010) without game characteristics: the mechanics of interactions are therefore not played within a game structure and are enacted only for collaboration and not for competition.

Competition is indeed a defining characteristic of game and not surprisingly all the game experiences studied as units of analysis are based upon competition and none of them provide users with only collaborative activities: all the mechanics of interaction should be consequently seen from a collaborative point of view when included in a tour like experience.

The tour could be a free tour or a guided one: in the first case visitors are free to choose their path and the exhibit to look at, while the second conducts them through one or more structured paths.

A useful remark is that very often game based experiences are essentially structured as a tour: treasure hunt games is frequently employed as a means to bring (young) visitors to exhibits in a museum or points of interest in the urban space, and the same could be said of urban adventures game, or geocaching and collect&trade.

What changes is the rule or better the superimposed game which adds different dynamics, story and conflict to the tour.

The choice of the rules is therefore the moment that establishes whether the future mobile experience will be based on game or not and gives an interpretation to the outcomes of the analytic phase and to the chosen mechanics

Fig. 9.9 Creative phase: models of interaction and story.

CREATIVE PHASE				
models of interaction with contents/users			story	
rules	configuration	conflict	kind of story	structure
tour	group	collaboration	units of information	one main story
free	role playing	competition	structured story (genres)	several stories
guided	no roles	collaboration + competition	mystery	
game	solo		adventure	
treasure hunt			epistolary	
urban adventure game			historic	
collect&trade			...	
check-in games				
card and board games				
...				
ad hoc				

of interaction.

The second unit, game's rules, encompasses all the codified games, whose rules could be applied to mobile experiences for museums and cultural institutions.

The analysis of cases has highlighted that the most common game is by far treasure hunt with its successive adjustments (urban adventure games, scavenger hunt, geocaching, collect&trade ... ) followed by card games.

This result confirms what just said about the difference between the tour and the game and that the tour model is paramount in cultural heritage field.

The games included in the framework are those described in chapter six. Treasure hunt, usually played indoor, and its open-air brother, the urban adventure game, ask players to locate treasures, valuable objects, in the space; the scavenger hunt is an adjustment of the treasure hunt games and replaces treasures with objects that nobody wants, for example not still recognized treasures; geocaching is a treasure hunt that guides players through GPS coordinates leaving hidden what will be discovered; the collect&trade game is a treasure hunt in which treasures need to be exchanged.

Other game rules can be deduced by card games as happens in PSM and Tate Trumps experiences, or be based on check-in games such as Foursquare.

Boards games too can inspire a mobile experience: just to make an example, the famous Game of the Goose can be employed to structure a urban experience in Tuscany where the tradition places its birth, using a traditional game strictly linked to the place where the experience happens.

The last unit within rules is *ad hoc*, the Latin expression used to indicate something especially designed for that situation: the rules could indeed be designed for a specific mobile experience without choosing from the codified.

The choice of rules is necessarily affected by several other choices such as the contents, the place, the learning approach and sociality and of course by the mechanics of interaction, but it also affects other units within the framework.

It heavily influences the story, especially if the rule is that of a game, because the narration should in fact integrate and justify all the chosen mechanics of interaction and games rules within a story, but it also affects the kind of conflict.

### **9.8.2. Visitors' configuration.**

Configuration here indicates people's relationship with contents and other visitors and answer the two questions: is the fostered relationship based on a solitary or group experience? does the team experiences provide roles or not?

The choice of the configuration of visitors seems to be highly dependent on the chosen model of sociality: if the analytic phase has indicated as the best choice a solitary visit or the pursuit of sociality it follows automatically a solo configuration; if the chosen model is the fusion it will follow a group experience; a separated visit is more likely to provide a role playing experience and so on.

From this point of view this framework's unit does not seem to add anything, but the interpretation should be slightly different: it certainly describes how people is configured during the visit but is more focused on the relationship between people and contents/people.

To clarify the concept we can think of a fusion visit: three visitors to a science museum follow the same path, look at the same exhibits but their mobile devices provide them with very diverse and personalized contents (based for example on the target). In this case it is true that the model of sociality is the fusion visit but the experience enabled by mobile devices is strictly personal, a solo configuration, that could be played also alone: what changes is the possibility to share what they have learned with their companions and make comparisons.

If the same three visitors are instead asked by the system to choose a role and mobile devices provide them with different contents, based on the role, and requires to share information, than the model of sociality is the fusion visit but the configuration is group, and in particular a role playing experience.

The two sub-units of the group experience are indeed role playing experience and not role playing experience.

Configuration, as shown with the previous example, is not necessarily related to a mobile game, because all three possibilities, namely solo, role and not role, can easily refer also to a tour experience: roles could be for example associated with personal interests and do not include game mechanics.

Role playing is placed voluntarily under the group experience despite the most common examples of role playing games, such as the MMORPG, are usually solo games that benefits more of a sense of social presence than of a true form of sociality (Ducheneaut, Yee, Nickell, & Moore, 2006): they are multiplayer games but do not imply that players should automatically get involved in a group activity.

The choice, in contrast with the current literature, is due to the particular field we are dealing with: first of all a solo role playing experience can lasts several hours before a player could engage in group activities with strangers, an amount of time usually not available for a visit; secondly MMORPGs let several players from all over the world meet virtually in the space of the game

while it could be very hard to find co-present players within a small museum for example.

Role playing experiences in cultural heritage field need therefore to be carefully organized, and they start automatically as a team experience, exploiting already existing groups, such as families, or particular events, like school trips and so on.

### **9.8.3. Collaboration or competition? Defining the conflict**

The last part to be discussed about the models and dynamics of interaction is conflict.

The term, such as rules, derives from the game world and includes essentially two forms: collaboration and competition, to which collaboration + competition can be added.

The choice of the kind of conflict is mainly influenced by the rules, as mentioned before: a tour without a game structure is likely to be based on collaboration, while a game experience usually provides competition.

Competition is the only conflict model when the visitor/player is alone and competition plus collaboration is used when he or she is part of a team, that means collaboration among the team's members and competition with other teams.

Despite the kind of competition naturally depends on the rules (for a treasure hunts the competition could be on how much treasures have been collected, how many points a players has totalized) not all the design mechanics could fit within cultural heritage field.

The use of time as a means of competition (e.g. the player who finishes first wins), for example, could be counterproductive for learning, forcing visitors to spend less time as possible in front of an exhibit, and dangerous for urban adventure games, forcing visitors to forget the common safety standards on the street (Ballagas & Borchers, 2007).

The choice of the kind of conflict is therefore guided by the selected rule but need to be verified in relation to the field of application and the aims of the projects.

## **9.9. What story do we tell?**

The story is an essential part of the mobile experience, especially if it is based on a game, and its development and creation should be carried out together with the definition of the models and dynamics of interaction just discussed.

It is a creative activity mainly based upon contents and strictly interrelated with the mechanics and models of interactions aimed at defining which are



the characteristics of the story to be written in the implementation phase.

The study of the cases has highlighted two main kinds of story: the first is structured as a simple sequence of tasks/descriptions without a strong narrative structure while the second heavily relies on a planned story with a plot and characters.

The first model can be traced back to the audio guides that proposed and continue to propose tours, based upon a sequence of stops in a linear or free model: the time between the stops can be filled with storytelling and music (Proctor, 2010) but the only common thread is the didactic aim or the layout arrangement.

Experiences based upon this kind of story usually attach more importance to the learning outcomes than to the complete immersion of visitors and foster a more detached approach between people and contents: characteristics common to the focused approach.

This kind of story is not only employed in tour models but also in game experiences, where the stops are used to ask visitors/players to solve riddles and answer questions.

The second kind of story, storytelling in the framework, is a more structured narrative with a plot that usually involves visitors as characters of the story asking them to have an active role in order to overcome difficulties and get to the final resolution.

The storytelling model can be used both in a tour model and in a game based experience integrating, in the first case, the mechanics of interaction and, in the second case the mechanics, the rules as well as the competition.

The story and in particular the structured story has also to take into account the outcomes of the analytic phase, for example building a story that encompasses all the kind of contents, addressed to a young amateur audience to be played in group in a city within two hours.

The stories could also be written according to the several existing genres such as adventure, comic, mystery, epistolary, historical, picaresque and so on being careful to match the genre with the contents: a mystery tour could be easily constructed about historical legends of a city, like in WhaiWhai experience, or historical experience for an archaeological site, such as Explore!, but a comic or a picaresque experience would not fit with a war museum for example.

Another choice is whether the experience is based on one main story or on several small stories: the first choice may provide a more intense immersive experience, involving visitors in a long structured experience while the second can easily fit with different targets, interests and levels of deepening of contents.

This phase is therefore aimed at outlining the main characteristic of the story, be it a sequence of stops or a structured narration, in order to build the scenario.

### **9.10. Making choices converge. Scenario building.**

The word scenario is here used to intend a useful tool to support the design and the implementation of the mobile experience looking mostly at interaction design and user-centred design field.

The scenario-based design approach proposed by Carroll (1999) well suits with the interpretation here chosen:

*“A direct approach is to explicitly envision and document typical and significant user activities early and continuingly in the development process. Such descriptions, often called “scenarios”, support reasoning about situations of use, even before those situations are actually created. Scenarios are stories.”* (Carroll, 1999, p. 1-2)

Scenario is exactly a story, a storyboard, which describes in a detailed way what will happen during the mobile experience, what visitors will do and how they will interact with contents and other visitors, how the system will work and so on.

The four scenario characteristics proposed by Carroll in the same paper (setting, actors, goal and plot), can help in its definition focusing the attention on where the experience will happen, who will be involved, with which objective and through which steps.

To these basic features we can add all the inputs deriving by the previous phase that can scaffold the scenario construction including the mechanics and the models of interaction as well as the story.

The result could be a written story as well as a storyboard, a patchwork, a sequence of post-it or even a working mock-up of the system to be employed in a real setting; what matters is that the scenario is able to describe what the experience is likely to be.

The aim is indeed twofold: on one side it's a means of communication, useful to describe the experience at a glance to all the actors and stakeholders involved in the project; on the other side is a powerful tool to verify the project and start an iterative process of tests and corrections.

The scenario needs indeed to be tested and iteratively adjusted before being used as basis for the implementation, in order to avoid a mismatch with the general aim of the project and with the inputs deriving from the previous

phases and to reduce possible mistakes.

Scenario building is a skill that usually qualifies designers, but all the competences are welcome to collaborate to this activity in order to keep all the diverse components of the project under control. Final users can be directly involved in scenario building phase but their role is paramount in testing it and giving feedback.

Scenario is therefore here presented as a design tool that essentially merges and interprets all the inputs derived from the previous phases transforming them into a feasible story.

This way of interpreting the scenario may be blamed of missing a drive towards innovation, “*the role of catalyst of actors and triggers of new ideas and solutions*” (Manzini, 2001, p. 97), being it more focused on the definition of the mobile experience and its deployment.

This remark is only partially true because analyzing in detail the model of scenario here proposed is not so distant from the Design Orienting Scenarios - DOS - proposed by Manzini (2001): the three components of DOS (vision, proposal and motivation) can indeed be easily identified within the whole framework.

The *vision* is indeed in the background of the entire framework that works towards the implementation of products, systems and services in order to provide visitors with a mobile experience that meets the goals defined by developers.

The answer to the question “what could happen if the designed system would be implemented?” is described within the scenario that details the vision through a set of products and services, mechanics and dynamics, namely the *proposal* in DOS.

The last characteristic of DOS, *motivation*, that explains why the scenario is relevant, relies in the matching of the scenario first of all with the vision but also with the choices and the outputs of the analytic and creative phase: the iterative process of tests and adjustments to which the scenario has to undergo is just aimed at verifying if the scenario is relevant and how it could be improved.

Despite the two different theoretical approaches, one more focused on designing an experience and the second on providing an innovative but feasible scenario, the result is common: a story that includes a general vision but also concrete proposals to be tested in order to proceed to the implementation of the entire system.

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## 10. Pilot project. Looking for Achille Castiglioni

*Looking for Achille Castiglioni - LfAC - is a project developed with SMAC - Studio Museo Achille Castiglioni - and aimed at testing the developed framework discussed in the previous chapter.*

*The project here described has therefore two main aims, to fulfil the needs described above and to test the efficacy, the usefulness and the feasibility of the framework.*

*The first sections describe how the framework has been applied and the choices for each unit; the central part of the chapter presents the scenario and explains how it has been implemented; the last part discusses the results.*

Looking for Achille Castiglioni - LfAC - is a project developed with SMAC - Studio Museo Achille Castiglioni - and aimed at testing the developed framework discussed in the previous chapter.

With his 60 years long career, Achille Castiglioni (1918 - 2002) is one of most renowned and representative Italian designers and architects who actively worked in the field of design (product, interior) and architecture.

SMAC stems from his heirs' willingness to conserve integrally his design agency and, in 2006, it opened to the public with the mission of conserving, digitizing and showing the collection and the archive.

The institution conserves indeed drawings, mock-ups and documents which tell the story of more than 300 industrial products, countless interior design projects and architectures, together with thousands of *objets trouvés* from which he used to take inspiration.

SMAC is a small but highly regarded institution which has reached 20.000 visitors in five years and organizes daily guided tours: Castiglioni's daughter and wife, together with two of his earlier collaborators introduce visitors into the architect's world guiding them through the four rooms and letting them touch and interact with the exposed objects.

The choice of SMAC as a partner for the development of the pilot project has, at least, three good reasons.

The first is an already existing relationship with SMAC, stemmed from a previous collaboration, that highly facilitated the project's birth and the following development.

The second is the paramount role that Achille Castiglioni played in the history of Italian design and of the School of Design in which this thesis is presented.

The third is that a mobile experience could work towards the fulfilment of two needs expressed by SMAC, that is to valorise Castiglioni's works diffused in the city such as architectures and those that are no more visible such as temporary exhibitions or interior design projects, and to let visitors see some of the digitized drawings, photos and documents usually conserved within closed boxes in the archive. The project here described has therefore two main aims, to fulfil the needs described above and to test the efficacy, the usefulness and the feasibility of the framework.

The next sections will describe how the framework has been applied, the choices made and the achieved results are discussed.

### **10.1. Dealing with the analytic phase.**

The analytic phase of the framework, discussed in the previous chapter,



is aimed at making all the decisions needed to inform the next phases and receives as input both aims and constraints.

The aims are those described above: to valorise SMAC's archive through its digitized documents and to let visitors know and explore those works that are inevitably not shown in the museum (e.g. architectures and interior design projects) and those that are no longer visible because dismantled to make room for new projects or just because they were temporary exhibitions.

To the aims, two main constraints must be added: a limitation in terms of available time for the development (a little more than one month) and in terms of existing competences in the development team.

The kick-off meeting of the project was indeed on March 3rd 2011 and during that meeting was decided to provide visitors with a running mobile application in time for the week of the 50th International Salone del Mobile in Milan (April 12-17th 2011).

The development team was composed by six persons with different levels of engagement, four from Politecnico di Milano with design competences and two from SMAC, more focused on a curatorial role.

The described aims and the constraints are therefore the inputs that inform the analytic phase here described.

#### **10.1.1. Who is the target audience.**

The choice of the target to which address the project is a tricky problem to be carefully considered, especially for those small institutions such as SMAC that do not have relevant statistics about their audience.

The museum indeed conserves data about the number of visitors and their provenance but does not keep information about their age, job, or level of education.

According to museum's staff the most frequent visitors' typologies are students, architects and designers, design lovers, photographers and musicians as well as curious and retired visitors (Bruzzi, 2011): summarizing, an audience that can be described as amateurs and experts, following the categories listed in the framework.

In order to have a more detailed description, the most recent statistics about museums' visitors in Lombardy (Bollo, 2004) has been taken into consideration: it emerges that people in the age range 26-45 are those who visit more frequently museums and cultural institutions, representing about the 57% of all visitors (26-35 yo = 25,3%; 36-45 yo = 32,2%).

Widening the range to include people between 19-55 the percentage rises to 85%, because visitors younger than 19 or older than 55 are under-represented.

Another feature to be considered is the provenance of visitors: the data collected by SMAC's staff show that 27% of visitors come from Italy, 50% from other European countries and 23% from extra-UE countries, in particular from Japan, the third represented country after Italy and France (Bruzzi, 2011).

More than three quarters of the visitors are therefore foreigners, an element to be considered both during contents' development (choice of the language) and for the choice technology (roaming rates).

Crossing these data with those emerging from the most recent statistics on mobile usage (comScore, 2011) we can notice a quite evident correspondence between museum visitors and smartphone users.

The most active segment in the mobile market both in US and EU5 is indeed represented by people between 25-34, followed by people aged 35-44 (comScore, 2011): the two groups together cover therefore about 46% of smartphone users.

Widening the age range to include smartphone owners aged 18-55 it results that this age range covers about 77% of the entire market, the same age range that totalizes the 85% of museum visitors in Lombardy.

People aged between 19-55 can be then considered the audience for LfAC with a core audience made by 25-45 years old visitors.

We are therefore dealing with an adult audience (19-55), coming from a EU country, supposedly not very diversified in terms of learning skills, with a shared interest in design and architecture and quite savvy about mobile technology.

#### **10.1.2. Time and Space of the experience.**

Time and space are discussed together because they are strictly interrelated, at least in this specific case.

The mobile experience is indeed aimed at valorising something that is outside the museum, taking visitors there where the project is/was, and this choice implies that the experience should necessarily take place before or after the visit.

Looking at the framework we can say that the experience would happen outside the institution (outdoor) and on-site, in other words visitors should be taken near different points of interests in the city and use mobile technology to get an enhanced experience.

If we consider instead LfAC as an activity independent from the museum experience, it can happen whenever the visitor wants and the mobile experience should therefore coincide with the visit itself.

Furthermore an outdoor experience, played in the urban space, does not

require special dedicated events because it can be played whenever visitors want without time constraints.

Regarding the duration of the entire experience the decision was not to exceed two hours, firstly because with more than two hours of intensive use, mobile devices could easily run out of battery and secondly because it seemed a more than sufficient time to provide visitors with contextual information.

The duration of the experience necessarily affects the space, because the choice of the points of interests must take into account how far they are and estimate an average needed time for visitors to go from one point to the following.

Summarizing the experience should take place outdoor, on-site, that is near the points of interest, before/after the visit, without particular time constraints and should not exceed two hours.

### **10.1.3. Choice of technology.**

The choice of the technology in support of the mobile experience, as discussed in the previous chapter, is strongly dependant on several other choices and in turn it can influence several others.

In the specific case of LfAC three main constraints was influential: the lack of computer programming skills within the team, the very short time available for the development and the lack of funding.

An off-the-shelf easily customizable (and possibly free/open source) mobile platform was therefore the only possible way to be followed.

Another constraint derives from the choice to structure the experience around points of interests outside the museum and to deliver contextual contents in the right place where the work is/was: this implies that the mobile experience should necessarily rely on a location based service.

Oomen proposes a clustering of location based services grouping them into five classes according to their main features (Oomen, Brinkerink, & van Toor, 2011): location aware display of content, contributing content by end-users, QR codes, augmented reality applications and location based games. This categorization highlights five different models of interaction between users and cultural heritage, useful to frame the future application.

A first choice regarding location based service, was not to use QR codes or other markers for two main reasons: first they require a paper map of the city to be found, excluding in this way those users who have not previously visited the museum and, secondly, because it would have required an authorization to fix or hang codes to every building involved in the project, a solution not feasible in such a short period of time.

Although augmented reality browsers could be very useful in reconstruct-

ing dismantled exhibitions and buildings, they have been discarded for three reasons: among the available contents there weren't 3D models to be used, the still imprecise nature of these application in guiding users towards the points of interest doesn't completely avoid the necessity of a paper map and AR browsers still required computer programming skills to be personalized.

Location based games and contents created by users were not considered properly two kinds of location based services but rather a model of interaction and a mechanic of interaction (with respect to the framework) and consequently not considered.

A location based display of contents seemed therefore to be the right choice, hence a system able to automatically locate visitors in the urban space and deliver contextual information.

The features needed for mobile devices are therefore to be equipped with GPS and Wi-Fi/3G connectivity ant to light, because they must be carried by visitors through the city: smartphones and tablets seemed therefore to be the most suitable for the project.

The high cost of these advanced devices, together with the fear they could be stolen during the tour suggested to develop an application that could run on devices owned by visitors: a small institution like SMAC could not indeed easily afford to buy and maintain several devices.

Summarizing, the choices emerged for the technology unit are: the use of an off-the-shelf platform able to locate visitors in the urban space and deliver contextual contents (location based delivery of contents), that runs on advanced smartphones and tablets owned by visitors.

#### **Choice of the platform.**

The lack of computer programming skills and funding together with the short time available for the project development led to the earlier choice of an off-the-shelf, easy to use and free platform: 7scenes, a mobile storytelling platform designed by the homonymous spin-off of the Dutch no profit Waag Society has been chosen to develop LfAC.

The choice is due to two main reasons: first is the platform's capability to adapt to the needs of the project and second is a direct contact with the society and the developers that allowed to have a continuous technological support and feedbacks.

7scenes is a mobile storytelling platform which allows producers to link multimedia data to a point of interest on the map and they will be automatically displayed when the user reaches the target point, locating him through GPS.

The platform is flexible and allows producers to create different mobile

experiences through a web interface which does not require computer programming skills.

The system provide four diverse single-user genres and four multiple-user genres.

The experiences available for a single users are: sightseeing, a free format that allows users to wonder wherever they want; storyline, a sequence of points of interest to be activated following the order defined by the developer; mystery tour, a storyline with only the next step visible; extra-passenger, a storyline which can be played while driving because it does not require the use of the hands.

The genres available for multiple users are structured as games: freeplay, users can wonder freely and are asked to perform asks in order to gain points; adventure, is a role playing experience where each character has specific skills and tasks; collect&trade, players are asked to collect objects in order to fulfil their task and to exchange them when close to other players; international trade, a collect&trade played between two far places.

Optional features are the possibility to assemble a team and schedule an event for them (teams and events), to have web players (web-palyers) and to send messages to players if you are the creator of the experience (puppetmaster).

Every experience created, the scene, is linked to a place, and becomes available to all users that are nearby, with a mechanism not dissimilar from augmented reality browsers such as Layar, that displays the nearby layers.

While playing, users are provided with an interactive map on their mobile device, that shows the points of interest and activates multimedia contents when the user reaches the right place.

Producers can link photos, descriptions, audio and videos to a place as well as a task or the possibility for users to make a comment; players can also take photos and share them through Facebook or Twitter.

Other features that weighed in favour of 7scenes are its capability of tracking visitors' path in the city and giving detailed feedback from users and its ease of use that allows even to not expert developers to create a mobile tour.

The application requires GPS enabled smartphones or tablets and runs on iOS and Android and a web application is under development.

#### **10.1.4. Criteria and kinds of relationship.**

In order to make visitors meet with contents the two criteria that most suit with LfAC are profile and location.

As already said the target of LfAC is quite homogeneous, adults with a shared interest in design and architecture and admiration for Achille Cas-

tiglioni, but they could be more interested in industrial design or rather in architecture or in interior design.

Profile, intended as personal interests, is therefore a useful criterion to make visitors meet the contents they may like most in the wide production of Castiglioni.

Furthermore the system is a location based service and location is necessarily a second criterion that can influence the choice of the contents.

Homophily is certainly the right choice in this specific case, and the system should allow visitors to head towards the nearest and the most meaningful (for them) points of interest among the available.

#### **10.1.5. Contents to be conveyed.**

The contents available for LfAC are quite heterogeneous and regard mainly product and interior design projects, exhibitions and architectures, to be described with the help of digitized documents from SMAC's archive.

LfAC looks therefore at the collection, considering collection the museum and its archive, but also outside the collection and precisely at those buildings and other design interventions signed by Castiglioni for the city of Milan.

A choice made together with SMAC staff was to include in the experience also the showrooms that still show and sell products designed by Castiglioni, in order to let visitor touch and interact with the industrial products and eventually buy them. Industrial design products are indeed made to be sold and used and not unique pieces to be watched from a distance.

LfAC should therefore convey contents related to the collection and contents from outside the collection but it should include also a more intangible knowledge, that is story that is behind every industrial design product, every exhibition and every building designed by the architect.

Documents, drawings and photos can help to tell the story of the projects and the memories as well as anecdotes of Castiglioni's heirs and collaborators can be exploited to build a richer experience.

Looking at the framework LfAC should provide three kinds of contents: collection, outside the collection and intangible.

The level of deepening of contents depends on the target and consequently the choice was to address amateurs and experts, implying necessarily contents created and edited by experts and curators.

#### **10.1.6. Sociality and learning approach.**

The aim of LfAC is to enhance the museum experience through a city tour, addressed to amateurs and experts, that shows and describes Castiglioni's

works in the right place where they are/were: it's therefore a project aimed at increasing and sharing the knowledge about the work of the famed architect.

A focused learning approach seemed then to be the most suitable to pursue clear learning outcomes and to address a cultured audience that is looking for a deeper and wider knowledge about the author.

At the same time was decided not to exclude from the experience that tendency to the narration that is typical of the guided tour at SMAC, especially when the tour is led by Castiglioni's wife or daughter (Bruzzi, 2011), in order to maintain continuity between the two experiences.

The main approach can therefore be defined focused but with a tendency to storytelling that is typical of the immersive model.

The models of sociality that best suit with the chosen approach are the personal visit or the fusion visit that allow a meaningful learning experience, being the first based on a personal direct engagement with contents and the latter on dialogue and confrontation (Paris, 1997; Silverman, 1999; Debenedetti, 2003).

Sociality is therefore not pursued or already existing and consequently the level of social engagement foreseen for LfAC is necessarily low, matching the level two or, at most, the level three in Simon's scale (Simon, 2010).

The fostered interaction is consequently among visitors and contents and the choice of the mechanics (the next step in the process) has followed these decisions.

### **10.2. Defining the mechanics of interaction.**

The mechanics of interaction have been described in the previous chapter and the charts highlights how the diverse mechanics fit with the choices made in the analytic phase.

In the case of LfAC to the outputs of the analysis, that guide the choice of the mechanics, we must add also the constraints due to the chosen platform, limitations that will also affect the models of interaction.

Tying to summarize the results of the analytic phase useful for the choice of the mechanics we can list:

- the mobile experience should be played before or after the visit to SMAC or be independent from it, and the contents should be delivered during the experience;
- it does not require special events and could be played whenever the visitor wants;
- LfAC is based on a location based service and visitors need therefore to be on-site;

- the experience is structured through an existing, not adapted, platform;
- the chosen criteria to match users and contents are interests and position;
- the fostered models of sociality are personal and fusion visit;
- the pursued level of social engagement is interaction with contents (level 2) or at most personal interests in a wider context (level3).

The level of social engagement is maybe the most influencing factor in the choice of the mechanics to be employed, because it limits the selection among the first twelve mechanics comprised from level one to three.

Another strong restriction is given by the chosen platform, that limits the choices to five, excluding the mechanics gift, interpretation, storytelling, vanity, profile, folksonomy and contents' handling.

Contents' consumption, contents' selection, hypertext, comments and 2.0 are therefore the mechanics available for LfAC: all of them match with the outcomes of the analytic phase and are supported by the chosen platform but it's important to decide which should be paramount and how to employ the others.

Contents' selection is certainly the mechanics that best suits with the requirements of LfAC allowing users to select the contents on the basis of their interests and position (criteria of the relationship) and incorporates the first mechanic, contents' consumption, that is the basis of a tour built with a focused approach.

This choice means that contents need to be clustered in order to allow visitors an easy selection: two basic criteria easily employable within the platform are the kind of content (video, audio, text, image ...) and the topic addressed (industrial design, architecture, exhibition...).

Hypertext and 2.0 (that encompasses also the mechanic comments) are secondary mechanics that can add to the experience: the units of contents can indeed easily include references to other points of interest and directions to get there while 7scenes platform allows web 2.0 actions during the visit, such as sharing contents and writing comments through Facebook and Twitter.

### **10.3. Creative phase: models of interaction.**

The three selected mechanics of interaction together with the choices made in the analytic phase are the basis for the definition of the model of interaction between visitors and contents, detailed in the framework through three different units, rules, configuration and story.

The choice of the rules is maybe the most important because in this unit is decided whether the experience should be based on a tour, a game or an ad



hoc model and what are the rules that govern the interaction.

Regarding LfAC, a game model has been discarded because it didn't easily fit with the chosen level of contents' deepening (amateurs and experts) and with the adult target (19-55).

A tour model resulted then more appropriate for the experience and in particular a free tour has been chosen as rule for the interaction: the "contents' selection" mechanic suggests indeed to allow users to freely wander in the urban space, following a personal path. Among the models available in 7scenes platform, sightseeing, the free tour, has therefore been chosen.

As described in the previous chapter the choice of the configuration is highly dependent on the preferred model of sociality but is not exactly the same, because it describes in detail how visitors relate with contents (section 9.8.2) with respect to their social configuration.

In the specific case of LfAC the chosen configuration is solo, that means that the provided experience is unique and can be played indifferently by a singleton or by a group of visitors: fusion visit, in this case, means that people could negotiate the choices and discuss about them but the system does not provide a personalized experience unless the visitors follow a personal path.

The kind of conflict is determined by the chosen rules: the tour model does not imply competition but only collaboration, that means that users select the contents and the system automatically delivers them.

#### **10.4. Choosing the story.**

This step is aimed at defining what kind of story the experience will rely on and how it is structured.

The choice for LfAC was mainly affected by the selected model of interaction: a free tour implies indeed a story structured through independent units of information ordered by visitors with their free choice. A structured narration with a plot and characters implies indeed a defined sequence of steps to be followed by users in order to proceed in the story.

A free tour could also be structured through small independent stories, like in WhaiWhai project, but this choice was discarded because it did not fit with the focused learning approach and with the selected level of contents' deepening.

Looking at the framework's structure we can say that the chosen kind of story is "units of information" and the structure is consequently "several stories".

### 10.5. LfAC's scenario.

The scenario proposed for LfAC is here described through a story that imagines a typical mobile experience provided by LfAC.

*X is a 23 years old Italian student, he's at the first year of the Master Degree in Product Design at Politecnico di Milan; Y is a 22 years old, Chinese Erasmus student who came to Italy to attend a semester at Politecnico.*

*During a course they were joined in a team in order to design a new industrial product and they decided to pay a visit to SMAC to gather some inspiration from a great master.*

*It's Wednesday morning, 10.00 am, Piazza Castello 27, Milan.*

*X and Y ring the bell of SMAC and are welcomed by a member of the museum's staff who makes them pay the ticket and at the same time asks some questions: where they come from, which is the preferred language of the tour, how they got to know SMAC and so on.*

*Y has some difficulties with the Italian language so the tour starts in English and the guide takes X and Y through the four rooms.*

*After about an hour the tour is ended and while X and Y are leaving SMAC, the guide gives them a flyer that presents LfAC and contains the instructions to start the experience.*

*X and Y are intrigued and furthermore their lessons at Politecnico will begin only in three hours, so they decide to try LfAC.*

*X has an Android smartphone while Y has just bought a new iPhone: following the instructions they install 7 scenes through Android Market and AppStore respectively and run the application.*

*Among the available nearby scenes they find two versions of Looking for Achille Castiglioni, one in Italian and one in English: X selects the first while Y obviously the latter.*

*The application provides a small introduction about the experience and gives brief instruction on how to use the system and on the meaning of the diverse icons they will find, then the experience starts.*

*Their smartphones show a map of Milan with coloured placeholders and a blinking dot. The instructions said that the placeholders represent the points of interest and the different colours stand for the diverse topics, while the blinking dot represent their actual position in the map.*

*Y rapidly zooms out the map to visualize all the placeholders and discover that clicking on them he can get a preview but the contents are not showed: they will be played only when reached the right position.*

*X is walking on the sidewalk in front of SMAC to verify if the blinking dot*

*updates his position, when suddenly his smartphone vibrates and a content is shown on the display; Y reaches him rapidly and his smartphone vibrates too.*

*They press start and a commented video introduces SMAC; when it ends the two guys have to decide where to go and looking at the map on the mobile's screen they choose to head towards downtown where the placeholders are very dense.*

*Y doesn't know the way to get there and decides to use the map of LfAC to keep the orientation while X knows well those streets, so puts the mobile in his pocket and starts walking.*

*X walks faster than Y, who keeps looking at the map and to suggest alternative ways, but he's stopped by a vibration of its smartphones: a new contribution is indeed available.*

*The two guys join again in front a building and pressing start drawings of the project, photos of the interiors and other documents are shown and described.*

*X has a good knowledge about Italian design and architecture but he ignored that the building has been designed by Castiglioni: he quickly takes a photo of the edifice and upload it on Twitter through 7scenes with the comment "did you know that the Chamber of Commerce of Milan has been restored by Castiglioni brothers after WWII?".*

*In the meantime Y is looking at the map in order to decide the next points of interest to head towards: he's particularly interested in industrial design products and from the map he realizes that the placeholders that represent this topic are mostly gathered near San Babila.*

*He then convinces the friend to get there, following a path that will allow them to meet as many points of interest as possible.*

*They walk together, staring at their phone's monitor and at the building surrounding them trying to figure out what will be exactly the next PoI: they are now in the right centre of the city and Y decides to wear his headphones because the background noise of the street is quite high and he's afraid of not being able to listen to the next information.*

*They are indeed approaching a new place holder and the icon on the map suggests that it is an audio contribution about industrial design: the audio starts and the two guy listen to it with attention.*

*At the end of the piece the narrator suggests to reach PoIs they did not take into account and after a brief discussion they decide to follow the advice and modify their path.*

*Looking at the map they easily reach a street that none of them has ever seen before: they get to know that 40 years before there was an elegant showroom there, whose layout had been designed by Castiglioni.*

*X is surprised to find such an hidden place in the right centre of the city while Y is fascinated by the photos he's watching and easily share some of them with his Facebook friends.*

*Quite an hour is passed from the beginning of the tour and they decide to reach quickly the area that was in their original plan.*

*They encounter several placeholders during the path, but they do not have time to listen to all: Y is quite disappointed and decides to pay a new visit during the week in order to discover all the neglected PoIs.*

*Once in San Babila they head towards several showrooms and LfAC provides them with the description of several famed industrial products they then observe directly within the shop: X wants to know what changed from the first sketches to the final industrial product so he browses among the drawings showed by LfAC and in the meantime examines the products on the shelves.*

*One hour and half is passed, Y's smartphone is running quickly out of battery and they need to go back to the university.*

*When they close LfAC they are asked to rate the experience and eventually write a comment so they rate and comment and then walks towards the nearest metro station.*

A brief test conducted within the development team verified that the scenario was consistent with the aim and with all the choices made in the analytic and creative phase and it was consequently employed as draft for the implementation of the system.

In the specific case of LfAC the testing phase of the scenario has been particularly short for several reasons: the first is the very simple model of interaction that does not require several adjustments; the second is that it's based upon an already existing and working platform with defined mechanics and the third is necessarily the lack of time.

### **10.6. Implementing the mobile experience.**

The implementation phase relied on the scenario described above and started with a careful selection of contents and of the points of interest in Milan.

About 70 projects, developed between 1947 and 1999 and referred to 30 different locations have been identified through a deep analysis of literature and review of the findings with museum's curators and Castiglioni's heirs.

A first selection has been done by positioning the locations on the map and discarding those that weren't within walking distance from downtown:

seven locations were therefore discarded but one was kept despite very far from the city centre.

The church of Saint Gabriel in Mater Dei is indeed the only religious building designed by Castiglioni in Milan and a great example of its kind, and it was therefore decided to include it in the tour: LfAC is indeed a free tour and visitors very committed with architecture could decide to reach the location despite far.

The following phase was the search of all the available material about the selected locations: documents, articles, photos, drawings, stories, mock-ups and all the accessible material at SMAC's archive have been collected in order to get a wide overview.

This phase has been carried out by the entire team in order to guarantee a fast and exhaustive documents' retrieval and a continuous comparison between sources.

A great amount of documents and data resulted from this phase and analyzing the results a new selection has been done: those PoIs with few documentation or without significant descriptive material have been discarded and 15 locations were finally included in the tour.

The most common available materials were drawings and photos documenting the project and its development, together with articles and reviews found in journals and magazines.

Slideshows, textual descriptions and audio commentaries were then identified as the most suitable way to convey contents but some limitations of the platform forced to slightly different choices.

7scenes platform indeed didn't allow to create slideshows but to link only one photo to each PoI: videos were therefore chosen as the only suitable format to show diverse images for each location, and textual descriptions were consequently avoided in favour of audio commentaries to be mounted with videos or delivered alone.

The audio description have been written paying attention to include several hints to let visitors continuously shift their attention from the device's monitor to the actual building or objects or vice versa and to link the points of interest in order to enact the "hypertext" mechanic.

All the descriptions followed and mixed the available sources and have been refined with reviews by museum's curators and Castiglioni's heirs in order to verify data reliability and to be enriched.

During this review was also decided to create three additional audio descriptions to introduce Castiglioni's work in architecture, industrial design and interior design and located in three panoramic points of the downtown which visitors go through toward the points of interest.

A selection of the available images, and eventually videos, for each location has then been processed in order to obtain three-four minutes long videos that matched with the audio description: 15 bilingual videos and three bilingual audio commentaries were the output of this phase.

7scenes platform allows to differentiate contents into four categories represented by different colours and contents were then accordingly clustered: SMAC is represented by a blue placeholder, while industrial design is purple, architecture is yellow and finally green represents interior design. The same colours are also used within the videos to recall the categories.

This simple trick allowed to add a new informational level on the map and to enact the contents' selection mechanic according both to position and users' interests.

All the videos and audios were then uploaded into the scene through 7scenes web platform and linked to the right place on the map in order to have two working prototypes (Italian and English) for the testing phase.

### **10.7. Tests and adjustments.**

The two prototypes have undergone a first debugging phase carried out by part of the team with an iPhone and two Android devices, a smartphone and a tablet.

This first session was aimed at solving technical problems eventually met and to verify all the contents and their correct positioning.

Without describing in detail all the bugs and the problems found and corrected it's important to point out some of them.

A major difficulty was the duration of the devices' battery: only the Android tablet succeeded in completing the test while the two smartphones ran out of battery.

It should also be said that the test lasted much longer than a normal experience firstly because it touched all the PoI and secondly because several contents were played more than once and an accurate reporting activity was carried out during the tour.

Other problems can be ascribed to the Android version of 7scenes which was still a beta and had bugs to be fixed, in particular frequent loss of GPS signal and slow updating of the current position were experienced.

Important dissimilarities in the download speed of videos between different phone carriers, due probably to their coverage of city's areas, were also found and this result led to a different management for the download of data. It was indeed decided to give users the opportunity to download on their devices all the contents at the beginning of the experience, a choice



Fig. 10.1. Some images used to create LfAC. Courtesy of SMAC.



Fig. 10.2. Some images of the testing phase.



justified also by the presence of Wi-Mi in downtown, a Wi-Fi network that allows one hour of free connection.

Visitors, and in particular foreigners, can indeed connect to this network, download 7 scenes and all the data at once exploiting the network and avoiding very expensive roaming rates.

The adjustments that followed the test were able to solve the problems encountered as confirmed by a following session of test: the prototypes have then undergone only one cycle of test and correction and the second release is the one actually in use.

Unfortunately there was no time to test LfAC with a panel of potential users and this phase has been postponed after the launch, which took place as expected on April 11th 2011, the evening before the opening of the 50th Salone Internazionale del Mobile.

A small test with a panel of twenty volunteers has been carried out after the launch, aimed at gathering data on their usage of LfAC and get insights of their appreciation in terms of learning and enjoyment.

The volunteers who took part to the testing sessions are all aged between 18 and 34 years (the target addressed by LfAC), with medium/high level of education but with different levels of familiarity with design and architecture, despite a common appreciation of the topics.

They have been asked to freely experience LfAC and then to complete a short questionnaire: multiple choice questions aim at defining visitors' profile while a ten questions Likert scale questionnaire tries to understand the perceived benefits in terms of enjoyment and learning. The table below shows the first result of the questionnaire even if the number of users is not still sufficient to consider data reliable.

Tab. 10.1  
Results of users' test  
in Likert scale  
(range 1-5).

	Average	St. Dev.
My knowledge on A. Castiglioni's work has increased	4,25	1,41
Location-based info are a value added	4,45	0,41
Audio and video have been up to my expectations	3,35	2,12
The archive images improved my understanding of the topics addressed	4	1,41
The duration of the audio and video was correct	3,45	2,12
It was easy to read the map and find points of interest	3,23	2,12
I did not encounter technical difficulties during the tour	2,28	2,83
It was fun to get around the city following points of interest	4,14	0,71
The tour showed me places in the city I didn't know	3,77	2,83

	Average	St. Dev.
After the tour I want to visit SMAC	4,55	1,41
I'm satisfied with the experience made	4,05	2,12
With the tour I learned having fun	3,77	2,12
	3,77	1,88

7scenes web platform allowed also to access the statistics of use and the paths followed by visitors and analyzing these data we can highlight two main points.

A more general consideration is that the application hasn't been very successful while a second, more specific, is that visitors prefer to move among near points of interest, without walking towards the farthest ones, mostly choosing the PoIs on the basis of position.

### 10.8. Discussion.

LfAC is a pilot project with two kinds of goals: the first is to test the efficacy, the usefulness and the feasibility of the framework while the second is more focused on fulfilling SMAC's needs, namely to valorise Castiglioni's works diffused in the city, such as architectures, and those that are no more visible, such as temporary exhibitions or interior design projects, and to let visitors discover some of the digitized drawings, photos and documents usually conserved within closed boxes in the archive.

This section discusses only the second order of aims, that is LfAC's ability to fulfil the defined aims while a broader discussion on the usefulness and efficacy of the proposed framework and process is dealt more in detail later.

Learning is certainly a major aim of LfAC and the proposed questionnaire aimed at verifying three main aspects: the perception of having learnt something, the role of location based information and the perceived usefulness of archive's documents.

From the results it emerges that users considered LfAC able to increase their knowledge on the works of Achille Castiglioni (AVG 4.25, STD 1.41), an important results if we consider that most of the involved users declared to have a good knowledge of design and architecture. In particular also people who had previously visited SMAC refer an increased knowledge on Castiglioni projects after LfAC tour.

From this outcome we can also infer that the focused learning approach, followed in the project, resulted in a perceived benefit in terms of learning.

The second issue takes into account the benefits obtained with a location

based service, that is to receive contextual information in a real setting, exactly where the project is or was: from the results it emerges that users considered this ability highly beneficial in terms of learning (AVG 4.45, STD 0.41), as a value added to the learning experience.

Furthermore users considered useful for a better comprehension of the work, to visualize on their mobile's screen documents from SMAC's archive that refer to the described building or object (AVG 4, STD 1.41).

These results therefore confirm that LfAC has fulfilled its aims, valorising both works not contained within the museum and documents from SMAC's archive: users indeed considered it useful in fostering learning about the collection, be it the collection of SMAC or that of the tour, but from the questionnaire it emerges also that users judged LfAC functional to discover unknown places in downtown Milan as well, even if most of them were familiar with the centre of the city (AVG 3.77, STD 2.83).

This positive side-effect can be explained in two ways: the tour includes locations out of the common routes in downtown, and LfAC stimulates visitors to walk using the map and to observe carefully and actively the surroundings.

Other questions were more focused at understanding users' satisfaction with the experience and if they perceived it as enjoying: the results show that users report a good level of satisfaction with the overall experience (AVG 4.05, STD 2.12) but not everyone agrees on it as testified by the high level of standard deviation.

This data can be easily related with the low level scored by the question 7, which asks users if they encountered technical problem: the results show that a lot of testers did actually find problems with the system, especially those experiencing LfAC with an Android device, whose release of 7scenes was (and is) still a beta-version.

The technical problem encountered may have therefore affected the question regarding the overall satisfaction with the experience.

Even if the average result for the question about enjoyment is quite high (AVG 3.77) an high standard deviation (STD 2,12) suggests that most users reported a good level of enjoyment and few of them didn't find it delightful.

From these results we can infer that users not necessarily consider enjoyment essential for a satisfactory experience and that they considered learning paramount within the tour.

Good results (AVG 4.14) with very low standard deviation (AVG 0.71) have instead been scored by the question 8 which is aimed at verifying users' enjoyment in wandering in the city following the points of interest.

Another remarkable result is that some users considered videos and audios not completely up to their expectations (AVG 3.35), a dissatisfaction par-

tially explained by the answers to the fifth question, from which emerges that videos have been found too long, and (we can imagine) consequently boring.

Other users, instead, reported that the quality of contents was high but that the urban environment, with the noise of the street and the continuous passage of people, resulted in a poor understanding of the audio, especially for those with no headphones.

Other results emerge instead from the tests conducted by the development team and by the statistics of usage available through 7scenes web platform.

The first remark is that smartphones during tests run quickly out of battery: the GPS strongly exploits the battery, restricting the usability of the application, a concern we can find also in other projects like ARthotheque that failed to reach young users because they feared to run out of battery (Schavemaker, Wils, Stork, & Pondaag, 2011). It should also be noticed that this problem was encountered only during the debugging tests but not during user tests, which lasted approximately one third of the time in respect the first testing session.

Nevertheless this issue should be considered carefully in designing a mobile experience and all the possible solutions analyzed: a location based services not based on GPS tracking, like QR codes, can for example overcome this limitation but pose other limitations such as the need of a paper map, as discussed in the section about technology.

Regarding the very low use of the application it's possible to list several reasons.

First is the digital divide: 7scenes platform runs on iOS and Android and requires high level smartphones with GPS and internet access, that means not more than 3% of Italian population (comScore, 2011). A second issue which raises the question of the possible uptake of these technologies by international visitors are the roaming rates: 75% of SMAC visitors are indeed foreigners and, despite the one hour free wi-fi coverage of the city centre, they could be afraid to incur additional charges.

A third reason could be the lack of information: only museum's visitors and few others knows that LfAC is available and 7scenes application is quite well known in the Netherlands and in particular in Amsterdam but it is not so diffused in Italy and not surprisingly the statistics reports that the English version of LfAC has been played mostly by Dutch visitors.

The analysis of the paths followed by users during the usage shows another remarkable fact, that is visitors' preference to move among near points of interest, guided in the choice only by the position and not by their interests.

The result is quite surprising because one of the motivations that influenced the choice of a free format was actually to allow users to freely browse

among the points of interests, choosing them on the basis of both interest and position.

The urban setting may explain this result: a museum's visitors can indeed easily choose different exhibits by interests and reach them with few steps while the PoIs in the city require visitors to cover bigger distances.

This remark can suggest that a free format could be preferred within a museum but not in a urban setting; if this format has indeed the merit to allow users to freely browse through the PoIs, it could also be distracting and less exciting while a defined path with compulsory steps could be indeed more engaging and guide visitors also towards the farthest PoIs.

Drawing some conclusions we can assert that LfAC has been successful in matching the defined (learning) goals but that maybe something able to let people enjoy the experience and get actively engaged missed.

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# 11. Pilot project.

## A mobile experience for Museo Glauco Lombardi

*Chapter 11 describes the second pilot project developed employing the proposed design framework: it's composed of two mobile experiences for Glauco Lombardi Museum (MGL) in Parma, Italy.*

*The aim of the project is to stress the framework employing it to support the development of two very diverse applications: an outdoor multimedia tour and a mobile gaming experience for families visiting the museum's rooms.*

*The chapter describes how the framework has been employed and the scenarios that emerged and ends with a brief discussion of the results: the project isn't still completed, and while writing it has only reached the end of the creative phase.*

Glauco Lombardi Museum, today housed at Palazzo della Riserva in Parma, Italy, stems from the extraordinary collection of professor Glauco Lombardi (1881-1970) who dedicated his life to collect, study and preserve the artistic and documentarian heritage of Parma under Bourbons and the Duchess Maria Luigia, wife of Napoleon and daughter of the Austrian emperor Franz I<sup>1</sup>.

Glauco Lombardi Museum (MGL) is a relatively small institution, which reached 11.428 visitors (Museo Glauco Lombardi, 2011) in 2010, but owns a rich and diversified collection that includes painting, drawings, photos, historical maps, sculptures, jewels, glasses and pottery, historical dresses, all dating back to XVIII-XIX century or referring to that period.

An important part of the collection is made by objects owned by Maria Luigia and acquired by Lombardi from count Giovanni Sanvitale, grandson of Albertina Montenuovo Sanvitale, daughter of the Duchess.

The importance of the historical figure of the Duchess and the paramount role she played in Parma stimulated the design of a mobile experience that revolves around her figure and aims at valorising the museum collection both in the museum and in the city.

As happened for SMAC the decision to involve MGL as a partner in the development of a pilot project has several reasons: first, an existing relationship between the supervisor of this thesis and the museum's director, Francesca Sandrini; second the challenge of testing the design framework in a completely different environment and third, but equally important, the great amount of documents and data - most of them already digitized - available for the project development.

The museum's curator and its employees are indeed very active in conserving, cataloguing and digitizing the collection, and the institution possesses high quality images of all the artworks and has recently completed a huge work of transcription and translation of the letters written by the duchess and collected by professor Lombardi.

While writing, the mobile experience here described has only reached the end of the creative phase within the design framework, that is the definition of the scenario, and the actual implementation of the system is starting.

This condition is mostly due to the lack of time: the kick off meeting of the pilot project has indeed been on December 23rd 2011, right at the end of the last year of my PhD research.

For this reason the following sections describe the setting up of the project, the scenario, but not the implementation phase, ending with a brief discussion about the partial results achieved.

<sup>1</sup>  
<http://www.museo-lombardi.it/sitolombardi/index-museo.htm>



### **11.1. Project's aims and design team.**

I can identify two orders of aims for the mobile experience for Glauco Lombardi Museum, the first more related to the research and the second to the museum itself.

As stated above, the second pilot project is an important step aimed at testing the design framework in another pilot project and, in particular, in a completely different environment.

MGL is indeed a very different institution compared to SMAC: it's older, it has a wider audience and deals with XVIII-XIX century history and not with contemporary architecture and design.

Furthermore, while the aim of LfAC was to valorise a collection that is outside the museum, in this case the project should provide both an indoor and outdoor experience, testing the flexibility of the framework.

The second order of goals are those of the museum that aims at improving the knowledge about Maria Luigia, valorising both the museum collection and the city of Parma, and exploiting the vast documentation collected around the figure of the duchess.

In particular the museum's curator defined as primary goals the creation of an indoor mobile experience addressed to families, able to introduce them in the life and history of Maria Luigia and the setting up of an outdoor experience that touches all the points of interest in the city which are in some ways related to the duchess.

Another goal pursued by museum is to increase the number of museum visitors, which declined in the last three years, by creating a mobile experience able to attract new visitors and to retain the actual ones.

The design team currently involved in the development of the mobile experience is composed by four members, two from Politecnico di Milano with design and (in part) technological skills and two from the museum (the director and her collaborator) with a curatorial role.

The condition is very similar to that encountered while developing LfAC, that is the lack of an expert programmer, at least at the beginning of the project.

### **11.2 Analytic phase. Defining constraints and making choices.**

The decisions regarding the analytic phase of the design framework have been made during a half-day meeting involving all the team members and aimed at giving a structure to the mobile experience.

The only inputs of this phase are the aims described above, that is the creation of an indoor and outdoor mobile experience, addressed respectively to

families and to a wider audience.

The two experiences are thought as separated and the following sub sections describe the decisions made for both, when different.

#### **11.2.1. Target audience. To whom we address.**

The first step toward the definition of the target audience of the mobile experience is to know who are the actual museum visitors.

According to the report produced by the museum for the year 2010 (Museo Glauco Lombardi, 2011) the visitors for that year have been 11.428 of whom the 84% of the permanent collection and the remaining 16% of temporary exhibitions.

Unfortunately the museum only knows how many of them have paid the entire fee, how many a reduced one and how many had a free entrance but does not have information about their socio-demographic profile, their interests or level of knowledge about the topics.

Despite the lack of reliable data about MGL's visitors, the long experience of the museum's director allowed to identify three recurring kind of visitors: families, school classes and middle-aged visitors that come alone or with companions.

While for school classes the museum has a well established didactic program with guided tour, labs and games, it almost lacks interpretative material and learning support for the other groups.

For these reasons the two target audiences for the mobile experience are families and middle-aged visitors, and in particular the choice was to address the indoor mobile experience to families and the outdoor to the latter.

For families I mean a group of at least two persons, heterogeneous for age and for knowledge of the topic addressed but not necessarily linked by ties of kinship, while the second target audience could be identified as a not diversified group of adults.

Looking at the statistics on mobile usage (comScore, 2011) the chosen audience is quite problematic: both children and people aged 55 or more are indeed pointed as not usual users or owners of front end mobile devices. The only group that, according to statistics, is more likely to own a smartphone is that of parents or young companions of children. This condition must be taken into account carefully in the definition of the technological constraints, in order to provide a widely accessible experience.

#### **11.2.2. When and Where: defining time and place of the mobile experience.**

The time and place change considerably for the two experiences: the first

is an indoor experience that happens during the museum visit while the second is an outdoor experience that necessarily happens just before or after the museum visit or at another time.

The ideal condition for the outdoor one is to be played after the museum visit so that visitors have already acquired knowledge about Maria Luigia and her life.

For both the experiences is foreseen a duration of not more than one hour and half, the common duration of a guided tour at MGL, and they can be played always, and not only in dedicated sessions.

One of the aims is indeed to provide visitors with interpretative materials, that are actually missing, allowing them to live a learning activity without the presence of a curator or of a museum's employee.

Both the experiences will be played on-site and in particular near the exhibits the mobile interpretation is referring to, but the project could also involve the creation of a dedicated web site that provides users with information and multimedia.

### **11.2.3. Technological choices.**

The choice of technology is strongly dependant on several other choices and for this project two constraints are particularly influential: the lack of programming skills within the design team, as happened for LfAC, and the target audience.

A common choice for both the experiences is to employ existing or adapted platforms in order to compensate for the lack of programming skills, but unlike LfAC, the choice has been not to identify a specific platform to be used.

In the specific case of MGL, indeed, there aren't strict time constraints for the project's delivery and this decision aims at leaving more design opportunities for both the projects.

Another limit is the need to employ visitors' own devices and not rented ones because the museum cannot afford the purchase and the maintenance of the needed tools: a strong constraint that asks for a careful reasoning about the audience.

The common points about technology for both the experiences are then the employment of an existing or adapted platform and the use of devices owned by visitors together with a short term temporal horizon for the implementation.

Looking more in detail at the single sub projects, the indoor mobile experience is addressed to families and then to two people at least (e.g. a father and his daughter) but also to more complex social groups (two parents with sons and daughters or families with grandparents): it follows that the mobile

experience should run on a broad range of widely diffused devices in order to allow several members in a family to play.

If we look at the kind of media that are more likely to be employed in the experience we can list text, images, audio and maybe videos plus possible interactive systems: it follows that the iPod Touch - or similar - is the “cheapest” kind of device that plays all the listed media but, excluding video and interactivity, a common MP3 player could also suit.

Considering instead the need of accessibility from a wide range of devices, a mobile website or a web app seems to be the right choice, providing visitors with multimedia contents accessible from different devices.

The Wi-Fi coverage of the entire museum is naturally a prerequisite for this solution and when not feasible this choice must be changed.

Regarding the second sub-project, the outdoor experience, the target audience are adults that we can consider quite homogenous in terms of interest in the topic addressed and knowledge, but very diversified in terms of available mobile devices.

The kind of media needed for this sub-project are likely to be the same of the indoor experience: text and audio, images and video plus interactivity.

In an outdoor setting, GPS could help visitors locate the points of interests, but the previous experience of LfAC teaches that applications that require very high level devices still suffer from under-utilization: in this project a location based service could therefore be an extra opportunity but not the core of the experience.

We also have to consider that while downtown Milan offers free Wi-Fi connection, the centre of Parma does not provide the same service and the mobile experience should necessarily be “light” in term of data to be downloaded and consequently of money spent (especially for foreigners).

For the outdoor experience it seems therefore interesting to provide a set of technological tools that can fit with diverse visitors’ technological equipment, from an audio experience accessible with a common mobile phone or MP3 player and completed with a paper map to a location based service that require GPS equipped devices and connectivity.

This flexible approach with different entry points according to the technological equipment could also be taken for the indoor experience in order to widen the accessibility as much as possible.

As already stated, in this specific project, the choices made for technology should not be intended as real constraints but only as suggestions to be carefully considered while defining the project scenario.

#### **11.2.4. Creating relations: criteria and contents.**

Profile and location are the two criteria to be used to match visitors with contents as happened for LfAC: visitors will be provided with contents on the base of their actual location but also according to their profile.

In other words users will receive contextual information according to their profile, in particular for the indoor experience that provides contents both for adults and children, while for the outdoor experience the target audience is considered quite homogeneous.

Profile could also mean the possibility for users to freely choose the exhibits according to their personal interests, browsing among them physically.

The kind of relationship that seems to best suit with this project is homophily, trying to meet people's interest.

Looking at the contents to be provided, they should be slightly different for the two projects: the indoor one must indeed focus on the collection while the outdoor experience must provide contextual and historical information.

In detail the indoor experience could focus on those artworks and objects strictly related to Maria Luigia and her life, give some information about the building which hosts the museum and provide visitors with historical information about the Napoleonic period of Parma.

This sub-project is addressed to families and it follows that contents should be provided at two different levels of deepening at least: an amateur level for adults and a beginner level for children.

The outdoor experience could instead focus on a more intimate side of Maria Luigia, exploiting the rich collections of writings and letters she wrote and linking them to the points of interest in the city: this approach does not exclude contents from the museum collection or contextual historical information.

The contents provided in this experience can reach an amateur level of deepening, addressing mainly adults with a shared interest in the topic addressed.

For both the experiences the contents are likely to be edited by experts only: the topic, indeed, is not so popular to allow a meaningful participation from users that goes beyond the simple comment or the recording of an impression.

#### **11.2.5. Sociality and learning: defining the approach.**

Looking at the experiences from the point of view of sociality we must distinguish between the two experiences.

The indoor activity is addressed to families and social engagement is necessarily a prerequisite: the foreseen level of social engagement is therefore the

level five, direct social engagement, and the model of sociality is the fusion visit.

Both the choices are direct consequences of the social groups we are addressing, usually parents keen to learning activities that allow to spend quality time with their children.

In this specific case the level five of social engagement does not mean to enter in touch with strangers but refers to sociality among the members of an established group - the family - and not necessarily involve all the previous levels of social engagement.

A different approach is instead foreseen for the outdoor experience which is mainly a personal activity: the level of social engagement is likely to be level two, interaction with contents, or eventually level three, personal interests in a wider context, if the system will provide users with 2.0 functionalities.

A personal experience means that the required model of sociality is necessarily a private visit that does not restrain sociality but doesn't provide support for it.

If the two experiences are different in terms of sociality, they share a common learning approach, that is the immersive one. The design team has indeed decided to choose a strong narrative approach for both the project, even if more pronounced in the outdoor one: a personal experience allows to involve visitors at an higher degree of immersion in a story while a family experience should necessarily contain some dynamics that belong to the collaborative approach.

The outdoor experience will be mainly characterized by a "pure" immersive approach, involving users in a story that will guide them in a learning and enjoying activity.

The indoor experience, instead, will maintain a main immersive approach, providing a plot, but at the same time it will be characterized by a collaborative strain, trying to match the fascination of a narrative approach with the liveliness of the collaborative one.

### **11.3. How to employ mobile devices. Mechanics of interaction.**

The mechanics of interaction to be employed in the two mobile experiences are quite different.

The outdoor one is indeed a quite passive experience that can hardly reach the level three of social engagement (personal interests in a wider context).

The mechanic that is more likely to be employed is, of course, the first one, contents' consumption, that will run across the entire experience while all the mechanics included in stage 2 imply active interaction of users with

contents which could disrupt the immersive narrative experience.

The only mechanics that could fit with such an activity are those included in the “TwoPointO” that allows users to share contents and make comments: this actions, indeed, do not affect the story and its development.

The indoor experience has a different aim, that is to stimulate social engagement among family members, and consequently different mechanics must be employed, in particular those that belong to the last stage, direct social engagement.

Contents’ consumption will be for sure used as basic mechanic while several others must be excluded for technological issues: the choice of guaranteeing an high accessibility to visitors, possibly through a mobile website, together with the lack of programming skills in the design team, strongly limit the choices.

Considering all the other choices previously made it results that the available mechanics are quite few and mostly limited to stage 5: bump, tasks, prizes and smart mobs are the mechanics that could be associated with contents’ consumption.

Among them, however, only the mechanics tasks and prizes seems to fit with the addressed social group characterized by family members that naturally know each other and maybe looking for and enjoying experience.

Contents’ consumption, Prizes and Tasks are then the mechanics which are more likely to be employed in the indoor mobile experience.

#### **11.4. Defining the models of interaction and the story.**

Making the mobile experience rely upon a strong narrative structure requires careful choices about both the models of interaction and, in particular, the rules and about the stories that will sustain the activities.

This section describes the choices made for the two experiences separately.

##### **11.4.1. Outdoor activity.**

As already stated, the outdoor experience is imagined as a walking multimedia tour that accompanies visitors through several points of interest in the city: the guided tour is therefore the rule that best suits with this activity.

Speaking of visitors’ configuration the only feasible for this kind of activity is “solo”, that means a personal experience or, better, one that does not provide specific support for a group activity: the tour can be played by several visitors together but this condition does not change the experience.

In this particular case the category conflict is quite irrelevant because users are provided with contents along a tour and are not involved in a gaming experience: within the cluster conflict, collaboration is therefore the choice

made for the outdoor experience.

The story that will sustain the mobile experience will be mostly based upon the letters written by Maria Luigia, diaries of XVIII century travellers on their Grand Tour and excerpts from newspapers and will accompany visitors during a guided tour.

This conditions steer the choice towards a semi-structured story halfway between the units of information and a full structured story: to maintain a strict philological correctness is indeed quite impossible to merge all the heterogeneous data within a story with characters and a plot but, at the same time, the chosen immersive learning approach asks for an appealing narrative experience.

A possible way to link data emerging from the available documents, without betraying the philological correctness, is to employ a narrator who gives contextual information about the diverse points of interests and introduces the excerpts in an organized manner.

The result could be a sort of chronicle, even if not exactly in chronological order, that links together the extracts and contextualize them: the choice is therefore to create a main story made of different parts.

#### **11.4.2. Indoor activity.**

The indoor mobile experience has a higher level of complexity if compared to the outdoor one, due in particular to the target audience, a family, that requires diversified supports of information and different rules to engage all the members.

An experience entirely based upon a game could be very attractive for the young members of the family, but, as it results from the cases' analysis, it could lack of deepening for the adult audience. On the contrary, a detailed description of the exposed objects could be formative for the adults but maybe not suitable for children.

These simple remarks suggest an hybrid solution that keeps in depth contents for adults but also a lighter mediation with game mechanics for children.

The mechanic of interaction "task" could be the starting point to structure an experience that matches different activities for the two audiences: adults and children could indeed receive information with different deepening and through different formats but they could be asked to collaborate in order to overcome a simple obstacle, for example a question that requires pieces of information from the two contributions.

A simple game mechanic, together with a background story, could engage children while adults could be provided with a well designed support mate-



rial and engage with their children in the gaming activity.

The rules are therefore two: a guided tour for adults and a simple question game for children.

The configuration required for this experience is naturally a group one and the rules described above steer the choice towards different roles for parents and children: this solution could indeed give them responsibility on the final result of the experience and make them actively collaborate to overcome the simple obstacles proposed by the system.

The kind of conflict that suits best with this activity is consequently collaboration + competition, being the collaboration among the family members and competition against the system to overcome the obstacles.

The limited numbers of visitors that daily frequent the museum does not justify a competition against families and the only possible way to make different groups compete is to use an asynchronous system, such as an highscore one.

Competition (on score, time etc...) among groups could be a simple way to stimulate involvement but it must be carefully assessed in order to avoid negative effects such as rush in a time based experience or very intricate mechanics in a score based one.

Regarding MGL it seems appropriate to limit competition to the simple overcoming of the obstacles proposed by the system because of the limited number of visitors and for the hybrid rules, halfway between a guided tour and a game: a competition among families could indeed result in a preponderance of the gaming activity over the tour one.

The duality of the experience in terms of rules necessarily affects also the choice of the kind of story: the guided tour for the adult members of the family could indeed be formalized as units of information while a more structured story could instead engage the children.

To maintain a certain homogeneity with the outdoor experience, a semi-structured story with a narrator that links all the stops could be an option for the children activity, and the use of different narrators with diverse tours could be useful to make families visit again MGL.

The narrating voice could be that of Maria Luigia, of Napoleon or of others characters: the stories are indeed addressed to children and we can afford to be more indulgent with the philological correctness.

### **11.5. Project scenario.**

All the choices made need now to be blended within a project scenario that describes in a quite defined way what will happen during the mobile experi-

ence. The following subsections propose the two resulting scenarios.

#### **11.5.1. Walking tour: outside the museum.**

*It's a sunny Sunday morning in Parma and A has convinced her husband B to leave their home and experience the new walking tour of Museo Glauco Lombardi: she was indeed informed of this opportunity by her friend C who visited the museum few days before.*

*The evening before, A and B visited the website of the museum to get some more information about the project and found a direct link to a website entirely dedicated to the mobile experience.*

*On the website they were asked to follow diverse tracks depending on their technological equipment: front end mobile devices or MP3 player.*

*B has a brand new advanced smartphone and followed the related link: a new webpage gives him the instructions on how to install the app and run the location based service.*

*A has an old cellphone and asked her son to use his iPod: so she followed the link of MP3 players and found several audio tracks to be downloaded on the device and a map to be printed.*

*Fully equipped they are now in front of MGL: A wears the headset and is checking the map while B's smartphone is vibrating because it recognized the first point of interest.*

*They press play together and start listening to the audio contributions: B can also visualize some images on the screen of his phone so he keeps it visible to her wife too.*

*They walk slowly as suggested by the voice and are dragged in the XVII-XIX century Parma through excerpts of letters, newspapers, books that describe the different points of interest they are near to or provide information about them.*

*One main narrating voice gives the most important information and the instructions while several voices impersonate diverse characters and read period excerpts.*

*The audio and video contribution are started automatically on B's device because his position is triggered through GPS, while A checks the map and runs the correct contribution on the basis of her position and the suggestions found on the map.*

*Classical music of the period runs across all the contributions and becomes lyric music in front of Teatro Regio: A is a melomaniac and is captured by the music.*

*The entire tour lasts about an hour and at the end they are again in front of the museum: it's only 11 am and husband and wife decide to enter the*

*museum they didn't visit for years.*

**11.5.2. Learning and playing: inside the museum.**

*It's Saturday morning in Parma and M and F with their 6 years old daughter D. are at the reception desk of MGL: while printing the tickets, the museum employee asks them if they want to try the new mobile experience for families and briefly explains how it works.*

*They only need a wi-fi enabled device and luckily M has a smartphone: so they decide to try the experience and the employee gives them the instructions and several plasticized cards with different artworks (fig. 11.1)*

*F starts reading the instructions while M logs in into the wi-fi network of MGL and then points with his phone a QRcode printed on the instructions.*

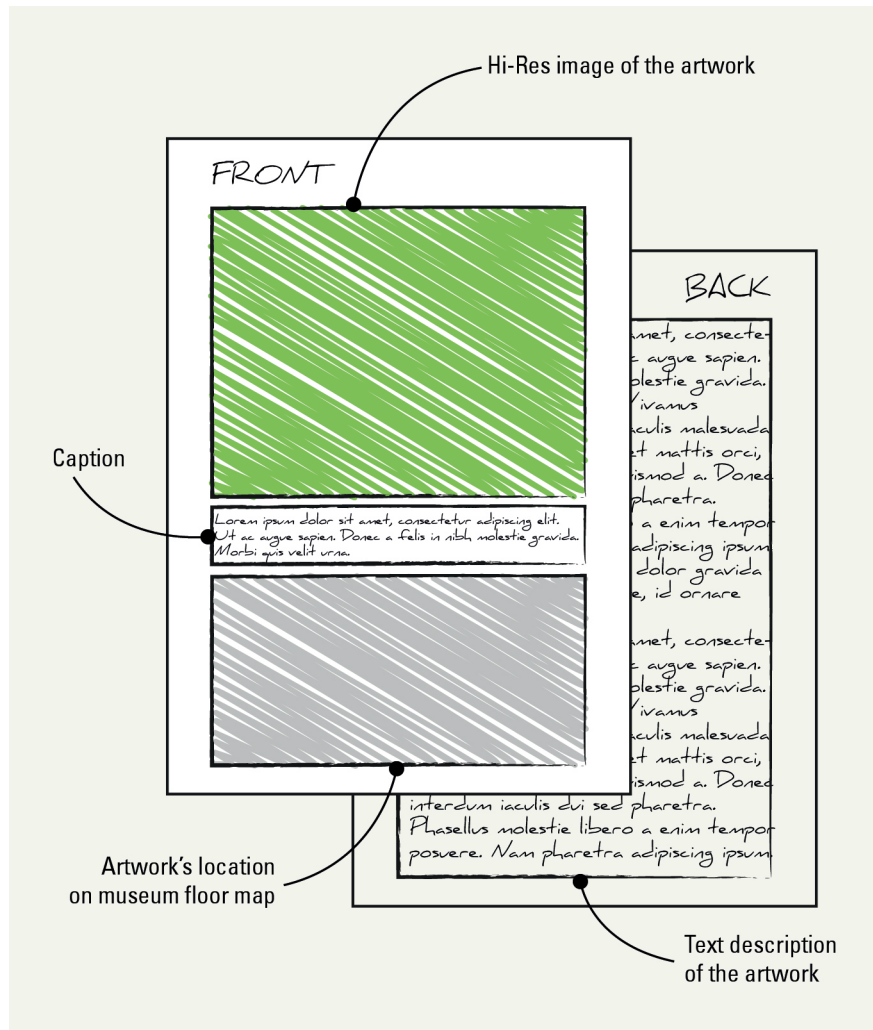


Fig. 11.1  
Concept of the  
artwork card.

*The web browser opens a mobile website that welcomes them.*

*The following part of the instructions explains how the experience works: the child will be the leader of the experience and will hold the mobile device, while the two parents will be her advisors, using the plasticized cards.*

*D is given the mobile device and now she must choose one of the three tours, the tour of Maria Luigia, that of Napoleon or the tour of Griffon, the beloved dog of Maria Luigia: she has always been fascinated by fairy tales and princesses and obviously she chooses the tour of the empress.*

*The voice of the duchess introduces briefly the tour and suggests the starting artwork (fig. 11.2).*

*The parents look for that work among the cards and, once found, locate it on the map printed on the card and head towards it. When in front of*

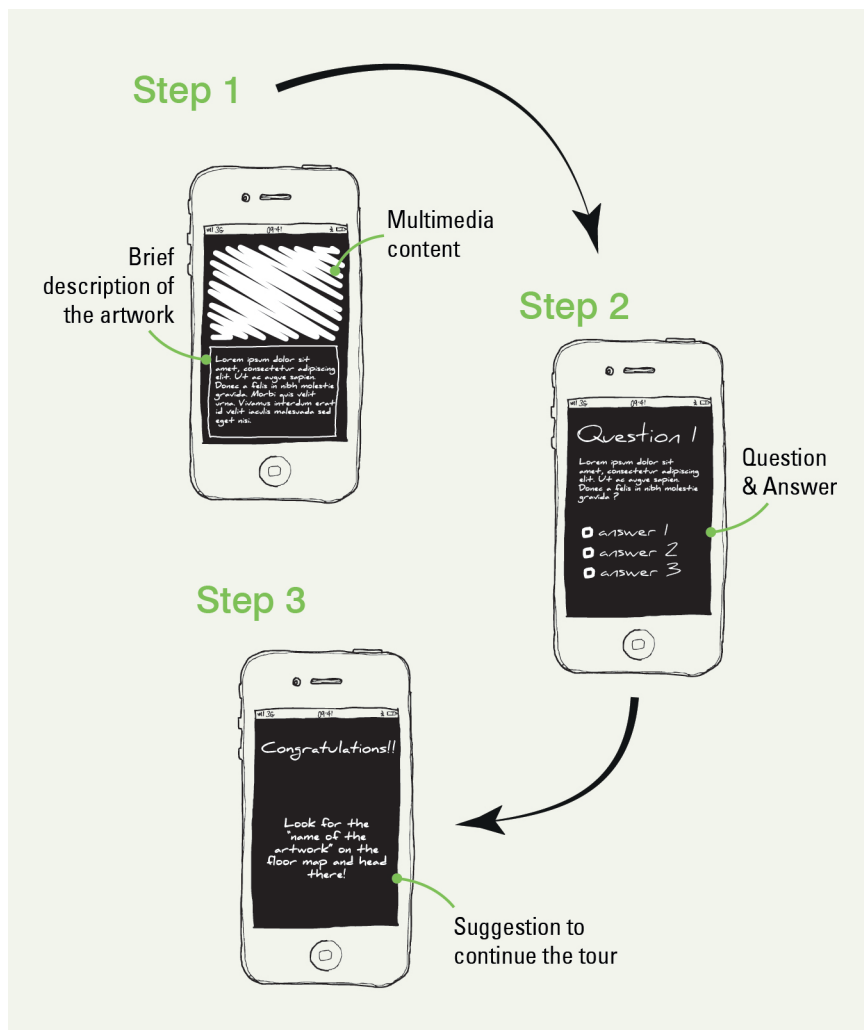


Fig. 11.2  
First hypothesis of  
interaction with the  
mobile website.

*the artwork D plays an audio contribution while her parents read the text printed on the card.*

*At the end of the audio contribution the system asks the child a question: she doesn't know how to answer correctly and ask her parents for help.*

*The answer isn't completely comprised in the audio nor in the text and parents and children have to collaborate in order to find the right answer.*

*Once answered correctly the system suggests a new artwork and the tour continues through several other artworks and lasts a bit more than one hour.*

*At the end of the tour the family go back to the reception desk and F returns the cards to the museum employee.*

*They then leave the museum while D is asking to come another time to the museum to try the tour of Griffon.*

#### **11.6. Results and discussion.**

While writing, the design of the mobile experience for MGL has only reached the end of the creative phase, that is scenario building, and the implementation is just started.

The results here discussed are therefore only partial and regard mainly the employment of the design framework through the two first steps, the analytic and the creative phase.

A first positive remark is that the design framework has proven to be flexible enough to support the development of two mobile experiences (three considering also LfAC) with very diverse characteristics: flexibility is indeed an essential need for a framework that is required to be able to support the development of indoor and outdoor mobile activities, be them tour or game based.

The design of the two pilot projects for MGL was also intended to stress the framework, that has been used to develop an outdoor tour and an indoor game that only share contents and the general immersive learning approach.

Another general remark regards the limited amount of time required to apply the framework: for both the experiences the analytic phase lasted only half a day, while the creative one, including the choice of the mechanics of interaction, lasted not more than two working days (about 15 hours of one person).

Similar remarks have been done about LfAC, whose analytic and creative phase have been quite fast, a condition justified with the early choice of 7scenes platform that limited the available choices. This condition is not relevant for the MGL experiences whose design has been left voluntarily free of any constraint.

The choices made applying the design framework have been described in detail in the previous sections but it's useful here to deal with those points of the process that need some clarifications.

A first issue regards the level of social engagement that the experience should provide.

According to the five steps scale proposed in the framework (Simon, 2010) the last step should mainly mean direct social engagement among people that don't know each other and several design mechanics work in this direction; in the indoor experience, instead, the level five means direct engagement among family members, a condition observed several times in the analyzed cases.

A second useful remark regards the learning approach: if the outdoor experience fits perfectly within the immersive one, the indoor activity is more problematic because it maintains mostly an immersive approach but with a collaborative strand.

This statement confirms once again that every framework implies a necessary simplification that hardly describes the complexity of reality, and must be intended as a tool to sensitize designers and developers and not as a sequence of strict guidelines.

The same remarks could be done looking at the creative phase: the rule chosen for the indoor experience is halfway between a tour (for parents) and a game (for children) while the kind of story for the outdoor experience is not exactly a codified genre nor a simple sequence of stops, but something that is between them.

These remarks do not affect the validity of the entire design framework as a support tool, even if it could be certainly improved, but, on the contrary, they demonstrate how the framework is able to stimulate reflection and to help designers taking into account several possibilities for each choice (including new ones).

The two scenarios/storyboards designed at the end of the creative phase seem to satisfy all the choices made and the defined aims and have been approved by the museum's director, giving the go to the implementation phase.

Despite these positive remarks the scenarios haven't still been verified through the creation of prototypes and the editing of contents and it seems therefore untimely to discuss them as results.

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## 12. Discussion and conclusions

*This last chapter proposes a discussion on the results achieved by the research, answering the research questions listed at the beginning and evaluating the design framework and process.*

*The limits of the research are also discussed and the results analyzed in the wider context of the research field.*

*Possible future works and new areas of research opened by this study end the chapter.*

### 12.1. Discussion of results.

The discussion is structured following the research questions proposed in 1.1, summarizing the issues already discussed in the previous chapters and reasoning on the proposed design framework and process.

The first question addressed by the research regards mobile supported learning in cultural institutions and aims at categorizing and defining possible approaches useful to support the design action.

Secondary research conducted on literature regarding cultural learning and mobile learning has highlighted that the two fields share common references to broad learning paradigms, namely behaviourism and constructivism plus a more fragmented contemporary paradigm that we can define collaborative.

These paradigms inform the three learning approaches proposed in 3.5 (focused, immersive and collaborative) that structure three different learning approaches: the first focused on providing detailed information, the second on involving visitors in a narrative experience and the third aimed at making visitors build a shared knowledge together. The approaches are useful to help developers make conscious decisions about the learning aims and to structure correctly the experience to achieve them: their usefulness does not rely on strict rules to be followed but rather on making developers aware of the different models and to make them reason about them.

The second question regards sociality issues related to a mobile supported cultural visit and aims at defining which models of sociality and which levels of social engagement can be pursued while designing the experience.

The four models of sociality (together, alone, separated and pursuit of sociality - 4.1) proposed by Debenedetti (2003) have been identified as meaningful because they add to the two traditional static models (alone Vs together) two dynamic models (separated and pursuit of sociality) easily supported by mobile technology.

The five steps proposed by Nina Simon (2010) are indeed used to describe the level of social engagement that can be pursued during a cultural visit.

These two frames together are helpful to support developers in deciding how visitors should be configured during the visit and how they will relate with contents and other visitors and adapt the design choices accordingly.

As remarked several times, both the learning approaches and the sociality frames discussed above are intended as tools to help a conscious design of a cultural mobile experience, are part of the design framework and affect other units within the frameworks.

The five levels of social engagement, for example, are used to categorizes the mechanics of interaction with mobile devices described in 9.7 in order to

help designers to choose them according to the defined aims.

The cited mechanics are also the answer to the third research question and are inferred from literature, from the analysis of cases and from the wide and growing sector of mobile applications: the list of course is not exhaustive and does not preclude developers to add new ones.

The mechanics of interaction, described in 9, can indeed be employed by designers in different ways and contexts in order to achieve the defined aims.

It must also be noted that the frame proposed in this thesis to analyze them (according to diverse constraints of the analytic phase) could be useful to fully understand the potentialities of new ones and to make developers aware of the behaviour each mechanic could enable and of its implications.

The provided mechanics are not intended as strict design guidelines to be followed by designers but only as a sequence of possibilities, an help and a way to reason about them in relation to other issues.

The fifth and sixth question, as well as the previous, has been diffusely answered in chapter nine and the described design framework and process have been applied to structure the pilot projects illustrated in chapters ten and eleven. What still lacks is a discussion about the completeness and usefulness of the design framework and about the efficacy of the proposed design process in the light of the results achieved by the pilot experiences.

A first question about the general design framework is whether it takes into consideration all the aspects related to the design of a mobile experience or not, in other words if it is sufficient to deal with the complexity of a project or not.

A part from the declared limits (implementation and test, business model, communication) that will be discussed later, the framework has successfully supported the design of the pilot projects without showing evident deficiencies that could affect the project development.

On the contrary the implementation of Looking for Achille Castiglioni has highlighted that the framework, under peculiar conditions, results redundant: the early definition of the off-the-shelf platform has indeed guided several choices, depriving some units of meaning and developers of the freedom of choice.

This result does not mean that the design framework is redundant in itself but that it can be fully exploited only if the technological constraints are not so strict and if the technological platform is defined ad hoc.

The remark is confirmed by the development of the second pilot project, for which a technological platform has not been defined early, and the framework didn't result redundant.

This point raises again the issue discussed in chapter nine: whether tech-

nology should be considered a constraint or not, and consequently if it should be taken into account early in the design process or only when testing the scenario or implementing the system.

The answer does not change: if the development team lacks computer programming skills, time or funding to develop a new application, then an off-the-shelf platform is the only possible way and the earlier it's chosen the better; on the contrary, if the team has skills, time and financial support then it's better to fit or adapt the technological structure with the scenario.

Technology, as well as the target, time and space, must be then considered a constraint because it may depend on factors that go beyond the choice of developers. Constraints need therefore to be addressed firstly in the design process because they affect quite all the other choices but are affected by themselves and from external factors.

What emerged during the development of the pilot projects is that the frameworks' units and in particular those encompassed within the analytic group cannot be considered alone, without moving back and forth among them.

They are indeed strictly interrelated, as discussed while describing them in chapter nine, and every unit is affected and affects other units requiring a process of continuous revision of the choices in order to keep an overall coherence.

This means that, within a single phase, there isn't a mandatory sequence to be followed (a part from starting from constraints) and that every unit must be intended as questions to be answered and the answers must be compared with those of the other units.

The design framework is indeed a tool to make designers aware of their possible choices and of what they imply and to support them in the process of decision making.

The general design framework, therefore, mustn't be considered as a sequence of strict design guidelines or recommendations but rather as a way to sensitise designer about the critical issues of a mobile experience.

This choice is in line with the design sensitivities proposed by Hindmarsh et al. who provide a list of interaction design actions useful to stimulate cooperation and sociability in museum setting, but specifying that they are means to sensitise designers and not tightly defined guidelines (Hindmarsh, Heath, Vom Lehn, & Cleverly, 2005).

The authors remark indeed that every strict guideline proposed for museums is bound to fail because every institution and exhibit arise different issues and needs (Hindmarsh, Heath, Vom Lehn, & Cleverly, 2005).

These remarks become particularly relevant in the light of the design pro-

cess here proposed, aimed at optimizing the development of a mobile experience for cultural institutions.

The overall process is essentially a design process that starts from a brief, goes through research and analysis, proposes a concept/scenario and get to the final product/experience through prototypes and an iterative phase of tests and adjustments.

The entire process is structured as a sequence of decisions, partially guided by the design framework, aimed at helping developers to take all the required factors into account and proceed efficiently to the creation of a mobile cultural experience.

Looking for Achille Castiglioni, was specifically aimed at testing the design framework and process, going through all the steps, till the delivery of a working mobile application (chapter ten).

A first remark about LfAC is that the design process allowed to deliver a fully working application in little more than one month with the effort of about three man-months.

This good result is partially due to the use of an already existing technological platform, which allowed to avoid the time needed to create and test an ad hoc platform. The early choice of the platform resulted also in a shorter analytic phase (less than one week) reducing the available choices, because of the technological constraints.

However, it's undeniable that the designed structure and process worked well in helping the development team to consider all the involved factors and their interrelations and to follow an ordered and optimized sequence of steps.

A particularly valuable fact is that all the choices made in the analytic and, partially, in the creative phases, resulted very useful in structuring the story and the scenario, assisting the team to design a feasible scenario well suited with the aims. A feasible and structured scenario guided correctly also the system implementation, avoiding several iterative processes of tests and corrections.

Similar remarks can be drawn also by the second pilot project whose scenarios and storyboards have been developed in a very short amount of time.

Another remark deriving from LfAC experience is that about three quarters of the entire process in terms of time, has been employed by the implementation and tests. The edition of contents, in particular, required a great amount of time (about 15 days), a factor to be carefully considered while planning the design of a mobile experience.

Despite only LfAC followed the entire process, some remarks about the design framework can also be drawn by the second pilot project and have

been described in the previous chapter.

In particular the framework resulted very flexible in supporting the design of two very different mobile experiences, and flexibility is necessarily a prerequisite for a design framework.

Summarizing, the design framework and process resulted useful to help developers to take all the required features into account, to follow a structured and efficient development path, and, at least for LfAC, to achieve the defined aims.

Quite accordingly LfAC's users report indeed an increased knowledge about Castiglioni's work and consider the experience satisfactory, being learning an expected result of the project.

Unfortunately LfAC was not aimed at exploiting mobile technology to foster social engagement and no reliable data are available about this issue. Anyway the study of cases and literature review largely demonstrate that mobile technology can play a role in fostering both learning and social engagement and that several design mechanics encompassed in the design framework work toward active visitors' participation.

Looking back at the main hypothesis that started the research, namely that a designed use of mobile technology can enhance learning and social engagement during cultural visit it can therefore be said that the research has demonstrated its validity.

Despite the two pilot projects structured following the design framework are not completely able to demonstrate its ability to support the achievement of social engagement, it can be considered a plus to have included them within the framework, and consequently to make developers reason on and be sensitised about these issues.

### **12.2. Research contribution and generalization.**

The research described in this thesis has been conducted from a design perspective and with a strong commitment to broaden designers' role in that particular field that sees the intersection of museum studies (in particular those addressing learning and sociality issues) with technology and in particular with mobile technology.

The main contributions of the research from the point of view of design discipline (Cross, 2006) are twofold: an extended role of designers that assume a key function in building mobile experiences for museums and cultural institutions and a new tool in designers' toolkit.

Designers' involvement in the field is not certainly new (exhibition design, interaction design, design museums...) but their role is here that of a director and together of a facilitator who works towards the definition of a future

mobile experience able to achieve all the defined aims and to comply with the constraints.

It's the same role that Salgado gives to designers (in particular interaction designers) in the building of an ecology of participation of visitors within museum field (Salgado, 2009), here proposed in the intersection between mobile technology and museum studies.

The strategic abilities of design are here presented as an attempt to give an answer to the chaos in the mobile space (Treviranus, 2009) and as a way to create even if not completely new, at least improved visiting models.

The design framework and process are a support tool for designers and the development team to face consciously the creation of a new mobile experience for museums and cultural institutions, taking all the crucial factors into account.

It's a tool addressed to every member of the development team, be he/she a museum curator, a technologist, a writer or a designer but implies design skills: it requires indeed competences that are typical of design such as scenario building and the ability to interpret imaginatively given constraints, and a certain habit to follow a process that is essentially a design process.

It must be remarked that the design framework here proposed is not a tool that receives inputs and automatically delivers a mobile experience but rather a tool that speaks the language of designers and aims at sensitising developers about the crucial aspects of a mobile experience for museums and cultural institutions, including learning and sociality issues.

The structured attempt to foster a chemistry between mobile technology, cultural leaning and social engagement through a design approach is therefore the main contribution in the design discipline but it also fits within the broad current debate about mobile interpretation for museums and cultural institutions.

Mobile technology and its fast growth is for sure a challenge for museums and cultural institutions (Smith, 2009; Proctor, 2011) and how to take advantage of it is still a completely open research field.

The reasoning about mobile technology and its role in fostering a learning as well as a social experience during cultural visit fits into the wider international debate about cultural heritage and its relationship with technologies, proposing a designerly way (Cross, 2006) to address the topic.

The aim is to create a support tool for the design of a mobile experience but, of course, the discussion about learning and sociality and the proposed approach can be easily employed to structure even activities not based on mobile technology.

The proposed design framework is a general one for its own nature and for

choice, because it must be potentially applied to every cultural institution: to museums, be they historic museums or demo-ethno-anthropological ones, to temporary exhibitions, archaeological sites or art cities and so on.

The framework is indeed addressed to GLAMs, Galleries, Libraries, Museums and Archives but can be easily adopted by festivals, open air cultural events, and all those events that imply contents to be delivered to an audience eager to learn, be engaged and, eventually, socialize.

### **12.3. Discussion of research limits.**

Design deals with wicked problems (Buchanan, 1992; Cross, 2006) and the topics addressed by the research here presented are not an exception.

The research moves indeed in the in-between among diverse disciplines and competences (technology, cultural learning, museum studies, exhibit design...) that are observed and interpreted in a designerly way, a condition that can be seen as a plus (designer as facilitator and director) but also as a complexity added, that requires to neglect some aspects, despite important.

In particular it must be noticed that the research has not addressed all the matters related to the business model behind a mobile experience (Burnette, Cherry, Proctor, & Samis, 2011), taking for granted that an institution that wants to build a mobile experience has already considered these issues. The business model is indeed treated within the design framework as part of the technological constraints in the analytic phase, an unexplored black box.

Of course the business model and, consequently, the choices made influence the project development but the design framework does not provide a guidance on these issues.

Another limit is that the research and in particular the design framework takes into account only the mobile experience, without considering the whole visit experience that could be more complex and, of course, not completely based on mobile technology.

This remark does not mean that the experiences developed with the support of the design framework cannot include non mobile activities (and the indoor experience for MGL demonstrates it) but only that the framework isn't specifically aimed at supporting them.

Another limit referred to the design framework is that it is detailed and discussed only till the creative phase that ends with scenario building: the implementation phase as well as the test phase are indeed not guided by the framework and left to the free initiative of developers.

This choice is due essentially to the great variability of the two phases that heavily rely on the skills of the team, on the chosen technological platform,



on the context and on the available time.

The only milestone is consequently the necessity to develop mock-ups and working prototypes in order to test iteratively both the technological functionalities and users' behaviour.

The last limit of the research lies in the assessment of the proposed design framework, made through two pilot projects of which none is capable to fully test the framework's ability to foster together learning and sociality.

Looking for Achille Castiglioni is a working application, developed following all the steps encompassed in the framework: it resulted very useful in verifying its completeness and efficacy and to assess the learning perception of users, but it does not provide feedbacks on sociality issues. LfAC, indeed, doesn't aim at stimulating a high level of social engagement and consequently includes only mechanics of interaction among visitors and contents.

On the contrary the second pilot project proposes a more complex scenario, animated by different kinds of interaction but, being it still a scenario and not a working applications, reliable data are missing.

Furthermore both the pilot projects were developed under my personal guidance and not by developers totally external to the research, a desirable condition to test the design framework's efficacy and usefulness.

#### **12.4. Future works and suggestions.**

The first activity to be done stems from the last limit discussed above, namely to involve designers and developers in the project of a cultural mobile experience in order to verify its efficacy.

This activity will be carried out with design students at Politecnico di Milano within the course "Augmented Reality and Mobile experience" held by prof. M. Ceconello, tutor of this thesis: the design framework here proposed will be indeed employed as a guidance for students in the development of mobile experiences.

The design framework has indeed a twofold nature: on one side it can support the actual development of a mobile experience but, on the other, it can stimulate reflection about the critical factors of a mobile experience and consequently teach designers how to do.

Another possible application of the proposed design framework is to structure a mobile platform following all the units encompassed within it: a cloud system, as that proposed by 7scenes and employed to develop LfAC, could be easily rearranged according to the diverse questions made by the framework. In this case the platform would be both a support for the decision making and a tool to implement the final working application.

A tool only aimed at supporting the decision making process could also be developed on the basis of the design framework, structured for example as a sequence of questions whose answers are interrelated and affected by or affecting the others.

Further research on the line proposed by this thesis could investigate more in depth the mechanics of interaction with mobile technology from an interaction design perspective, studying the interaction in itself and not only its impact.

Other studies could instead extend the research to include the entire visit experience within the framework, encompassing also the business model and non mobile actions and interactions.

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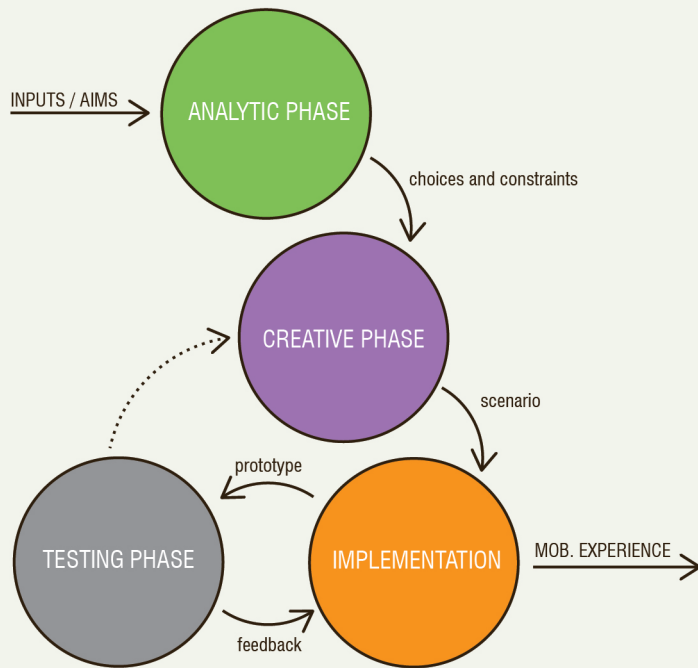
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# Appendix A

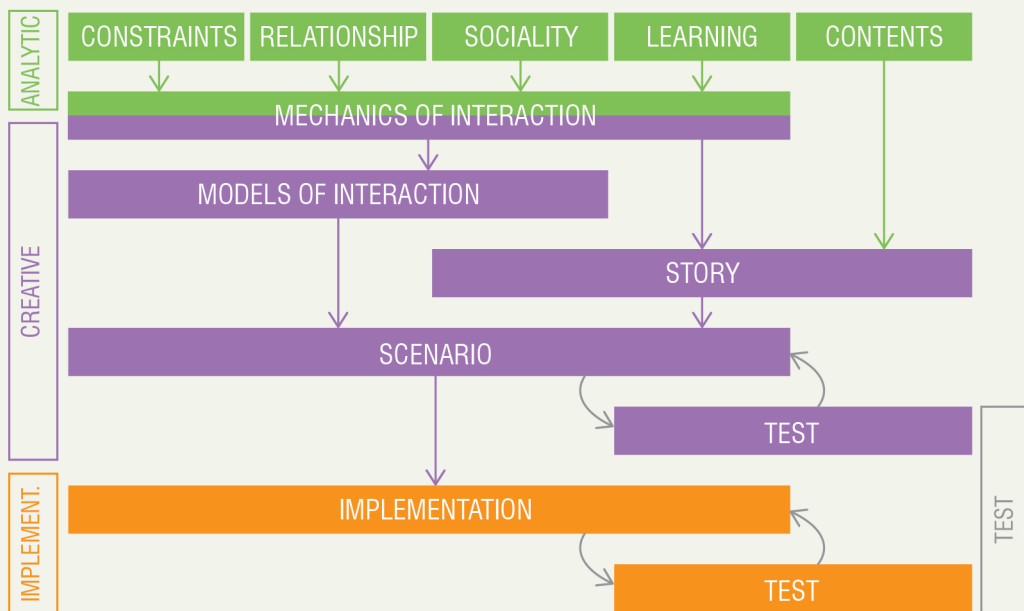
Tables and diagrams summarizing the design framework



DESIGN FRAMEWORK: MAIN STEPS



DESIGN FRAMEWORK: GENERAL STRUCTURE







## DESIGN FRAMEWORK: ANALYTIC PHASE

ANALYTIC PHASE				
constraints				relationship
target	time	space	technology	criteria of relationship
socio-demographic profile	when	indoor	platform	profile
interests	before the visit	outdoor	existing	visiting behaviour
level of knowledge	during the visit	remote	ad hoc	needs & requirements
	after the visit	on-site	adapted	position
	duration of the experience	near the exhibits	kind of media	randomness
	dedicated sessions or not	dedicated areas	temporal horizon	
			kind of device	

ANALYTIC PHASE				
contents			sociality	learning
kinds of content	level of deepening	edited by	social engagement	models of sociality
collection (content)	beginner	experts	1. contents consumption	fusion visit
building (container)	amateur	users	2. interaction with contents	personal visit
from outside	expert	experts + users	3. personal interests in a wider context	separated visit
intangible			4. indirect social engagement	pursuit of social engagement
			5. direct social engagement	



## DESIGN FRAMEWORK: ANALYTIC-CREATIVE PHASE

ANALYTIC-CREATIVE PHASE		
mechanics of interaction		
direct social engagement	STAGE 5	<b>Smart/flash mobs.</b> <i>Stimulating flash mobs and learning events</i>
		<b>Prizes.</b> <i>Based on group-on model: if at least x visitors meet, then ...</i>
		<b>Tasks.</b> <i>Visitors are asked to perform collaborative actions</i>
		<b>Bump.</b> <i>Asking visitors to make their phones bump with others</i>
		<b>Adaptive path.</b> <i>Visitors' path is modified in real time according to their needs and behaviour</i>
indirect social engagement	STAGE 4	<b>Serendipity.</b> <i>Awareness of possible buddies (contents/visitors) nearby</i>
		<b>Meeting points.</b> <i>Exhibits and Poles as places of social molecularization</i>
		<b>Voice.</b> <i>Visitors can communicate through mobile devices (walkie-talkie, police radio, ...)</i>
		<b>Chat.</b> <i>Chat system inferred from MMORPG (say/tell/group mode)</i>
		<b>Questions.</b> <i>Bi-directional questions and answers</i>
		<b>Trade.</b> <i>Visitors are allowed to trade virtual gifts or goods</i>
	STAGE 3	<b>Gift.</b> <i>Visitors receive and so unexpected virtual gifts</i>
		<b>Interpretation.</b> <i>Stimulating serious criticisms from visitors</i>
		<b>Storytelling.</b> <i>Visitors create stories about the collection in a collaborative way</i>
		<b>Vanity.</b> <i>It adds vanity to profile as a means to stimulate conflict (in a game based experience)</i>
<b>Profile.</b> <i>Showing visitors' personal profile</i>		
<b>TwoPointO.</b> <i>Commenting, creating and sharing contents</i>		
personal exp.	STAGE 2	<b>Comments.</b> <i>Visitors make comments and read those of other visitors</i>
		<b>Folksonomy.</b> <i>Social tagging activity</i>
		<b>Contents handling.</b> <i>Visitors use contents as rough material to be elaborated</i>
		<b>Hypertext.</b> <i>Visitors can browse contents following links</i>
		<b>Contents selection.</b> <i>Visitors can choose contents they prefer</i>
S1	<b>Contents consumption.</b> <i>Visitors consume/absorb contents</i>	



## DESIGN FRAMEWORK: CREATIVE PHASE

CREATIVE PHASE			
models of interaction with contents/users			
rules	configuration	conflict	story
tour	group	collaboration	units of information
free	role playing	competition	structured story (genres)
guided	no roles	collaboration + competition	mystery
game	solo		adventure
treasure hunt			epistolary
urban adventure game			historic
collect&trade			...
check-in games			
card and board games			
...			
ad hoc			



# Appendix B

LfAC: questionnaire for user test







# Looking for Achille Castiglioni

Questionario anonimo di valutazione  
Anonymous assessment questionnaire

Nazionalita' | Nationality

\_\_\_\_\_

Sesso | Gender

F  M

Fascia di età | Age

13-17  18-24  25-34  35-44  45-54  55+

Professione | Job

student  
studente/ssa  employee  
impiegato/a  freelance  
libero professionista  teacher  
insegnante  retired  
pensionato/a  other  
altro

Livello di istruzione | Education

middle school  
scuola media inf.  high school  
diploma  bachelor degree  
laurea triennale  master degree  
laurea quinquennale  other  
altro

Conoscenza degli argomenti | Knowledge on the addressed topics

beginner  
inesperto/a  amateur  
amatore  expert  
esperto

Hai compiuto il tour | You made the tour

alone  
da solo/a  with companions  
in compagnia

Se hai compiuto il tour in compagnia ritieni che questo abbia giovato all'esperienza?  
If with companions, do you think this condition has benefit your experience?

yes  
si  no  
no

Avevi visitato in precedenza lo Studio Museo Achille Castiglioni? | Had you previously visited S.M.A.C.?

yes  
si  no  
no

Quale sistema operativo hai usato? | What operating system did you use?

iPhone IOS  android



		Totalmente in disaccordo Strongly disagree	In disaccordo Disagree	Né d'accordo né in disaccordo Neither agree or disagree	D'accordo Agree	Totalmente d'accordo Strongly agree
1.	La mia conoscenza sulla produzione di A. Castiglioni è aumentata My knowledge on A. Castiglioni's work has increased					
2.	Ricevere le informazioni nel luogo esatto dell'intervento progettuale è un valore aggiunto Location-based info are a value added					
3.	I contributi audio e video sono stati all'altezza delle mie aspettative The audio and video have been up to my expectations					
4.	Le immagini di archivio hanno migliorato la comprensione degli argomenti trattati The archive images improved my understanding of the topics addressed					
5.	La durata dei contributi audio e video è corretta The duration of the audio and video was correct					
6.	È stato semplice leggere la mappa e trovare i punti di interesse It was easy to read the map and find the points of interest					
7.	Non ho incontrato difficoltà tecniche durante il tour I did not encounter technical difficulties during the tour					
8.	È stato divertente muoversi in città seguendo i punti di interesse It was fun to get around the city following the points of interest					
9.	Il tour mi ha fatto conoscere luoghi della città che non conoscevo The tour showed me places in the city I did not know					
10.	Dopo il tour voglio visitare lo Studio Museo Achille Castiglioni After the tour I want to visit Studio Museo Achille Castiglioni					
11.	Sono soddisfatto/a dell'esperienza compiuta I am satisfied with the experience made					
12.	Grazie al tour ho imparato divertendomi With the tour I learned having fun					

Commenti | Comments

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