

Investigating on mobile technologies in museums: how to offer a better user experience

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ABSTRACT

The interest towards the use of technological tools in museums to create a more enjoyable and satisfying user experience and to support the learning process has been increasing during the last years. In this paper is presented a qualitative study which consists of two interviews performed on 2 museum visitors and 3 museum volunteers who work as guide at the Egypt centre in Swansea. Purpose of interviews is gathering information about the limitations of the current offered tools and exploring new possibilities offered by the adoption of new mobile technologies.

INTRODUCTION

"When going to a museum, most people only see a building with art, however, most museums are far more than that¹." is the opening quote of a promotional video which presents iBeacon, a technology introduced by Apple to support location awareness in museums². The cited quote perfectly summarize one of the main problem with museum exhibitions nowadays: the way people are allowed to visit museums is usually strictly passive, the information is usually not personalized according to their preferences and knowledge, so that the learning process is not supported and the visitor's experience is poor and not as much enjoyable as it could be if supported by different tools. We are living in the digital era but people still visit museum relaying on books, written instructions or audio-guide.

However, before implementing any new technology or developing any new supporting tool, we need to deeply understand what are the limits of the current ones and how the digital ones could feel the gap of the user needs. Aim of this paper is therefore investigating on these aspects by performing a set of interview involving visitors and volunteers working as guides at the Egypt museum of Swansea.

RELATED WORK

Damala et al. identify the visitor's task of easily getting information about an artefact by using his location as one of the main challenging aspect to solve, therefore they propose a mobile augmented reality application to support this task [1]. Their prototype is implemented using a Ultra Mobile PC (UMPC) integrated with a web-camera: when the visitor points at the artefact the acquired video is displayed real-time on the UMPC, integrated with 2D and 3D virtual objects which, if touched, display new content organized in several

layers. Thanks to this solution the visitor does not need to look for the right information on an artefact in a muddled way since all information he needs is immediately available just pointing at the artefact.

Another aspect strictly related to the information which is offered to the visitor regards its depth: different visitors, different background and knowledge are translated in a different depth of information that has to be displayed. An interesting work in this direction comes from Aatifori et al. who developed CHESS³ which aims to enrich the visitor experience by offering a personalized and interactive storytelling [3]. CHESS starts with an on-line quiz which helps to retrieve the visitor knowledge and preferences, so that the experience offered by the mobile devices can be then calibrated and modelled around them.

The spectrum of the works that research on the use of mobile technologies to improve the visitor experience is very vast and it suggests that the scenario is open to new ideas and possibilities.

INVESTIGATING NEW MOBILE TECHNOLOGIES

When visiting an exhibition people can usually choose between several options to support their visit, such as tour guides, audio guides, books, or the written instructions spread along the museum. These tools are characterized by several limitations.

Firstly, all of them are shaped around a fixed depth of knowledge, meaning that the offered information could be too specific and detailed for a novice visitor or too superficial for an expert one. In theory, the tour guide is the most flexible one, since the guide has got a margin to choose what to tell to visitors according to their curiosity and background; however this theoretical possibility is impeded by the fact that tour guides involve groups of people, so that the guide has to keep in consideration the needs of the group and not of the single. Secondly, except for books, all the offered information are strictly confined inside the museum walls: once the visitor walks out he can no longer access it, even if he paid for it. Thirdly, the current tools are usually not flexible or easy to change in terms of order: supposing the visitor is using a book, then he needs to follow the order presented by the book to visit the exhibition or he has to look for the right page every time he wants to know something about a specific artefact; or, even worse, in the case of the tour guide he has

¹<https://www.youtube.com/watch?v=q8QfRYUmIsI>

²<https://developer.apple.com/ibeacon/>

³Cultural Heritage Experiences through Socio-personal interactions and Storytelling

got no choice at all, since he has to follow the group. All these considerations lead to my research question:

RQ How can new mobile technologies transform the visitor from a passive observer to an active player?

The question can be subdivided in more detailed questions:

RQ1 How can new mobile technologies be used to support the visitor learning processes?

RQ2 How can new mobile technologies be used to achieve personalization of content, interaction and flexibility?

RQ3 How can new mobile technologies be used to offer visitors with a more enjoyable, satisfying and unique user experience?

To answer these questions we need to involve the main actors: visitors. It is by investigating with them about what make them unhappy about the current tools that we can better understand how those limitations can be overtaken. Museum volunteers are also a vital source of information since, spending their working time at the museum, supporting and helping visitors, they hold a deep awareness about visitor needs.

Study description

Data Gathering Format

To gain information from visitors and volunteers a set of semi-structured interviews was chosen. In theory, since the aim of the research is exploratory and the main point is looking for new ideas and insights by engaging constructive discussions, a focus group would have been probably the best choice. However it collides with the actual constraints: visitors are rewarded with anything more than a small refreshment, which would not justify the required effort to take part in a focus group; on the other hand volunteers are involved in the study during their working time, so that bringing back all together at the same time, would leave the museum uncovered of personal.

Similarly, an unstructured interview would probably has been more suitable for the purpose, that is stimulating people imagination, raising doubts and brain storming ideas without the weight of any prefixed path to follow. The choice of the semi-structured interview is however justified by the fact that the unstructured interview would requires a great level of expertise from the interviewers, since it is more difficult keep the discussion on the right track and the interpretation is much more challenging [4], while the current interviewer is a non native speaker at her first interviewing experience.

Participants

Interviews will involve museum visitors, as they are the main actor of the research, and volunteer working as museum guides, because of their knowledge about visitor needs. In particular two male students between 20 and 25 years old and 3 male volunteers between 20 and 45 years old were recruited for the interview. Visitors were recruited on the way out from the museum, once they had finished the exhibition's visit, during weekends, according to the higher affluence, while volunteers were interviewed during weekdays, in order not to interfere with their main duties.

Interview Structure

The visitor's interview was slightly different from the volunteer one, but they both aimed to gather information towards visitors' needs and they were both constructed around the same main topics. The first part of the interview consisted in a warm up series of non-threatening questions such as demographic close questions. The central part of the interview was the most important and it was shaped towards three main topics: visitors' motivation in visiting museum, visitor opinions about the use of traditional supporting tools and visitor ideas, insights and concerns about how new mobile technologies could be used to integrate or substitute the existing tools. Finally, the last part of the interview was developed to give a chance to the interviewed to discuss any untreated related topic of his preference and to dissolve any doubts asking questions to the interviewer.

The only difference between the visitor and the volunteer interview was the different perspective: while the visitor was asked for answers regarding his opinion, the volunteer was asked to infer the visitor opinion by using his developed knowledge about the visitor's behaviour. In other words, while the visitor's interview gave a direct feedback, the volunteer's interview gave a indirect feedback mediated by his opinion and experience.

Recording tools

For the purpose of the study the interviewer used an Android mobile phone, which was used to record the entire interview, and a laptop, where the audio-recorded files are copied as backup as soon as the interview was completed. The interviewer also disposed of a paper sheets with interview's questions used also to take extra annotation, such as non-verbal communication details.

Procedure

Visitors were interviewed during weekends because of the higher affluence, and they were recruited on the way out from the museum, once their visit was finished, while volunteers were instead interviewed in their spare during weekdays according to the lower visitors affluence. During the recruitment phase the interviewer introduced herself and she explained the study's motivation and what the study consisted of.

Once that the participant accepted to take part on the study, the procedure was slightly different for visitors and volunteers: the visitor was taken to a more private and quiet space just outside the museum area, where a desk with all the required tools (ethics papers, mobile phone for the audio-recording, laptop, interview paper sheets, pens) was set; instead, because volunteers usually sit behind desks in different areas of the museum, and they had to be available for any visitor request, it was up the interviewer to move the required instruments in a suitable place for the volunteer.

Before starting the interview, the interviewer delivered the participant the ethic papers (Bill of Rights and Research Consent Form) to be read and signed, reassuring him about any ethical issue and clarifying any doubt that may have been arisen; the interviewer also reminded the participant that the interview was going to be recorded. This phase was identical for each participant.

The interview started with a warm-up session where the participant was asked with simple and mainly close questions, to control the level of stress and make the atmosphere serene. After the warm-up session, the main session, where the main topics of the interview are discussed, took place; the order of the questions and the time dedicated to each question was variable, depending on the course of the conversation and what seemed more natural. When the interviewer realized the time was running out (interview time was fixed between 10 to 15 minutes for each participant) or all questions were answered, she started a cool-off period consisting of few easy questions to help the participant to release any tension. Finally, in the closing session, the interviewer switched off the recorder to highlight that the interview was over and she thanked the participant offering him a small refreshment.

RESULTS AND ANALYSIS

Overall the three interviews involved five people divided as following: a group interview with two volunteers, a group interview with two visitors and a single interview with one volunteer. The total time of recording was about one hour and a half.

The gathered data have been analysed with a inductive thematic analysis approach, meaning that the coding process did not try to fit the data into a pre-existing model. In other words the used approach was exploratory and content-driven rather than confirmatory and hypothesis-driven: in fact purpose of the research was eliciting new findings from participants without following any prefixed theory. From an initial count of about forty different codes, data have been reduced and grouped into five main themes presented in the following sections⁴.

Visitor's motivation as key to understand their needs

People visit museums for different reasons, and their motivation is usually strictly connected with their previous knowledge, their expectations and to time and effort they will to spend visiting a museum. From the gathered data emerged that motivations can be very heterogeneous.

Some people visit museums, even if not directly interested, just to spend their time during a break in an alternative way, or because they deem it as a fascinating place to meet up with friends:

Vi-2: It (museum) is a great place to meet up, it's fascinating, you can discover stuff.

Sometimes they can even consider it as a refuge from a bad weather:

Vi-1: Why do I visit museums? Well, it's normally raining!

or as a drop-off point for their children:

Vo-3: Most of them (activities) are set for children, to give parents a break giving them something to do.

⁴In the following sections the *Vi-n* abbreviation will be used to report a quote of the *n* visitor, and the *Vo-n* abbreviation to indicate a quote from a *n* volunteer.

These people usually have a low knowledge about the exhibition they are going to visit, they do not will to spent too much time or effort, since the exhibition is not their primary reason for visiting the museum.

Other people, however, can be highly motivated and interested on a specific museum or exhibition: students working on a research project, adults with a passion on a specific topic, they all visit a museum with a certain goal in their mind, which usually is to improve their knowledge on a certain field acquiring as much information as possible. Their motivation is so high that in some cases, how it happens for students involved in some research projects, they even became volunteer in the museum to have an easier access to museum's resources.

Finally, for some people the motivation is not visiting a museum or a exhibition itself as a whole, as they are interested in a single, special artefact or activity:

Vo-1: I can't stress enough how much important is the mummy⁵ here, I can say 80% of the people they ask for the mummy. It's what everybody wants and what everybody remembers among of the things available.

This kind of motivation can be pretty high insomuch as some people even return more than once ,accompanied by friends or family, only because they want to show them what they have already seen.

Time and space affecting on visitor' experience

Time and space are key aspects in the sense they affect on the visitor's experience in several ways.

Firstly, museums have opening times, which usually correspond to working time for most of the regular workers, making impossible for them to visit museums during weekdays. This aspect could justified our findings, which reported that weekends' visitors usually consist in schools while weekdays' visitors mainly consist on families and group of adults. Secondly, as mentioned, the visitor's motivation is strictly connected to the time he will to spend to visit a museum which in turns depends on the size and complexity of the exhibition: for example both visitors declared they would will to spend a maximum of three hours for visiting a museum, but on the other hand they also complained because of the lack of time when visiting huge museums:

Vi-1: For example with the British museum was absolute massive so there is not time to visit it in only one single visit.

Space and time limit the user experience in the sense that museums are not always opened, therefore accessible, or they can be too big to be visited given the available amount of time. On the contrary, space, can also be not enough: a volunteer of the Egypt centre, for example, explained that on the basement of the museum they shielded many artefacts which due to logistic and space reasons, could not be shown to the public.

Finally space cannot be enough also because of overcrowding

⁵The mummification activity is the most famous activity at the Egypt centre museum.

which does not allow people to get access to some part of the exhibition or to take part to the arranged activities:

Vo-3: Sometimes it gets very crowded we can't do some of the activities we'd want (...) So if schools are here we let them handle objects but sometimes if someone else wants to handle them but because there is a school here we have to apologise and ask to come back later when they (schools) have lunch.

Visitor preferences for supporting tools

People approaches for visiting a museum can variate, due to some of the mentioned aspects such as motivation, time and space constraints. The different approach adopted by each person is translated in different preferences for supporting tools. In general, both visitors and volunteers confirmed that people do not like paper books and it is interesting to be noted that, while visitors did not give an explanation for that, volunteers affirmed that people seemed to be afraid by books and reluctant to touch them:

Vo-3: Sometimes they (visitors) use books, but sometimes they rather ask us more or less. Because I think they are really afraid to touch a lot of it. I don't know why people are afraid to touch.

Audio-guide were judged by the two visitors as interesting but not flexible enough, and in particular one visitor pointed out that sometime they are too expensive or not available:

Vi-1: Audio guides just go too slow, or also are unavailable, so reading text was the fastest way to get the knowledge I wanted.

Vi-2: Yeah I always read written instruction it's much more easier.

Visitors and volunteers disagreed on the visitor's preferred method to gain information: while both visitors declared to prefer written instruction, volunteers saw themselves as the preferred method:

Vo-1: Visitors use different methods but often it's more the case they ask us about something if they need.

Vo-3: They use the books sometimes, or read written instructions, but in general they rather ask us more or less.

On this point it must be underlined that because of the low number of people involved is not possible to make any clear assumption, but it is still interesting to note the diversity in perception. Visitors declared to prefer written instruction because considered as an independent way to visit the museum, while volunteers declared themselves to be the best way to give information because of their flexibility and helpful nature. Moreover visitors declared that sometimes volunteers were lack in knowledge, fact perhaps confirmed by a volunteer himself:

Vo-1: Sometimes we (volunteers) don't know what they (visitors) want to know but we always say: we may do not have the answer to this question but definitely I can find someone who do have it (...) Because believe me sometimes we have people here who knows enough. But actually they are able to help me. A lot of students

who comes here they are learning about Egypt so they are more knowledge about Egypt than I am.

so that they usually prefer to look for answer, if needed, using other resources, such as their phones.

In particular, visitors seemed to use their own equipment, such as phone or tablet, to look for more detailed information, not provided by the museum, or just to take pictures. In one occasion a visitor pointed out that when he needed visual information, such as maps to contextualise for example a historical event in a certain area, using a mobile phone and visualise the map, rather than asking a volunteer, felt appropriate and effective:

Vi-1: I prefer using my phone rather than ask someone, especially if it is visual information such as a map, the visual information helps you to explore information a bit more rather than image if the volunteer answers "it is near Cairo".

Artefacts fragility and impossible interaction

Museum are usually characterised by the fact they contain valuable and fragile pieces of art. It means that the user experience and in particular the interaction is seriously compromised. People usually have to look at artefacts positioned in a fixed position, they cannot directly interact or they need to ask to staff members, which are not always available; in the most extreme case they cannot even take photos or talk aloud. Therefore a very challenging task on the museum side, is to find a way to protect the artefact without compromising the user experience by denying the visitor with any interaction:

Vi-1: It would be nice if we could show what else we've got in the museum, like we have a store room downstairs and half of the artefacts are unseen because some of them are so fragile that we haven't still found the right way to arrange them in the museum.

Museum holds precious and unique pieces which is impossible to find in other places, insomuch as some students even decide to became volunteers only to gain free access to the museum resources:

Vo-3: Some students become part of the centre so that they can learn more and have access to the reference we have got and which are not always available. So for example in the corridor out there you have shelves with books, only if you are member is the only way you can take them out of here.

Respect of visitor emotions and feelings

Visitor emotions and feelings should be considered carefully and they came up in several critical aspects. One volunteer for example described as one of the most critical task trying to understand the visitor level of knowledge needed: some people just go through a quick visit and they do not want to be engaged in any activity, or they just prefer to visit the museum autonomously, while others ask of all the help they can have:

Vo-1: One of the most challenging aspect is trying to gauge how much they know so I can figure out how much

information I should give them. Because some people they just come and they don't want to be bother; they just look around and then, maybe, if they want, they stop to ask us something (...) Some people they ask us half dozen of questions for like half an hour before they leave the gallery.

This aspect is empathised during interactive activities: while children seem usually happy to play, adults are sometimes reticent because they feel patronised if the activity in which they are involved is not challenging enough. A volunteer for example explained that while adults do not usually like the mummification activity, since considered to childish, they all like group table games because considered more challenging:

Vo-2: But we also have a games upstairs like table games and they (visitors) all love it, children and adults. Probably because there are very difficult rules, they (adults) don't feel patronised there. Because it's a game, they don't feel like it's not for them. They are intrigued.

Finally, another critical aspect, concern with the visitor's sensibility and beliefs: some children for example got scared when assisting to the mummification process because afraid that a real dead people was covered underneath the bandages. Moreover some adults, especially if accompanied with children, in many occasions were annoyed by the fact that the volunteer's explanation could be in contrast with their religion beliefs.

DESIGN IMPLICATION

The gathered data allowed to retrieve the presented five main themes. However these themes are still not directly connected to the research questions introduced at the beginning of the paper. To draw a connection and to try to answer those questions a series of guidelines have been developed: therefore applying the following rules to the development process of any technological system should help for providing visitors with a better user experience.

Flexibility as keyword to model an adequate user experience.

During the research has emerged that people visit museum pushed by a lot of different reasons, so that they can be lowly or highly motivated. Moreover, because the research sample was very limited, it was not possible to investigate all possible reasons so that only a small amount has been considered. Referring to the visitor motivation, one of the main challenge that a museum has to face, is to find the right way to shape a user experience which can suit anybody, no matter the time they will to spend for a visit, their interest on the subject or their previous knowledge. Offering flexibility means that people should be able to choose the method they prefer to gain information, but also that that method should be calibrated on their knowledge, expectations, motivations and needs. A good example on this direction was offered by the cited CHESS application [3] which modelled the offered experience by questioning the user with a on-line quiz to perform in advance.

Moreover the information should also be given through different parading of interaction, or between the same paradigm

but with different approaches: for example an application developed for a mobile phone with a touch screen display could be able to provide the same information using plain text, video, audio, the conjunction of the three of them, or using more creative ways such an interactive games which allow visitors to learn by playing.

The presented information should not be bind to a specific amount of time, and the user should be set free to choose and informed about timing. For example when presenting information about a specific area of a museum an application could ask the visitor how much time he will to spend to visit it, offering personalised paths. In this case it is also important to make clear to the user the status of the current activity, that is for example how much of the activity has been already accomplished and how much time is still needed in order to complete it. Those concepts are not new, and they can be for example easily reconduced to the *User control and freedom* and *Visibility of system heuristics* of Jacob Nielsen [5].

Assuring flexibility

Information	Provide different level of information according to the visitor background.
Modalities	Offer different ways to access the same level of information.
Time	Allow experiences to not be limited by time, providing alternatives.

In figure 1 are shown some possible implementations for the presented guidelines. The visitor is presented with a choice of different activities, where for each activity is indicated the time needed to complete it highlighted by the different colours and the level of difficulty, indicated by the number of triangles.

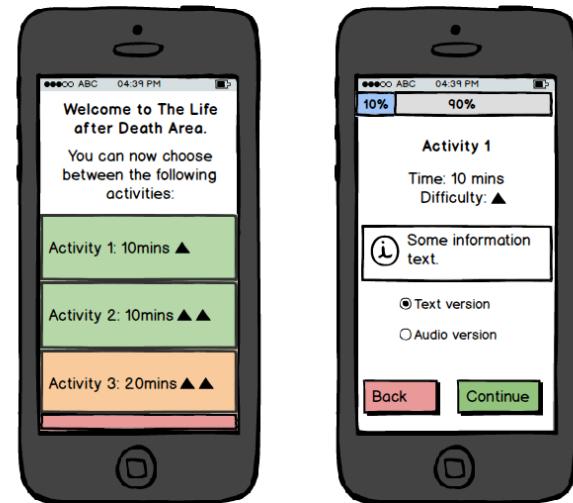


Figure 1. Possible design choices to promote flexibility.

Moreover, when a visitor choose an activity, it is always shown on the top how much of the chosen activity has been completed. Finally, for the same activity, the visitor can choose between different modalities such as reading text or listening to an audio recording.

Overtake space and time limitations: extend user experience outside the museum's physical borders.

We have seen that space and time are one of the biggest limitation of visitors, in the sense they cannot always get access to museums because of the opening times, they cannot participate to some activities if they require too long or if the place is too crowded so that only a restrict amount of people can participate. Time and space constraints can be easily overtaken with the use of technology. For example we could develop an

Overtake space and time constraints	
Space	Allow visitor to get access to some information or artefacts not reachable in a specific moment through alternative ways.
Time	Allow visitor to select and store in an alternative way the needed information so that it can be accessed later.

application to inform the user about the artefact shown in a certain area not accessible at the moment because too crowded. The visitor would be able to decide if he is interested, so that he would wait, maybe reading some information about the artefact in the meanwhile, or to proceed towards other areas of the museums. Even better the application could allow the visitor to take note of unavailable artefacts on a virtual map so that he could have reference points to go back to in a second moment.

The mobile application could also allow to scan and recognise artefacts, storing them in a virtual personal gallery which can be accessed by the user whenever he wants and even outside the museum. The application would allow the visitor to preserve his experience outside any limitation of time and space making his experience pervasive since any border would disappear.

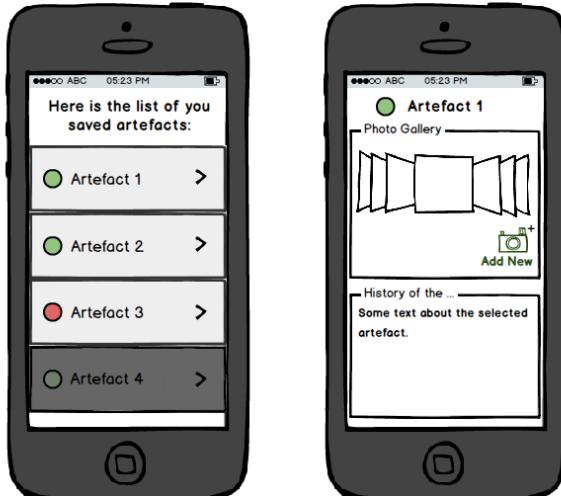


Figure 2. Possible design choices to overtake space and time limitations.

In figure 2 is presented a possible implementation for an application: basic functionality would allow the visitor to some artefact to a list, collect photos, collect information, see the

availability of the artefact, indicated with a red/green led. To engage a long-lasting relationship some of the item could be made unreachable outside the museum, such as the fourth which is displayed on a grey colour. In fact as pointed out by Barnes [2], making all the content available to everyone even outside the museum could cause a lack of surprise in audiences: then the fact that some content is available only inside would create a stronger relationship between the visitor and the museum.

Substitute an impossible real interaction with a possible virtual interaction

We have seen that, except for time and space, that last big constraint is represented by the value, uniqueness and the fragility of the artefacts. It means that the visitor interaction is inherently limited by the fact that artefacts cannot usually be touched, or even completely seen since most of the time they are shielded behind glasses in a fixed position. One more time technology can easily permit to overtake the limitation. We

Overtake fragility constraints	
Artefact fragility	Provide alternative way to interact with inaccessible object.

could imagine for example to develop an application which show a 3d model of the artefact which can be therefore easily manipulated, or we could use the virtual reality to simulate and achieve an immersive user experience. A good example, even if not related with a mobile technology, is given by the *Mummy explorer project*⁶ which allows visitors to be able to use simple multi-touch gestures to explore a mummy as shown in figure 3.

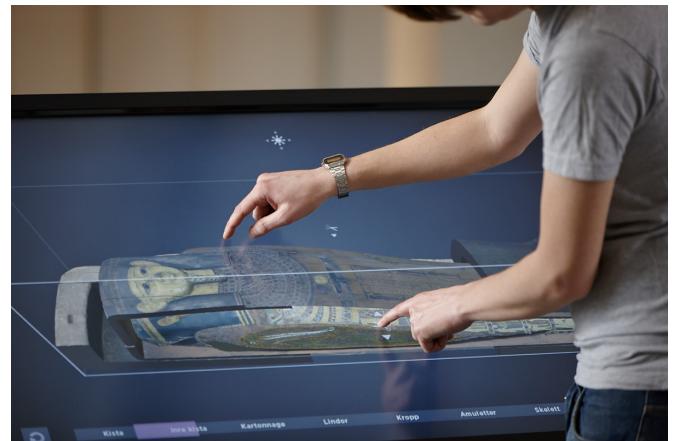


Figure 3. A visitor interacting with a mummy reconstruction.

Understand and respect user feelings

When engaging an interaction with visitors we should always consider their feeling and be careful toward any critical aspect. For example if we are developing a game which contains scenes that could scare a child or a sensitive adult, we

⁶<http://www.interspectral.com/projects/mummy-explorer/>.

should make sure to implement some mechanism to inform the user and prevent the children to use it without the parents' consent. We should also always be careful not to offend visitor beliefs when the presented content could be in contrast with religion or political beliefs.

The task of understanding visitors is not obviously accomplished only by thinking of methods to avoid bad feelings, and it needs to focus on finding ways to promote the positive ones. For example during the study is emerged that visitors, especially if adults, have the need to be involved in activities which are perceived as challenging, otherwise there is a risk that they will feel patronised. Offering challenging activities can be achieved in a similar way to the one presented in the *Flexibility as keyword to model an adequate user experience* section where to offer a different depth of information, different levels of information were offered to the visitor.



Figure 4. A game could be accessible only by visitors owning an adult ticket, recognisable by the barcode.

REFLECTION AND CONCLUSION

The research leaded to interesting findings, however it has to be noted that some limitations could have biased the study. Reasons depended both on the chosen method and on the interviewer skills.

Limitations of the method

People tell their story which, because is a subjective version, sometimes does not correspond to the truth. For example while volunteers affirmed that visitors usually prefer to ask volunteers for help, visitors declared to prefer written instructions or mobile phones. The found contradictions lead to underline the major weakness of a qualitative study: people express their opinion which is by its nature subjective. A good research needs triangulation in order to improve the reliability of the gathered results, therefore for any further study is required to involve a higher number of participants with complementary methods.

Limitations due to the interviewer skills

The interviewer limitations are divided in the following four categories.

Estimating and dealing with unexpected situations

Several unexpected situations happened during the study which affected on the quality result. Firstly, while the researcher was prepared to interview one people at the time, in two occasions both visitors and volunteers were in couple, so that the design had to be changed on the fly to adhere to the new constraints. Secondly, keeping track of the time was extremely hard so that all the interview lasted around 30 minutes instead of the 15 estimated. Thirdly, not enough attention was paid in finding the right location for the visitors' interview, with the results that only busy places where available when the study took place, making the recordings analysis much more complicated. Finally, in at least one interview, the participant kept talking after the researcher announced the interview was over and the recorder device was turn off, so that important insight could have been lost.

Controlling the conversation

One of the most difficult part experienced as interviewer regarded the control of the conversation. Firstly, because as mentioned before the researcher was not ready to interview two people, controlling the conversation between the two of them was hard as it was not taken into account during the preparation process. Moreover, during the volunteers' interview, the situation was made worst by the fact that one of the volunteer did not let the other talk and did not allow the interviewer to stop him either. The fact that it was not possible to interrupt him, also caused than in several occasions he covered more than one topic ad the time, defacing the prefixed questions order.

Finally the control of the conversation was also made difficult by the fact that the rhythm was fast, and not being the researcher a native speaker, it was hard to catch an information on the fly to exploit it to address the conversation on a new line.

Making the conversation natural

Another big challenge faced by the researcher during the interview concerned finding the right way to make the participant feel comfortable by engaging a conversation which appeared natural.

For example in one occasion a volunteer looked at the prepared paper-sheets which consisted in a list of questions where each question was followed by a white space to be eventually filled by the researcher: because of the format the volunteer thought that the researcher was supposed to write something for each question, and because he saw that the researcher was not taking any note, he was afraid to have given the wrong answers⁷.

Finally, another problem arisen because of the language: as the researcher was not a native speaker, to be confident in speech, she was tempted to literally read questions from the prepared paper-sheets. However, because when someone reads a text, the voice tone does not sound natural for a conversation, it caused the conversation appear slightly odd.

⁷ At the end of the interview the volunteer asked the researcher if she had obtained what she was looking for, since he noticed that she did not take any note.

Wrong design choices

Most of encountered problems were reconducible to some poor design choices. Firstly, according to the study design, a semi-structured interview was prepared: however, after the first session, it was changed to an unstructured interview because of the impossibility of controlling the conversation experienced with the first volunteer. In fact, since controlling the conversation was impossible, it appeared as a better choice to follow the conversation flow, provided that it lied between the main topic borders. However, during the second interview, where the conversation proven to be easily controllable, emerged that a semi-structured form was actually the best choice. Clearly, changing the design of the interview during the research, affected on the results' quality.

Secondly, the choice of the questions proven to be not completely adequate for the purpose. The interview was structured as the participant had to answer to the research questions, however, aim of the interview should be investigate a more wider spectrum of interest. That is, if the research question investigates on how to use technology to offer a better user experience, the interviewer should not ask the same question to the participant but instead investigating on more general situations which could directly or indirectly affect on the research area. This fact was mitigate by the choice of unstructured interview, which allowed the researcher to redeem by the prefixed question, on the other it made the entire process less stable, therefore less reliable.

In some cases the researcher asked leading questions which compromised the participant answer: for example in once case the researcher asked about the participant opinion on mobile game application to improve the visitor experience; because the participant was asked about a specific case (a game) when the interviewer asked about technology in general, the participant seemed unable to set him free from the game concept.

Finally, questions did not clearly meet the target in a dual way. On one hand they caused the research to slightly shift from the research topic. On the other hand, because questions where both general and specific to the Egypt centre, they caused findings to be ambiguous and not generalisable to a wider case nor to the specific case of the Egypt museum.

Conclusion

In this paper are presented results of a qualitative study, conducted on 5 people through an unstructured interview, on how mobile technology can be used to improve the visitor experience.

The gathered data allowed to distinguish five main themes: visitors are pushed by different motivations, so that they have different needs in terms of required information, time and effort they will to spend for a visit; the visitors experience is usually limited by time and space constraints which do not allow him to be in control of his own interaction; the visitor experience is also limited by the intrinsic nature of the museum as shield of valuable and untouchable artefacts; visitors, according to several aspects, need and prefer different tools for supporting their visit; finally, the visitor experience can be seriously compromised if their feelings are not taken into account in each interaction step.

Findings allowed to derive some guidelines that should be applied for the development of any technology which may be involved in museum exhibition, and for the implementation of any system using the current technology. The presented guidelines are defined by a general character, so that some practical implementation examples, to confer a more practical approach, have been provided.

In particular the following guidelines have been suggested: *flexibility as keyword to model an adequate user experience, overtake space and time limitations: extend user experience outside the museum's physical borders, substitute an impossible real interaction with a possible virtual interaction and finally understand and respect user feelings*. Despite the study allowed to discover some interesting findings, because of the lack of skills of the researcher as interviewer, the result quality could have been slightly compromised. The study still represent a good starting point from an exploratory point of view, but for any further study it is recommended to pursue on a more specific and focused area of interest.

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APPENDIX

24 – April 2015
15:00

Visitor V1, Visitor V2,, Interviewer
males
around 25

I: How often do you visit a museum for year?

V1: 10
V2: 8

I: Why do you there?

V1: I am interested and I'd like to learn things

I: So you are specifically interested in something?

V1: It's normally raining
V2: Yes it is a great place to meet up it's fascinating, you can discover stuff

I: How much time are you willing to spend for visit an exhibition?

V2: I average 3 hours
V1: 3 hours

I: Have you ever visit a museum more then once?

V1: For example with the British museum was absolute massive so there is not time so visit it in only one single visit?
V2: And also usually every time you go there something has change and you find something new
V1: And the also I was taking a friend there even if I was there before

(2:19)

I: Do you usually study something before going to see the exhibition?

V1: Lately I've been interested in some prehistoric stuff so I knew thing before going there
V2: I just rock up

I: How do you try to get some information from the museum once you are there?

V2: Audio guides just go too slow, or also are unavailable so reading text was the fastest way to get the knowledge I wanted.
V1: Yeah I always read written instruction it's much more easier

I: Do you find satisfying?

V1: Yeah
V2: It's alright. Sometimes in too far complex and more interaction would be nice to be fair.

(03:54)

I: You never ask for help to volunteer or guide in general?

V1: Personally I've never found them so much helpful
V2: I haven't never asked them personally but some of my friend do it.

I: So you mean you ask and they weren't satisfying?

V1: I've never asked. If all the contain is labelled well enough. I suspect as for a website you should never have the need to ask. Unless you have specific questions but I go to museum occasionally no to learn something specifically.

I: So you like just going there, reading information and no interaction?

V1: Yeah

I: Do you use any technology such as mobile phone etc while you are visiting a museum?

V1: Yes I've used wikipedia and stuff, or searching for a location on a maps to understand where they are talking about

I: So when the information is not enough you prefer using your phone rather than ask volunteer?

V1: Yeas especially is it visual information such as in a map, the visual information help you to explore information a bit more rather than image if the volunteer answer "is near Cairo".
V2: Yeah for me is the same and also I prefer to look on the phone because volunteers are busy all the time.

I: What about information at the Egypt museum. Was it clear? Enough?

V2: It was relatively OK if you weren't look for too much specific information
V1: Is was cool but is didn't seem cohesive as an experience, it didn't seem deep enough and I wasn't really a fan of the torches and these kind of stuff. If I go to see thing I just want to see the and I seemed like it was more oriented to children and it is in the middle of the university campus.

(07:42)

I: Did you like the museum?

V1: 5 out of ten?
V2: yes

I: Any idea about how a better interaction should help to provide a better user experience? Have you seen any?

V1: The top floor of the British museum is absolutely brilliant, very interactive but not very deep. but they also had paper book but they did not really feel immersive enough.
V2: Plus you asked before about volunteer, but I prefer if I have to play a game, or do some activity I prefer to do it by my own.

(10:35)

I: Why don't you go often?

V1: Because I can get all the information in once and there is nothing new then.. things would change enough.

V2: And it's now always free.

I: How can you think the experience at the Egypt centre could be improved?

V1: It needs more than a theme? It seemed also that there was not a path to follow and volunteer seemed like hanging around. And there were loads of them and there were this weird situation where they are actually more than the visitors. And you feel like you are intruding in their space or so.

I: Were you afraid of taking part on activities or was it fine?

V1: Not al all it was very intuitive, it was encouraging

V2: Absolutely fine

22 – April 2015

15:10

Volunteer V1 and V2, Interviewer

both males

V1 around 50, native speaker

V2 around 23, French

I: How many hours for week are you committed here?

V1: 6 hours a week

V2: 6 hours a day

I: What are your main duties as volunteers

V1: Give them an explanation of the light, pretty standard.. because we have realized not all the artefacts are so fragile, as they are made of metals, wood, stone and stuff .. which does not really care about the flash lights.. but we do also very fragile object, sensitive to the light like upstairs.. a tunic.. and it is not as much the tunic but the paint on the tunic, light temperature can fade colours..

V2: So you explain those kind of things about light, why you want to do it.

V1: You give this explanation and this is a very simple answer.

V2: We also ask them if they have questions, we explain them we arrange activities, upstairs we can play games..

I: What kind of people?

V1: Mainly group from schools, big group of 40 children under 14. But also family. We have a lot of activities, dressing up, music, food and drinking.. with clay, god where they dress with hats ...

I: So are the activities mainly for children?

V1: Usually during weekdays we work with school but it available to everybody. A large work of activity is based for children.

I: Does children come always with school or also with family

V1: Well, usually with school.. We can have even on every day, but then there could be nothing for an entire week. They are big group. If they are very big we split them in smaller group, like if we have 30 children we divide them in three different group, each group can do a different activity and when they finish we switch the activity of each group. They stay here all the day long, they even have lunch here between activities.

I: Do they come more than once? For example if they are not be able to do all the activity in one day.

V1: Initially each school came only once, although we have some schools, local schools, they are coming regularly, like once a year. But every year of course different people

because form the school there are about 40 children, so let's say to classes, and then the year after other two different classes comes. And we have different range of age each time so for example 5 to 7 and then 7 to 10, And so sometimes we miss some children because the go to the next stage of the school. We do not have a lot of teenagers. And then 11 to 13.

Strictly speaking unless children come back with their family, then with their school we only see them once.

We have different activities which last about half an hour and they choose 6 activities for the day. So they those plus lunch. If they arrive later we try to cut some activities because they can't come back so we have to finish within the day.

But if they come with their family is very touch and go, depending on what time they are turning up. Generally they come at 3 and then we can't do any activity.

90% of the people coming here they ask of the mummy even before we mention it, they know it.

The main reason why most of people come here is to see the mummy. And the mummy really depends it can be 5 to 40 minutes, it depends on how are you doing it, how much interaction are you putting in it. But if they arrive later we can't do the mummy. Some of us they do it but ...

Generally the best chance to do it is when you have a group of children, like 6 children. Of course it is a dummy mummy non a real one.. (laughing) because there are some rumours about some years ago of a colleague that we have a children thinking that it was a real one. You know children have a very incredible imagination.

Generally people get what they need in one visit. But there is not any limit in how many visit a people can have.

V2: If they come back they come back with the family. Maybe they came with the school and they did some activities and then they come back with their family because they want to show them what activity they did.

(10:26)

V1: The good thing is we don't charge.

(11:56)

I: What I was thinking is, usually people come only once but it is a shame because they could come back. Imagine if you have different activities to offer every time do you think the would come more than once?

V2: Yeah we do some event like museum at night..

V1: Yeah they are quite regular but not every day. As far as the children come with the school we have al kind of activities, we have a list that we send to the school, then they choose 6 of them. The limitations is only about how many activities they can do in in

their time here. Most of the school they have to leave here at some point. Generally it's any time between 10 and 2.30. It's just not possible to do every activity we have. But we have every activity which is in the list.

(13:20)

And also we don't have enough stuff available. Because except the arrangement with the children we have to keep the place going.

We have 6 7 people paid here but the rest of us are volunteer. The enjoyment I have I don't want to be paid, they have the money. But I really enjoy when other people have happy here.

For activities and information. Information we had to learn before teaching them.

So we started in the same place where visitors are, so we understand them.

We also have to understand how to act with people. For example we learn than we don't have to patronize them.

The difficulty is also we learn to try to engage visitors. Sometimes they don't know anything about Egypt. Because sometimes we have people coming here for no reason, for example students during breaks.

It's trying the get a feel about how much information they want from me. Because believe me sometimes we have people here who knows enough. But actually they are able to help me. A lot of students who comes here they are learning about Egypt so they are more knowledge about Egypt than I am.

We learn the basics. And explaining about. But Egypt culture is very vast, compared to the simplicity we teach.

(17:43)

I: When you arrived here there already were these kind of activity or are they recent?

V1: Those sort activities already existed. ... One of the things we have now, we have a sheet where we ask for the email address and then we invite them to send us a feedback. ... It goes along with the comment books we have upstairs, where people give us some feedback, how good it was, or they thought about how good it should have been.

I: Is there a common topic?

V1: It's very variate, and most of them are very general comments. and most of them are about the mummy. I can't stress enough how much important is the mummy here, I can say 80% of the people they ask for the mummy. It's what everybody wants and what everybody remembers among of the things available.

(19:39)

I: So the main way they use the get access to information is through you, or interaction/activities.

V1 and V2: Yes yes

I: So I see there are some book guides, do they use them?

V1: Some visitors read it but very rarely. It's more the case they ask us about something. And of course different people needs different entertainment a sort of different level so.. Sometimes we don't know what they want to know but we always say: we may do not have the answer to this question but definitely I can find someone who do have it. So we interact with each other which is a good thing (meaning about other volunteers). So the main source of information interaction: one is with us and the other one is internet.

I: and activities?

V1: yes of course.

I: You mention before you main concern is about how to give the best experience to visitors. According to you experience, what aspects you think are the most important one?

V1: Remember trying to gage how much they know about this so I can figure out how much information I should give them. Because some people they just come and they don't want to be bother, they just look around and then they stop to ask us something. Some people they ask us half dozen of questions for like half an hour before they leave the gallery.

The other thing I was talking about is about how to be ethical? Which is not only related to children, most of us are old and mature enough to understand how to interact with other people, we learn how to do it from out life, but we need to reinforce it. Our first aim is to allow to get the best they can when they come here, so that they go away happy for have being here. If they are not happy that's what we want to know so that we can work there.

(23:10)

I: How much are they actually involved in the activities, such as in the mummification process. They actually take part?

When we do it with the public it's quite interactive. We tend to describe it but especially if we have a group of people we try to encourage them to take part, wrapping , put the mask everything. We encourage visitors especially the children.

I: Are they usually shy or they are happy to participate?

V1: Generally they are happy to participate, but sometimes they are afraid probably because of their imagination. They think something is going to be horrible.

You can have children with difficulties other do not want to do it

Generally children they want to do it. What I found out when you have groups it that adults. They tend to be very sceptical about it. Probably they feel patronized, we don't mean to but probably this is what they feel.

I've managed my self to convince adults to get involve sometimes and then they were surprised about how much they liked it.

(25:23)

But we also have a game upstairs like table game and they all love it, children and adults.

Probably because there are very difficult rules, they don't feel patronize there. Because it's a game, they don't feel like it's not for them. They are not intrigued.

--- recorder OFF but still

big/vs small exhibition

- in the big one we don't have time for interaction, we barely see the things are there

24 – April 2015

11:32

Volunteer V3, Interviewer

males

V3 around 35, native speaker

I: How long have you been working here?

V3: Nearly two years

I: How many hours for week?

V3: Over 20

I: What kind of people do usually come here?

V3: It varies.. sometime it is like more children because they come here for school projects or we have activities for them but we do also have lots adults who comes here because they have a interest and we also have lot of student so they come here to do the research.

I: Are those students studying here?

V3: Most of the time if they are students they do ask us about volunteering or a bit more information and we took them to the volunteer manager to get them to become part of the centre so that they can learn more and have access to the reference we have got and which are not always available. So for example in the corridor out there you have shelves with books, only if you are member is the only way you can take them out of here.

I: How do people usually get information about the museum, before coming here?

V3: We have got a facebook page, we've got a website page, the tourist information board centre has got information.

I: Do they learn something before coming here? Or they just come here by chance?

V3: Most of the when they come here they have known already about Egypt the history, they maybe have been to the British museum and then they've been asked "where are you come from" and then "look there is this museum close to you, you could visit it" basically we work with a lot of other museums in the area, so people get to know what we are about.

I: I see there are some books here. Do people use them or do they prefer asking you?

V3: Sometimes they use the books, but sometimes they rather ask us more or less. Because I think they are really afraid to touch a lot of it. I don't know why people are afraid to touch. Because some things of course we don't allow the to touch but the book you can see, they are around, of course they can use them.

(04:28)

I: What about activities? Are them for children?

V3: Most of them they are set for children, to give parents a break giving them something to do but most of the time then they become a part of the young volunteer here. Thought we do have things for adults, most of the time when it's done in night sessions, we have got an event coming out "night at the museum" for example ...

(05:42)

I: What about mummification, is for children or for adults?

V3: Both really, children love it and we do our best to get children involve in it, sometimes we do ask the adults but you be surprise in how many of them cringe even though we may be just cutting sealing ... adults enjoy more than kids sometimes

I: Adults are more shy?

V3: Sometime they are but it depends on what they like really what they want to get out of it

I: Do people come more than once?

V3: Yes we have repeated visits.. they come to see if there is something new, we do have lectures, ...

I: So they come to see if there is something different and new?

V3: Yes or to show friends and family about what they saw or did or other time they pop here just to kill the time but they have to go somewhere else

I: What do you think it is the most important thing to do to offer visitor the best experience?

V3: To get them to enjoy their experience we try to be always friendly which is difficult for example with children, some of them are happy some of them are scared by us. We always ask questions if they need help.

I: Do they use mobile phone?

V3: Some use to take the photo, more than digital camera. They enjoy it. We are trying to get wifi now.

(10:33)

I: How do you think about using mobile phones or tablets for helping children of people in general to help?

V3: It really a great way for anyone to learn a bit more especially like today is a quite day but if we have a school in and other people come in to visit we try to cover all the bases but there are enough volunteers and the other thing is sometimes it gets crowded we can't do some of the activities we want.

So if schools are here we let them handle the objects but sometimes if someone else wants to handle it but because there is a school here we have to apologize and ask to come back later when they have lunch. It would be handy for them to learn

I: Is it difficult to help people with such different backgrounds?

V3: Sometimes it is especially when students are coming here to learn and they cannot speak English. If they have a broken English.. we have translated books but it is difficult to explain them.

But we are translating from Egypt to English than to another language so it becomes quite challenging.

I: It is difficult to engage them?

V3: Sometimes is difficult and sometimes very easy, sometimes we ask if they need help and they say no but then they leave weird comment on the comment book and you know they could have just asked us.

I: I guess interacting with people must be difficult sometimes

V3: It is hard. Especially with religion, sometimes it odd. Sometimes you are trying to explain them some of the religious beliefs because downstairs we've got the God and God ..and sometimes we explain how it works and we get from schools a bit of review back but the parents who have a different faith they may be not happy. Sometimes religious beliefs conflicts with what we want to teach. Sometimes can create difficult situation but most of the time it doesn't.

(18:24)

I: Can you think about any way technology can help?

V3: It would be nice if we could show what else we've got in the museum, like we have a store room downstairs and half of the artefacts are unseen. So maybe you could show them what you have and explain why you can't show them.

I: Is because you don't have the space?

V3: Yes we don't have the space but also some are so fragile that is not possible to move them out of the box.

V3: It would be also interesting to have something like you have the phone and take a pictures of the artefact and it kind of scan the object and then it can give you information. But it should also save it so that you can read it later. Imagine you are working for a project and you want to print it out later for example.

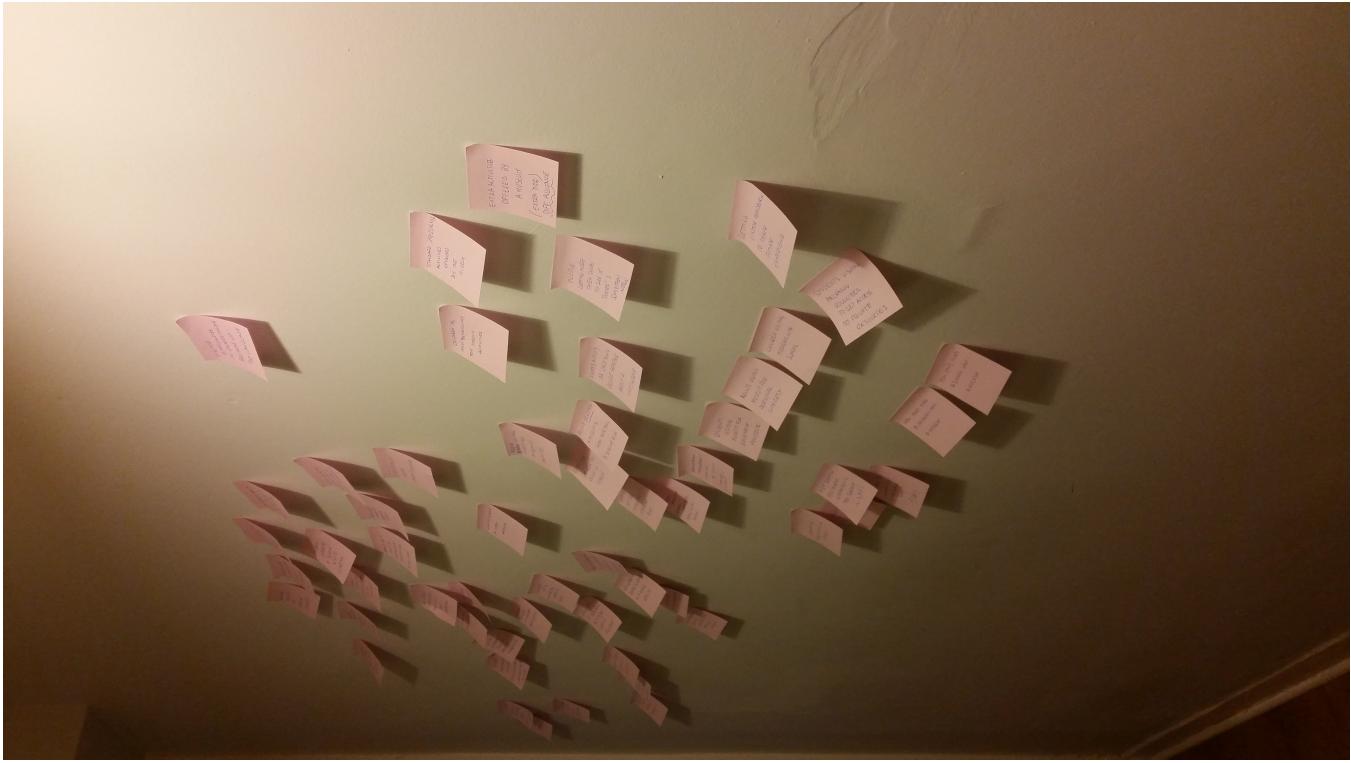


Figure 5. Codes

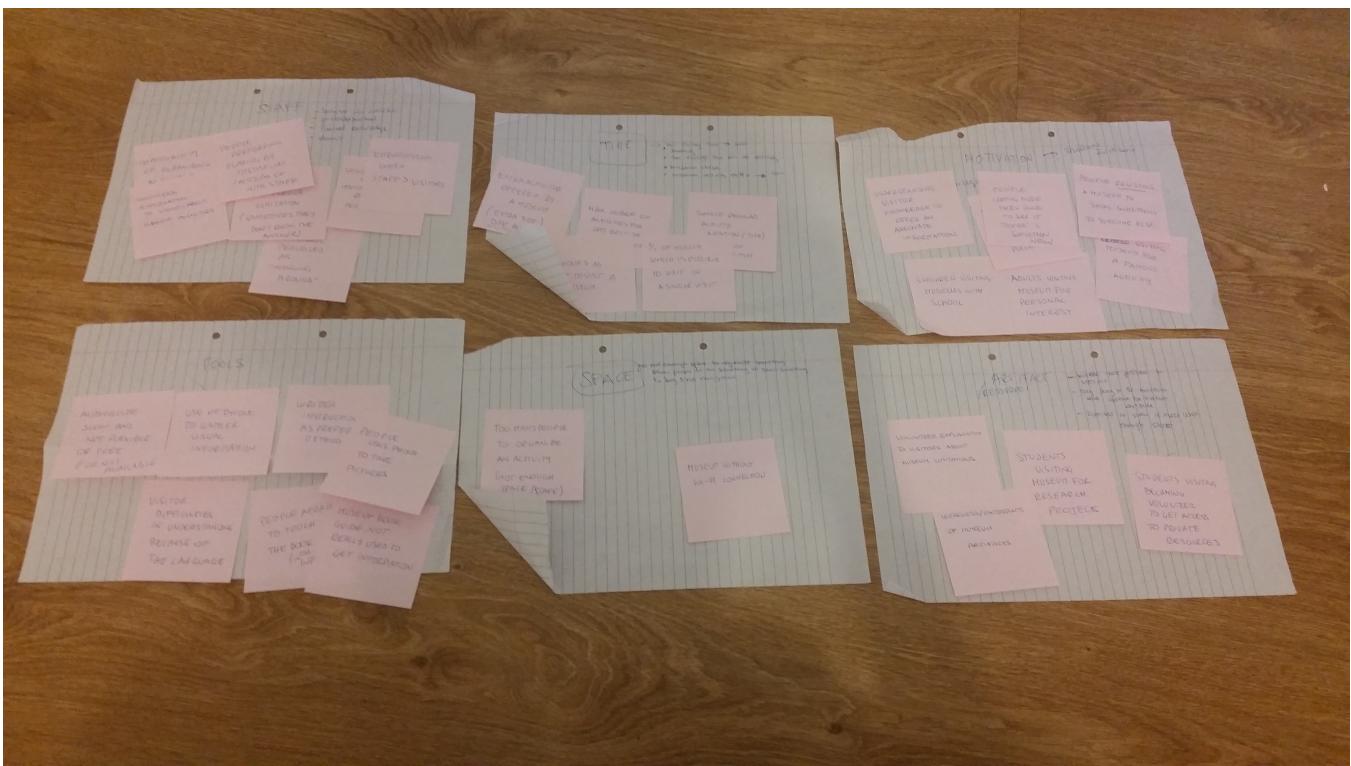


Figure 6. From codes to themes