Digital Technologies in Museums
An ethnographic study
Pyrite, “All that glitters is not gold”
(Internal Documents of Museum, 2016)

“The mineral Pyrite is also known as ‘the fool’s gold’, because its form and shine tricked those seeking for gold! It glitters like gold but “All that glitters is not gold”. The most common way that gold diggers used to check whether their finding was gold or shiny pyrite was to bite it! A piece of gold would melt between the teeth and bring great joy, but a piece of pyrite, which lacks the softness of gold, could cost the gold digger a teeth! (Field notes, Observation 20 March 2016).”
Abstract
This thesis follows a research at the Mineralogy and Petrology Museum of the University of Athens (Greece). The purpose of the research is to examine how digital technologies can support museums in attracting new visitors during the economic crisis, and provide design suggestions. The research was conducted under the interpretive paradigm using the ethnographic methodology and the participatory design approach. The staff, volunteers and artists related to the museum participated in interviews, thinking aloud sessions and a workshop. In addition, several observations were conducted during guided tours of visitors. The data were analyzed through thematic analysis. The findings provided themes of identified issues and opportunities concerning the implementation of digital technologies in the museum, such as the underlying policies of the University of Athens, the role of the museum in society, material in the collections that attracts visitors, the importance of the staff in guided tours and the technologies currently being used. Suggestions were put forward during the workshop and were elaborated later on. The thesis aspires to contribute to studies that concern the sustainability of cultural establishments that are being afflicted by the economic crisis currently veils Europe.

Keywords
Digital technologies, museums, visitors, audience development, ethnography, observation, interviews, workshop, participatory design, economic crisis
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The writing of this thesis is the seal of a journey to knowledge I embarked on, the first day I started to attend this master’s programme. On this “journey to the unknown” nothing was easy and maybe that’s why it was so exciting. During these two years I experienced both pleasant and unpleasant feelings intensely, I met people who have inspired me and made me want to continue my effort, I made new friends who stood by me and gave me courage when my strength was ebbing away.

The difficulties and the anxieties were countless but my happiness is indescribable now that I come to the end of journey. Facing all this, I came out stronger since this master’s programme offered me valuable knowledge and experiences and helped me develop many skills so that now I can rise to future challenges. For me, this has been one of the greatest experiences of my life because it broadened my horizons and changed my way of thinking.

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Thanks to everyone who believed in me!
List of Abbreviations

ICT Information and Communication Technology
IMF International Monetary Fund
IS Information Systems
IT Information Technology
MINT Metadata Interoperability Services
MMS Multimedia Messaging Service
NTUA National Technical University of Athens
PD Participatory Design
UoA University of Athens
UCL University College London’s
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1. Introduction

The global economic crisis that erupted a few years ago could not leave Greece unaffected. Nonetheless, this crisis was not the only reason why Greece has been in predicament trouble since economical politics in the last thirty years have brought the country close to bankruptcy more than once (Meghir, Vayanos, and Vettas, 2010, p.3). As a result, Greece joined the International Monetary Fund (IMF) in 2010 to receive help for its debts. The first package of austerity given by the IMF was on 3 March 2010 (Matsaganis, 2011, p.501). The government believed that this economic support could lead Greece to fiscal consolidation. However, since then the two packages that followed have brought Greece to an extremely difficult situation.

Due to the economic circumstances the cabinet ministers decided to cutback funds not only in the cultural sector but also in education and health sectors. Unfortunately when the conditions are so severe, it is the cultural sector that is mostly affected by the government’s politics (Tsiara, 2015, p.177). It was not only Greece that adopted these strategies because of the economic problems but also many other countries in Europe which faced similar difficulties. For example, the Italian Finance Minister Giulio Tremonti seemed not to understand those who complained about the cuts in the cultural sector. He tried to justify his decisions to reduce the support to the cultural sector by saying: “After all you can’t eat culture” (Siegal, 2013, p.41).

Due to the economic crisis, I assume it is difficult to criticize the budget reduction related to arts and culture when “there are more crucial necessities to be met” (Munoz-Darde, 2013, p.221). However it is important to have a balance in all areas of life, but when poverty level has increased dramatically and the majority of citizens literally starve, then the priorities inevitably change. The government cannot just ignore their citizens and announce that part of the state budget will be used to finance and support social institutions such as museums, concert halls, art galleries, universities or libraries (Munoz-Darde, 2013, p.221).

It has already been seven years of economic crisis in Greece and everyday things get increasingly worse. Among those who received a severe blow on funding were the universities. Their budget was reduced up to 80% and this resulted in the reevaluation of their needs. The reassessment was very difficult to implement. Moreover, every year since the economic crisis began the amount of funds corresponding to the aid of the universities was unclear. Under these circumstances the educational institutions were not allowed to manage their resources correctly or to plan and organize the next academic year accurately (Nikolaidis, and Maroudas, 2013, p.139).

Hence the budget reduction was made for all universities in Greece including the first university in the Balkan Peninsula and the wider Eastern Mediterranean region, the University of Athens (UoA). After being established in 1837 the UoA has been operating continuously from its inception on 3 May 1837. The University has eight Schools with more than 50,000 undergraduate students, 1800 faculty members and 1100 administrative employees. As it has been aforementioned, the UoA was not spared the consequences of the economic crisis, which were now visible in the cultural life of Greece. Consequently, there was an imminent risk for its survival (Tsiara, 2015, p.177). The administration of the University had to decide “how
resources should be distributed” (Munoz-Darde, 2013, p.221) to ensure its sustainability, and re-think the orientation of education so it could adjust to the current financial difficulties without sacrificing quality (Nikolaidis, and Maroudas, 2013, p.127).

The financial situation has also affected the university museums. There are sixteen university museums that belong to the UoA. The museums’ exhibits are very interesting from a scientific and educational point of view and cover a wide range of scientific fields. However, the aforementioned economic situation gives rise to “a loss of confidence in the museum’s role” (Earle, 2013, p.534). Due to the economic crisis the following questions are addressed: how important is their contribution if a country wants its citizens to be educated and cultured? Are museums really necessary now that all kinds of information are easily accessible on the Internet? What is the cost of operation and maintenance of each museum? How many people visit the museums daily? Is it important for the members of our society to keep them open?

The same questions arise every time the fate of a museum is to be decided. The fate of museums involves not only their physical existence but also their role as a pole of attraction for visitors. Museums should not be reduced to storage places of priceless exhibits but like other cultural centers they should be an alive section of society which people are informed about and wish to visit, otherwise there is no reason for their existence. Lindqvist (2012, p.4) emphasizes that “Visitors and customers are pivotal for museums” because they offer financial support even though they cannot completely solve the problem of their sustainability. It is obvious after all that museums have to struggle against adverse circumstances because their stability is being affected directly and indirectly by the economy (Lindqvist, 2012, p.1).

To combat the negative trends, museums use different strategies such as to adopting a user-friendly policy to ensure a larger number of visitors (Camarero, Garrido, and Vicente, 2015, p.228). Therefore many museums around the world organize periodical exhibitions, cultural events and educational programs for schools or activities for families. They also collaborate with other museums or cultural institutions and promote their actions through public relations in order to find contributors to support them.

Digital technologies are an important ally in the effort to attract visitors to the museums. For example institutes, organizations, companies, governments or individuals can create an account in social media in less than a minute or promote themselves through a webpage. Those who do not use social media do not belong to cyberspace and therefore they cannot have a direct contact with their audience at low cost (Kaplan and Haenlein, 2010, p.67). This is a tactic that most museums are adopting, but there is no guarantee that their design is appealing to the audience since “Social Media is not an easy task and may require new ways of thinking” (Kaplan and Haenlein, 2010, p.67). Thus, in order for the museums to be competitive, they have to attempt to stimulate the audience by designing challenging environments and applications through technology, which meet the growing expectations of the public. Additionally, they enrich their offer with e.g. mobile applications (Eghbal-Azar et al. 2016, p.133), electronic games for computers and tablets, storytelling, virtual tours, QR codes (Pérez-Sanagustín et al. 2016, p.73) and so on. Through the use of digital technologies museums try to keep the public informed about their contribution to
culture, knowledge and entertainment, the events they organize and generally everything they believe that would be interesting for their audience. The way a museum will use technology can help it not only to maintain its visitors but also to attract newcomers, something that is very important for its viability mainly in times of economic crisis (Spiridon and Sandu, 2016, p.87).

**Motivation**

Museums have a history of several centuries. They are institutions that keep knowledge alive for all of us. On this long journey, many things have changed and museums could not have remained unaffected. Occasional economic crises and mainly the one that Greece has been plagued with the last seven years put museums in danger of being closed down. At the same time the rapid development of digital technologies has created a new environment where people have high expectations since “We are literally surrounded by digital things” (Bratteteig, et al., 2010, p.17).

Thus, we live in the ‘era of high technology’ where information travels at high speed; on a daily basis, people receive thousands of stimuli from images, videos, sounds, and learn to interact, share, participate, and communicate with people who live on the other side of the planet. This evolution of technology creates high expectations to all of us. Is it possible for the museums to remain unaffected by these changes? I assume not. And what does this mean for their survival? It means that in order for a museum to meet these increasing demands due to digital technologies, it should become more creative and innovative to “display their collections in a way that has more of an impact on the visitor” (Camarero, Garrido, and Vicente, 2015, p.228). The traditional image where visitors stroll in the museum halls observing the exhibits and reading the tags next to them is now being challenged by digital technologies. For instance a combination of digital technologies and the actual exhibitions, like a video with 3D technology which might present a virtual society in Ancient Greece, is certainly more exciting. That is why some museums, as it is at the Acropolis Museum in Athens, are already applying these new technologies in conjunction with the traditional exhibition to attract the public (Acropolis Museum, n.d.).

I have been working as a librarian at the University of Athens the last thirteen years and I am well aware of the economic difficulties affecting the university since its budget has dramatically decreased. Nevertheless, the staff of the university tries to operate the institution in the best possible way but under these circumstances the priorities have changed and the university cannot allocate money from its poor budget to its museums when it cannot meet the established needs.

I consider museums and libraries ‘temples of knowledge’ in which we must invest if we want to have cultured, civilized and educated people. When I first visited the Mineralogy and Petrology Museum of the Faculty of Geology and Geoenvironment at the University of Athens four years ago, I was really excited by its collection. Since then I have seized every opportunity to inform acquaintances and friends about this museum because they are not aware of its existence. What is amazing is that even university employees have never paid a visit to it.

The motivation to do this research has stemmed from the question of “What can I do to support this museum in order to increase the number of its visitors?” In this research I will involve the staff and the volunteers of the museum and their experience
of the contact with the visitors, to identify how digital technologies can be used to support the museum’s operations and attract new visitors. To use digital technologies could help at two levels: one is the economic level, since visitors are one of the main revenues of income of the museum and digital technologies can be used to attract new audience (Lindqvist, 2012, p.4). The other is the social level; digital technologies can be used to help the museum established itself in the field of museums, in academia and in the consciousness of people.

Whether a country wants to sustain its cultural institutions such as museums is indicative of the kind of citizens it wants to have. Certainly things are not always so simple. Unpredictable factors such as the economic crisis have forced the government to make difficult decisions and to reduce the budgets of the universities. For this reason, it is necessary for the university and museum administration to reorganize and readjust the aims and the policy of the operation of museums using the limited available funds.

**Purpose and Research Questions**

This research will be carried out at the University of Athens in the Mineralogy and Petrology Museum involving its staff and volunteers. My purpose is to build on their experiences contacting with the visitors of the museum, to identify and suggest design ideas on the use of digital technologies in the museum that assumingly attract new visitors and revitalize the museum.

The museum belongs to a specific context which contains several external factors that affect it such as: the applicable legislation, the tourism and cultural policy and mainly the economic situation of a country. The economic crisis turned out to be a defining point in the way museums functions in Greece.

However, museums as cultural centers can provide valuable knowledge to people of all ages. Nowadays especially, when people use digital technologies and become familiar with new technological creations very quickly, the sources and the ways people acquire knowledge has changed. There is, therefore, a need for museums to change their policy, to redefine their contribution to society and to show the importance of their role not only in the education and knowledge sector but also in that of entertainment and fun.

So the questions arising are how the museums can face the new challenges that have emerged from the economic crisis and how they can be not only sustainable but also attractive the moment they fall low in the country’s priorities and their budget is severely reduced. While trying to answer these questions museums are called to make use of all current available means to achieve their sustainability.

From the above, two research question are formulated:

1. **What are the external factors that affect the museum?**
2. **How can museums, facing these external factors, use digital technologies to attract new visitors to ensure their sustainability?**
There is a variety of digital technologies used in museums mentioned by the literature of the topic. Each museum uses the technology that best suits its own exhibits and its own visitors. In this research this variety of available digital technologies is used as an inspiration, and by employing the experience of the staff and volunteers, I have tried to find those technologies that are suitable for the Mineralogy and Petrology Museum of the UoA.

**Relevance**

The University of Athens has sixteen museums which are in a similar economic situation. The research will be carried out at the Mineralogy and Petrology Museum and will suggest ideas on how digital technologies can be used to attract new visitors taking into consideration the external factors that will be identified. This will pave the way for subsequent research in the rest of university museums. It can also be the motive for other cultural centers open to the public such as galleries, libraries, archives, etc. to follow the same innovations to make changes in their strategies.

The employees of the museum will benefit from this research because they will have the chance to experience the participatory approach. Through the participative process the employees will be able to exchange experiences with their colleagues and the researcher, suggest ideas on viewing the exhibits of the collection and the organization of new events and activities, which could attract new audience. It will be an opportunity for them to work in a different way from the one they were accustomed to and imposed on them by the way the UoA operates.

The research will be beneficial for visitors as well because they will have the opportunity to see significant exhibits dating from 1837 from a different perspective with the use of digital technologies in addition to the traditional exhibition.

**Scope and Limitations**

The aim of this study is to make use of the external factors identified in combination with the experience of staff and volunteers involved in the guided tours, who come into direct contact with visitors. The information they gain directly or indirectly from the visitors, will be valuable in making design recommendations, which could benefit the museum and society in general. One limitation in the research is that I have decided not to include the visitors in a direct way e.g. by asking them questions, but rather try to view the exhibits and their popularity through their eyes. Thus, I will concentrate on the staff’s and volunteers’ experience. Another reason for not involving visitors is the fact that there were children in most guided tours and it would be difficult to get permission for their participation in the research since they were accompanied to the museum by their teaches and not their parents. Of course, visitors are a living part of the context of the museum and thus they are included in the research implicitly. Moreover, since the research was conducted while courses were running, I was not able to include the professors of the Faculty due to their increased obligations.

The results of this research could inspire other museums and cultural institutions to include digital technologies adjusted of course to their own collections of exhibits, rules, policies and aims, which are governed by its specific unique philosophy.
The museum is in Greece and the participants are Greeks too, so the whole research was conducted in the Greek language thus I needed to spend extra time in translating everything into English something that poses a challenge.

I am an employee at the University of Athens. For this reason, I was cautious in approaching colleagues and at the same time make sure that I fully respect the rules of the institution. My presence should be discreet and I should not hinder the work of others or the orderly operation of the museum.

**Disposition**
The rest of the thesis is structured as follows:

*Chapter 2 - The Mineralogy and Petrology Museum*
Chapter two describes the *Mineralogy and Petrology Museum* of the University of Athens where the research will be conducted.

*Chapter 3 - Literature Review*
Chapter three includes the previous research and literature review relevant to my subject.

*Chapter 4 - Paradigm, Methodology and Methods*
Chapter four contains the paradigm, the methodology and the methods used to collect and analyze the data, the validity and reliability of the research as well as the ethical considerations that are raised.

*Chapter 5 – Empirical Findings*
Chapter five presents the findings of the research according to the concepts that were produced in data analysis.

*Chapter 6 - Discussion*
Chapter six includes the findings and concerns that have emerged throughout the research.

*Chapter 7 - Conclusion*
Chapter seven contains the conclusions, the contribution of the study in scientific field and ideas for further research.

*References*
The literature used in this thesis.

*Appendices*
Appendices of consent form, interview questions, welcome introduction in workshop, posters, declaration form, etc.
2. The Mineralogy and Petrology Museum

This chapter features the setting of the research, the Mineralogy and Petrology Museum. It includes an account of its history, how the museum is structured and what collections it includes.

Figure 1: The Mineralogy and Petrology Museum is located in the Geology building
(Internal Documents of Museum, 2016)

The research will be conducted at the Mineralogy and Petrology Museum of the University of Athens (UoA), see Fig. 1. The Greek War of Independence (Greek Revolution) which started in 1821 generated the idea of establishing a national university that was finally founded in Athens in May 1837. The UoA is not only the first university in the liberated Greek State but also in the Eastern Mediterranean region and the Balkan Peninsula (National and Kapodistrian University of Athens, 2009a). UoA consists of eight Schools and 38 Faculties. The Mineralogy and Petrology Museum belongs to the School of Science and the Faculty of Geology and Geoenvironment which is the oldest faculty at UoA. Today this faculty comprises six departments.

The UoA has sixteen museums that are proud of their most interesting collections. Three of them belong to the Faculty of Geology and Geoenvironment: the Museum of Palaeontology and Geology, the Zoological Museum and the Mineralogy and Petrology Museum. All three are located in the Geology building at the UoA but they have autonomous space. However, they are not independent institutes, thus they follow the regulations that apply throughout the University.

The history of the Mineralogy and Petrology Museum’s collection started with the foundation of the Natural History Society in 1835. This Society had set up a variety of interesting collections (botanical, zoological, anthropological, mineralogical and paleontological). Some of them came from donations while others were purchased. The UoA was founded two years later. Due to financial difficulties that the Natural History Society faced in 1837, it decided to cede parts of its collection to the UoA so that they could be used for educational purposes. Since then, the collections belong to the UoA. In 1908 three University Museums were established: the Mineralogy-
Petrography, Palaeontology-Geology, Zoology and Botany, which operate as independent branches (National and Kapodistrian University of Athens, 2009b).

The Mineralogy and Petrology Museum was housed in a building in the center of Athens until 1979. Then, the collections were transferred and stored in another building at the University campus until 1996. As time went by, this building was reduced to a storage place cluttered with a messy jumble of old, useless objects, and furniture that were covered in dust, see Fig. 2 and 3.

Figures 2 and 3: The building was reduced to a storage place before it restored and turned into a museum (Internal Documents of Museum, 2016)

At some point it was decided that the building should be restored and turned into a museum, see Fig. 4 and 5. While the showcases were being repaired, many of the samples were damaged and separated from their labels. In order for the museum to reopen, the samples had to be restored and reclassified.

Figure 4: The museum today (Internal Documents of Museum, 2016)
Mineralogy and Petrology Museum’s collections are exhibited in a gallery with three halls and an audiovisual conference room occupying a total area of 1100m². There are also the employees’ offices, warehouses and labs, which are not accessible to public, see Fig. 6.

Since the establishment of the Mineralogy and Petrology Museum, many important donations have helped the Museum to enrich the oldest collection of minerals and
rocks in Greece with unique pieces of incomparable beauty and value. Those include a donation of samples from the Ural Mountains donated in 1858 by Kaemmerer, the Cabinet Advisor to the Russian Empire, a collection of 555 samples from Russia and Siberia donated by Charitov in 1860 and a collection of the geologist Fiedler with minerals from Greece that was donated to the museum by King Otho and Queen Amalia in 1863.

Today the museum boasts a large amount of samples: 10,000 mineral ones and 15,000 of rocks and ores but only a part of them is displayed in the museum showcases: about 3500 mineral and 400 rock samples (National and Kapodistrian University of Athens, 2009b). Hence, the collection enjoys international prestige.

The permanent collection at the museum is divided into two parts. The first one is the ‘systematic and thematic collection’ which comprises all kinds of minerals. In each group there is a large number of samples in a variety of colors, texture and shapes. These samples are exhibited in heavy, wooden showcases from the 19th century and are of great scientific interest for researchers and Geology students, see Fig. 7.

![Figure 7: Systematic and Thematic Collection in showcases from the 19th century (Internal Documents of Museum, 2016)](image)

The second part is the ‘aesthetic collection, which captivates the public with the radiant beauty of crystals, the sparkle of precious and semi-precious stones and the intricate shapes created by nature. They are displayed in modern, lit showcases, see Fig. 8.
The Mineralogy and Petrology Museum belongs to the Faculty of Geology and Geoenvironment. The museum staff consists of four employees. Three of the employees officially belong to the Faculty while one is appointed at the museum. They are all geologists and apart from giving guided tours they also preserve the samples of the collections. The Museum follows the opening hours of university services. It is open daily from Monday to Friday, from 8.30 to 14.30 for school visits and the public. The museum also offers guided tours.

Besides the regular exhibitions operating throughout the year, three Sundays in November and three in April, the museum organizes special events such as periodical exhibitions of private collections, lectures as well as interactive games for children and the whole family, see Appendix A. These games include ‘Hunting crystals’, ‘Discover the treasures of the earth’, ‘Awakening a volcano’, ‘Making my own Earth’, ‘Painting my own mineral’, ‘Mineral Lab for families’, ‘Mineralogist for one day’ and ‘Mr. Mole and its minerals’. Every child can participate in more than one of these games. For the first time, in April 2016, the museum organized a modern art exhibition titled “MinerARt”, see Appendix B, with artifacts inspired from the collection of the museum, combining science and art, see Fig. 9 and 10.
Figure 9: Sculpture titled “Time – Saturn”  
(My personal Documents of Museum, 2016)

Figure 10: Installation titled “An act of real political love”  
(My personal Documents of Museum, 2016)
3. Literature Review

In this chapter, a review of previous literature connected to the topic of the research is presented, categorized according to their theme.

Digital technologies have an impact on people’s everyday lives as they transfer information around the world in the shortest possible time. The information may be in the form of text, image, photo, sound or video. People who have access to digital technologies daily receive and send hundreds of stimuli, and thus they learn to interact, to participate and to communicate with people who live on the other side of the planet. This rapid development of digital technologies creates a new environment and people with high expectations.

Is it then possible to look down on museums in this Digital Revolution, especially when other institutes, organizations, companies, governments or individuals are using digital technologies to promote their profile through social networks and communicate with their audience? In the ‘era of technology’, digital technologies can be an important ally in the effort to attract newcomers to museums, as shown in the literature below. Due to this evolution of technology and to the economic situation at the Mineralogy and Petrology Museum, my aim is to identify and suggest design ideas on the use of digital technologies in this museum with the intention of attracting new visitors and revitalizing it.

This research will be conducted within a broad framework which includes the following issues: museums and society, museums and economic crisis, museums and digital technologies, museums and visitors, participation and visitors, interaction and museums, Participatory Design and museums, co-design and museums, ethnographic research in museums, observation in museums. Nevertheless, since the previous literature on the issues mentioned above is too extended, I chose to present those closely related to my research questions which are: new trends of digital technologies in museums, the role of museum in relation to visitors and economic crisis and culture.

Before I present the previous work related to the abovementioned issues, I will integrate my research to a societal context. Dahlbom (1996, p.29, p.38) illustrates how people and technology have become intertwined when he argues that the forum in Informatics is on theory and design oriented studies. What is of great interest is the way Dahlbom (1996, p.33) presents the stages computers went through from their first appearance in the 50s when they were generated to serve military purposes until the 90s when personal computers became a means of communication, entertainment, education etc. with the use of the Internet. Walsham (2012, p.88) focuses also on the connection between people and technology when he claims that the world has changed the last two decades and ICTs are prevalent everywhere. He underlines that even in developing countries ICTs are used because people possess and use mobile phones (Walsham, 2012, p.88). Walsham believes that this rapid evolution of Informatics/IS requires some changes and only after these changes are made can we pose the following question: “Are we making a better world with ICTs?” (2012, p. 92). This question cannot be answered with a simple yes or no, but as it can be seen
from the literature below, the use of digital technology is a key concern of the museums in order to ensure their sustainability.

Bradley (2010) is another scholar who examines the impact of digital technology on society. According to her, “technology is for humans and should facilitate and improve our wellbeing and quality of life” (Bradley, 2010, p.183). Bradley has developed the Convergence theory where she illustrates how computer technology, tele-technology and media technology are converging together and that technology is now found in all levels of human life from the individual to the societal. This can cause a certain “ICT stress” since people keep becoming dependent on technology and need it to function properly at all times (Bradley, 2010, p.187). Since ICTs are now affecting the environment of human life in all aspects, the role of ICT being used to build a good society needs to be taken into account in the strategic planning from a local to a global level.

This dependence on technology led many museums to adopt digital technologies. This adoption was not a step taken from one day to the next, but the result of other research which was made in the past and continues until today since technology does not cease to evolve. In the upcoming subsection, I will present previous works where digital technologies are used in museums.

New Trends of Digital Technologies in Museums
In his research, Parry (2013) argues that the proliferation of technology affects the cultural institutions directly, thus museums decide to integrate digital technologies in their collections. Moreover, the museums’ presence in cyberspace is as important as their physical presence and the information provided by them to the public is available in various forms in the media. Therefore, the museums are accessible worldwide. Parry continues saying the application of new technologies in museums seemed an expensive and highly demanding step since apart from the equipment museums needed to buy, they also had to train their staff. Parry (2013) argues it was a risk that managers of cultural institutions had to take. However, within four decades after computing, they have adopted digital technologies and have begun to form a new policy on the management of their collections (Parry, 2013).

Spector (2013) also discusses how technology should be used to support and facilitate the learning process. The learning process is closely tied to the field of museums, so the digital technologies that can support the educational programs in museums should be taken into account. In order to come to an understanding of how technology can be used in this way, extensive research needs to be done to evaluate whether and how technology does improve learning, instruction and performance (Spector, 2013, p.2). A list of resources for emerging technologies, their potential in learning and evaluation of their credibility is presented. Spector argues that applications of technology which failed in the learning process are to be seen as opportunities for improvement of the technology application and not as a discouraging factor. Several technology trends are mentioned such as open content, Massive Open Online Courses (MOOCs), personalized learning, portable devices, larger information repositories, richer education environments and more holistic approaches (Spector, 2013, p.5). This richness of available digital technological resources can prove challenging in managing and evaluating the proper solutions for each learning process. Spector
concludes that “technology is the purposeful application of knowledge to benefit society or a group of people”, with emphasis given to the role of digital technologies in supporting the common good (Spector, 2013, p.7).

Furthermore, a mobile application created in the Greek context by Tselios et al. (2008) has been designed for learning in museums. It takes into account the pedagogical approaches that can be embedded in design. Tselios et al. (2008) propose creating a learning activity for a museum and giving the opportunity of sharing experiences through mobile technologies. They conclude that designing such an application needs to take into account several approaches such as the cognitive framework, the specific technological characteristics and the learning process setting (Tselios et al., 2008, p.667).

One of the most prominent trends in design for museums nowadays is the use of social media. Stuedahl and Lowe (2013a) make use of small scale prototypes in order to explore communication through social media in museums. They position their research in the critical paradigm. Then, they question the role of social media in relation to museums. According to the authors’ conclusion, critical research in combination with participation is proven to be very fruitful in this research theme. In addition, Stuedahl and Lowe (2014) explore the case of a museum innovation in Oslo. They look into how mobile social media can promote participatory design processes at the community level. Stuedahl and Lowe (2014, p.109) conclude with the diversity that arises from the engagement of the community through PD and the emerging factors of “cultural shaping of identity, shared values and belonging”.

An additional use of mobile technologies in design that Stuedahl and Lowe (2013b) suggest is opening new possibilities for the visitors. In this research mobile applications are used as a means of exploring the museum. In order to combine the knowledge of designers with the experience of museum staff and create new designs, Stuedahl and Lowe (2013b) employ the participatory approach. They also involve students as participants in this research since they are already familiar with digital technologies, both as contributors and spectators, and have an awareness of social media and mobile technologies (Stuedahl and Lowe, 2013b, p.17).

Arvanitis (2005) also presents a case of using mobile technologies in museums. In this research mobile technologies are used outside the museum. Arvanitis (2005) builds on the concept of the “museum without walls” suggested by Malraux (1967). That is, a museum that offers information and knowledge to remote visitors. In addition, Arvanitis (2005) builds on the “post-museum” concept coined by Hooper-Greenhill (2000). The latter is a place of mutual learning and knowledge construction. Those two concepts are presented through a qualitative research project where young participants were asked to photograph monuments of the city Thessaloniki and then to send them through MMS to the researcher. The aim of the research was to make the best use of digital technologies and to explore the role of monuments and culture in the everyday life of the public. The outcome of the research showed that through sending MMS messages, the participants developed an interest both in the monuments and additionally in how they fit in their everyday lives. According to Arvanitis (2005, p.255), that kind of use of mobile technologies can further the efforts of museums to achieve the “museum without walls” concept.
Eghbal-Azar’s research (2016) is also based on mobile technologies. She argues that the use of mobile guides is becoming increasingly popular with those visiting historical sites, botanical gardens, zoos or museums. These means offer special tours according to the interests of each visitor. In addition, they provide extensive information about various exhibits or individual exhibitions of artists, which the visitors can choose to see, if they coincide with their interests. Eghbal-Azar (2016) investigated two issues to see whether introducing this kind of technology would help a museum. In particular, he examined first whether the visitors using mobile guides were affected by them and second if the way the museums presented their exhibits affected the information chosen by visitors to see. The research showed that the visitors who used mobile guides stayed 60% longer in the exhibitions that those who didn’t. This is an important indication of what mobile guides offer to the visitors and consequently to museums.

Finally, the use of interactive means in museums is explored by MacFadden (2008). Understanding the evolution of life on our planet through the exhibits of a natural history museum is not easy. However, technology in the 21st century offers various means like interactive screens, educational games, videos, etc., which are very attractive for the audience since they make exhibits more comprehensible. MacFadden (2008) pays attention to the design process because setting such an interactive exhibit may be difficult to alter afterwards.

**The Role of Museum in Relation to Visitors**
Visitors are the heart of museums and without them there is no reason for their existence. That is why museums are using different ways to reach out to society and attract new visitors or bring back the old ones, something that is important for their survival. They should therefore find out what could possibly draw their attention. If they manage to understand visitor’s desires and expectations and outline the profile of the target audience, then they can design digital technologies that meet their needs. Apart from that, they try to engage the visitors in the designing process, thus the visitors have an active role in designing digital technologies and are not mere recipients of the final product.

Understanding the audience of museums is also an important factor in sustaining visitors and inviting new ones. Black (2016) is exploring the “core” museum audiences and identifies the main reasons that a 70% of these audiences have no special interest in the museums’ collections right now. According to Black, museums have failed to attract well-educated visitors for a long time. Instead of local public, a 50% of museums’ visitors is proved to be overseas tourists. According to the Taking Part survey, the main reason for the public not visiting museums is lack of interest (Black, 2016, p.4). Another problem seems to be the form of the permanent exhibitions retaining a didactic display, which promotes a “one-way transmission of knowledge” (Black, 2016, p.6). Black presents a list of reasons why this style of exhibition still dominates, the main cause being a habit both on the museum’s and visitors’ part. The public also seems to have a tendency to visit cultural areas to socialize, so according to the author, the museums needs to re-think their environment as a place of high quality leisure destination. This change in the public is something that museums must acknowledge and turn to more participatory practices to engage audiences (Black, 2016, p.11). This of course does not mean that museums will or
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should lose their function as a safe keep of culture and promotion of knowledge and understanding. Instead, they just need to adjust to the current audiences (Black, 2016, p.13).

On the other hand, Hein (2005) argues that museums have an educational role but the educational direction is far broader than assumed and this is directly connected to society. He provides a wide scope of museum activities which include apart from the usual activities such as exhibit tours and programs, others such as external partnerships and web related activities. Hein gives a background of knowledge according to the constructivists’ theory which assumes knowledge is actively created by engaging in meaning making, and argues this makes education “a socio-political activity with a goal of improving society” (2005, p.361). Thus, due to their educational role, museums also assume a social role. Hein suggests two directions in the social action of the museum, the exhibition content and the museum practices. The content must not only inform but also engage visitors and practices must include community members and aim towards their collaboration.

Camarero, Garrido and Vicente (2015) also investigate the effectiveness of visitor orientation in European museums. Museums and cultural institutions in general were forced to adopt a more consumer-oriented policy due to the economic crisis and the challenges that they faced lately. They have turned their attention to the visitor, trying to understand their needs and adapt accordingly in order to increase their audience. Their aim is not only to understand visitors but to excite them. A survey in 491 museums investigate the impact of innovation and custody, always in relation to the visitor’s expectations and whether the implementation of a strategy like this is beneficial or not for the museum financially.

Skov and Ingwersen (2014) explore the visitor’s web search behaviour. They want to understand what kind of information is of interest to those visiting a digital collection and how they “interact with digital museum resources” (Skov and Ingwersen, 2014, p.97). They identify four main characteristics in visitor’s behaviour: (a) searching behaviour has a strong visual aspect, (b) topical searching is predominantly exploratory, (c) users apply broad known item searches, and (d) meaning making is central to the search process (Skov and Ingwersen, 2014, pp.96-97). The results showed that web visitors mainly look for information and images for specific exhibits (Skov and Ingwersen, 2014, p.97). This research was conducted at a National Museum of Military History and involved a small digital collection but Skov and Ingwersen suggest that a future survey to be done on larger digital collections such as the Europeana portal (2014, p.97).

Participatory design approaches are also used in the museum research. Mygind, Hällmans and Bentsen (2015) conducted an extended literature review of participatory practices in the development of museum exhibitions. They explore how inviting ‘external participants’ can contribute to the different stages of designing an exhibition (Mygind, Hällmans and Bentsen, 2015, p.119). Their review is based on identifying methods used in this participation initiatives, the degree of participation, the rationales used and what the obstacles are, as well as facilitating factors in involving external participants. Their findings include an extensive analysis of the methods used and their results. Mygind, Hällmans and Bentsen also discuss issues such as the
importance of the way museums run participatory projects, and how possible it is to engage external participants in the end.

One of the key points in PD is motivating people to actually participate. Hansen’s and Iversen’s (2013) research in the LiTiRUM project was to motivate young students to participate in the creation of a learning platform. They tried several techniques such as providing food and beverages to students, as well as sweets that would not normally be available at schools. Also, they rewarded them with cinema tickets for participating and gave them free lunches (Hansen and Iversen, 2013, p.331). Besides material enticements, during the research workshops, Hansen and Iversen promoted the use of modern technology with learning and games that encouraged teens to participate. Indeed these techniques succeeded in motivating students to participate. They categorize the motives used in the LiTiRUM project according to Hedegaard’s hierarchy of motivation. One of these categories is dominants motives such as playing for pre-school children. They conclude that there needs to be a balance between the different kinds of motivation for students’ participation to be successful.

Tammaro (2016) presents the relation of digital heritage and participatory approaches, and how this relation has affected the role of the users. According to Tammaro, digital technologies have made cultural resources more easily available to the public (2016, p.37). The participatory culture is presented as opposed to the passive culture which views users only as consumers, while an approach of “doing it together” is promoted (Tammaro, 2016, p.38). Through several examples that show the relation between digital heritage and participatory approaches adopted, the effect on the role of cultural institutions is presented. Their aim now is not only to produce but to innovate and create. The role of users is also challenged as they are now called upon to become creators too instead of being simple consumers. This change poses a challenge for cultural institutions with regard to copyright laws, quality evaluation, the conservation of their content and the impact of participatory approaches on society. Even though there is a lot of opposition towards the use of participatory approaches, Tammaro (2016) argues the approach is useful. In order for cultural institutions to be able to adopt participatory practices, they need to become “communities of learning that share experiences, best practices, and learn from one another, adapting to various situations and circumstances” (Tammaro, 2016, p.43).

Dindler et al. (2010) also based their research on PD when they conducted a workshop titled “Gaming the Museum” in the Moesgaard Museum in Denmark. This was part of the Participatory Cultural Heritage project of the Center for Digital Urban Living. The aim of the workshop was to explore ways children can participate in interactive museum exhibitions by taking as a point of departure their everyday activities. The workshop included teenage children, their teachers and researchers. They used several digital technologies that the children were familiar with in order to engage them in games that included the museum exhibits. Dindler et al. (2010, p.78) found that if the starting point is the everyday engagements of children which they already feel familiar with and find interesting, it is more likely that they will want to participate, than if the starting point is the exhibition space which they are not familiar with.

Yiannoutsou and Avouris (2012) are other researchers who explore the use of games in museums. They claim that mobile games in museums are usually limited to a
scavenger hunt or role play narratives. They examine the visitors’ experiences of four museums that use mobile games and they claim that the role of the exhibits in these games is subordinate while the story is of utmost importance. Thus, the participation of visitors in the game design process is suggested, so that they can adopt a more active role in the learning procedure and create “an enduring relationship” with the museum (Yiannoutsou and Avouris, 2012, p.84).

Were (2010) also uses participatory approaches in museums when he presents the case of University College London’s (UCL). According to Were (2010) in the last two decades museums have been trying to become more open to the public by approaching and engaging the people who lived in communities around them. The UCL is selected to elaborate on the matter in the UK context and explore the role of the university staff in this opening up of museums. UCL has been facing the problem of its collections being tightly oriented towards education. Additionally, a lot of collections that were created after the initiative of an individual may be unknown to other university departments other than the one s/he belongs to. After studying previous literature review, Were (2010) argues that the issue of reconsidering the audience of the museum and changing the focus from strictly educational to more open is vital to museums’ sustainability. This change of focus is made through participatory approaches. Were presents the concept of the “participatory contact zone” first introduced by (Clifford, 1997 cited in Were, 2010, p.293). In this zone different actors from the museum and the public can come together to share ideas. This way the collections that are hidden away in the departments of the university can be “re-imagined as dynamic entities” and become open to the public (Were, 2010, p.298).

Were (2010) gives an example, amongst others, of a collaborative project between UCL, the University of Bergen and the British Museum which used a 3D scanner to scan objects from an ethnographic collection. In this project people from different scientific fields and geographical locations came together to complete this digitization. The 3D digital image, the product of the project, was then taken to the Solomon Islands, which was received with a lot of enthusiasm. Such projects provide space for bringing together people from within and outside academics. Of course such space can also become a field of conflicting ideas but Were (2010) argues that the benefits of participatory approaches are important for increasing the competitiveness of museums, and thus their sustainability.

Apart from participatory approaches, ethnographies have been included in previous works. Huvila (2013) recollects his research in a Nordic museum where ethnographic observation and interviews with the employees were conducted to examine the structure of information in the museum. It is imperative to know how the museum staff perceives, exchanges, manages and promotes the information it holds on a daily basis. As Huvila argues, it’s not only in the collections and documented resources where information is found, but also in the organizational memory of the museum (Huvila, 2013, p.1358).

Fuks et al. claim that researchers use ethnography, workshops, prototyping etc. in order to involve “multidisciplinary teams and users” in design process from its beginning till the end to boost creativity (2016, p.681). However, the selection should not be random but it should include people from relevant disciplines or related to the design product (Fuks et al., 2016, p.684). The research was conducted in Brazilian Planetarium and Science Museum and the careful selection of the participants helped
them to see different points of view, something that turned out to be very fruitful for the design (Fuks et al., 2016).

By enlarging the participation range, Munro (2014) describes an ethnographic research conducted in Glasgow Museums where groups of society members along with the staff shared their opinions about specific issues. A museum is a place where visitors interact with the exhibits and experience various emotions each time according to their point of view. Could these emotional labors play a role in shaping social policy? What is the view of the museum staff about emotional workshops?

Finally another research connected to ethnography is that of Unal (2012), who explored which of the exhibits of the Antalya Archaeology and History Museum attracted a specific group of students. The research was qualitative oriented and the method of participant observation was used to see the children’s behavior. In the findings a variety of different ways in which children expressed their interest is presented as well as a variety of other emotions that the children seemed to experience such as fear for exhibits related to death, or on the contrary, laughter caused by naked statues and similar exhibits.

**Economic crisis and Culture**

Everything mentioned above is affected by one important factor, which is the funding of cultural institutions. Unfortunately the economic crisis in recent years has brought about great changes to their operation. “The funding to the cultural sector has been drastically reduced” (Tsiara, 2015, p.176). It is, therefore, a challenge for museums to adopt digital technologies during the economic crisis.

In these turbulent austerity times, the role of the museum seems to be the object of research. Using a literature review, Mudzanani (2015) explores how museums can serve other roles than the strictly educational one and how they can contribute to economic development. According to Mudzanani’s findings, museums should actively show the socio-economic opportunities that they can create and instead of being threatened by economic austerity they can become a resourceful part of society. As Mudzanani proposes, a way for this to be achieved is the establishment of partnerships by museums with other organizations such as chambers of commerce, educational institutions, government agencies and tourism organizations (2015, p.337).

There are several scholars who pay attention to references in the literature about the consequences of the economic crisis and austerity policies for museums and their financial handling. For example, Siegal (2013) describes a paradoxical situation where European countries that have a history of supporting cultural activities such as the United Kingdom, the Netherlands, Italy, Hungary and Portugal were forced by the economic crisis to significantly reduce annual budgets for museums, archives, art galleries and other cultural organizations. A key point in this article is the fact that cultural activities were supported by public money, and as the author says it is now “hard to fathom in the private fund-raising culture of US” (Siegal, 2013, p.40).

Relevant to this problem of finding funds for the museums in times of crisis is Lindqvist’s research. She argues that there is not yet extensive research into the direct and indirect effect of the economic crisis on museums (Lindqvist, 2012). Lindqvist
(2012) suggests that the financial management of museums, which receive their revenues not only from the State, but also from donors, visitors, customers, etc., is not simply a matter of finding a new revenue source. Instead, the author suggests that museums invest in long-term relationships with “friends associations” in order to achieve financial stability and avoid being vulnerable to any potential changes (Lindqvist, 2012, p.10).

An issue that is also relevant with museum budgets is budget allocation. Munoz-Darde (2013) provides an excellent exploration of this issue through the example of an excessively expensive sculpture placed in front of a hospital. This raised a conflict between the basic needs against the cultural needs of the hospital. This leads Munoz-Darde to provide several suggestions on how a budget allocation should be handled in order to provide for both those needs and closes with a connection of cultural needs to the idea of “social goods as collective needs” (2013, p.242).

Finally, an article by Tsiara (2015) examines how Greece is dealing with the cultural sector in the times of economic crisis. The article argues that the sustainability of cultural institutions is greatly threatened since they have low priority in receiving funds. As a response, guided by artists themselves, a new approach of “self-management” and “new artistic collectives appear and strive to realize their social interventions with minimum resources” is rising (Tsiara, 2015, p.177).

Conclusion
The work presented above shows that there has been extensive research into museums. The development of technology and later of digital technologies that gradually became part of our lives affected the field of museums. Digital technologies change the traditional image of museums since they are evolving daily and are used by museums as a modernization tool for better viewing of their collections and as a means to attract new visitors. Mobile phones, social media, QR codes, online games and applications, multimedia, MOOCs are just a sample of what kind of digital technologies a museum can use in order to become more attractive.

In addition, museums are trying to be part of society and to attract not only tourists but also people who live in local communities around them. The traditional educational character becomes broader since digital technologies support new educational activities which follow new trends in learning. The museums go “outside the walls” with their digital collections. Visitors can find a wealth of information and images in these collections even if they cannot visit the museums.

Research has also focused on the economic crisis, which was the reason for reductions in funding cultural institutions. The challenging topic I want to research in my thesis is how in Greece, a country plagued by economic recession, a university museum could employ digital technologies in order to attract new visitors when government funds are no longer available.
4. Paradigm, Methodology and Methods

This chapter introduces the interpretive paradigm, which this thesis is based on, as well as the methodology and the methods that have been used. Additionally, it describes the participants of the research as well as how data were collected and analyzed. Finally, it illustrates the validity and reliability of the study and the ethical considerations that rose while planning and conducting the research.

Paradigm

A ‘paradigm’ underlines “the assumptions about knowledge and how it can be obtained” (Hirschheim, 1992 cited in Myers, 1997). Each scientific field adopts a set of assumptions and based on these, it shares ideas and views and participates in common practices (Hirschheim and Klein, 1989, p.1201).

The paradigm in this research is the interpretive one, through which I attempt to understand and explain the phenomena by taking into account “the meanings that participants assign to them” (Orlikowski and Baroudi, 1991, p.5). The interpretive paradigm relates to this research as part of its aim is to arrive at a deep understanding of the staff and volunteers’ experience during their contact with museum visitors. This experience can help interpret the characteristics and the expectations of visitors and how these affect the current or future use of digital technologies in attracting new ones. Furthermore, the staff and volunteers’ characteristics and expectations also need to be understood in depth since they are the ones who will be called to support any new digital technologies in the museum. Finally, another important part that I need to comprehend is the external factors such as economic issues, which influence museums and their decisions on the application of digital technologies.

According to Walsham (2009, p.5), interpretive methods of research spring from the theory that reality is constructed by society, and thus, its perception is subjective. It is, therefore, obvious that interpretive studies do not look for the one and only objective truth of the world. Additionally, there are no correct and incorrect theories in interpretive research but it is only through discourse with others, the way the research was conducted and could be evaluated (Walsham, 2009, p.6).

Walsham (2006, p.321) also observes that while the researchers’ use of interpretative approaches is on the increase, there are no specific guidelines on how to conduct an interpretive research. In order to compensate for this weakness, he sets out to address the following: 1) how to carry out fieldwork, 2) the role of theory and data analysis, 3) constructing and justifying a contribution to ensure the quality of work and 4) dealing with ethical issues and tensions which arise before and during research. These are the guidelines that this research is based on.

One of the main decisions in carrying out fieldwork is choosing a style of involvement. According to Walsham (2006, p.321), there are two styles of involvement: the outside/neutral researcher and the involved/active researcher. This decision influences how the research is planned and carried out. Specifically, my decision to be an involved researcher led me to seek contact early on with the
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manager who was responsible for the place where I intended to conduct my research. Thus, I could ensure access to the area and information, as well as get to know the staff. The fact that I worked in Greece at the UoA facilitated the communication with the participants and the data collection since the language of communication and culture are the same.

Next, I chose the theory upon which to rely to analyze my data, which is elaborated later in this chapter, and I justified this choice. The purpose of each investigation is to contribute and to promote science, thus I explained how my research would contribute to the IS field and which particular audience it addresses. Further, the ethical considerations were included since I started planning my research. My main concern was to ensure participants’ confidentiality and anonymity because I did not wish to cause them any inconvenience. In addition, I ascertained that the source references are used accurately, according to the rules and guidelines for research.

**Methodology**

An ethnographic methodology will be used which aims at looking at the world the way it is experienced by those who live in it (Crang and Cook, 2007, p.1). That means that data are collected through direct contact with the participants and the context of this research. These data can be affected by two factors. The first one is the way that the relationships amongst people of similar or different background develop while the second one is the researcher’s ‘outside life’ for instance, friends and children (Crang and Cook, 2007, pp.9-10).

The understanding of human actions and of the world in general can support the design of new technologies (Blomberg et al., 1993, pp.139-141). Moreover, Blomberg et al. (1993, pp.141-142) mention many ways in which ethnography relates to design: understanding the setting where technology is employed, avoiding imposing the designer’s ideas, exploring the use of specific technologies, seeing how technology works in the context it was designed for, allowing users to imagine new ways of use, as well as finding the relationships between different users in the setting which affect the technology design.

This relation of ethnography to design is the reason why more and more research related to museums and to designing of digital technologies applies this particular methodology (Crabtree, 1998; Moura, 2011; Hackett, 2014; Storz, 2015). The designer is no longer regarded as an expert because it has been observed that many times s/he must create something for a workplace that s/he does not know very well. Therefore, in this case ethnography is particularly important since it encourages reflection, which leads to a broader understanding of both the environment and people in their daily activities and lives, and thus contributes to a more accurate interpretation.

The methods included in ethnography are observation, interviews and document analysis. These are followed if we want to collect “first-hand experiences, fact-finding, referrals, collected bits of paper, sketching and photography etc.” (Crang and Cook, 2007, pp.131-132). The data collected from these methods are qualitative since the ethnographic methodology is “a qualitative orientation to research” (Randall, Harper and Rouncefield, 2007, p.169). Due to the wide variety of the collected data,
they should be systematically analyzed. An in-depth analysis is necessary in order for the researcher to make sense of the data and come up with conclusions.

Ethnography is also used in Participatory Design (PD), as a means to study work practices and to receive a foundation for the design. Ethnography in itself is not necessarily oriented towards changing the environment being explored, while on the other hand PD is not always concerned with acquiring a deep understanding of the context of design. In a way, PD provides an outlet for ethnography’s descriptive process since even though change is not a part of ethnography in itself, it can be fuelled by the understanding provided by ethnography (Blomberg and Karasti, 2012, p.91).

Participatory Design (PD) emerged in Scandinavia in the 70’s and has been established since then as a design approach which argues for the participation of end users and relevant actors throughout the process of designing new technologies. PD first focused on the workplace, and aspired to ensure “a better fit” between the technologies introduced and the way workers had already been doing their jobs (Kensing and Blomberg, 1998, p.168). Throughout the years, other participants coming from the workplace and belonging to higher hierarchies have been sought out as well. PD has also expanded in other places, including cultural organizations (Kensing and Blomberg, 1998, p.168).

PD has two main values: the equalizing power and the democratic practices. According to these values those who participate in the design process have a different background, knowledge, experiences and mentality (Van der Velden and Mörtberg, 2014, p.4). Moreover, the democratic character creates a climate of trust amongst the participants because everyone is treated equally, and thus facilitates the design process (Van der Velden and Mörtberg, 2014, p.4). Kensing and Greenbaum add four more principles to these values: “situation-based actions, mutual learning, tools and techniques, and alternative visions about technology” (2012, pp.33-34).

The principles of ethnography and PD can complement each other in many ways. Blomberg and Karasti (2012, pp.90-91) mention, for instance, that as participatory design respects the different knowledge of the actors involved in design, ethnography also focuses on getting the insight of those actors by becoming part of their context. This opportunity to become part of the participant’s context also strengthens the basis for mutual learning between participants and designers. Though the meaning of participation itself may somewhat differ in ethnography and participatory design, their commonalities and complementary possibilities can enrich the conduct of this research.

By using the ethnographic methodology and Participatory Design approach in this research, and in my capacity as a researcher, I can come in direct contact with the ethnographic group of those who work in the museum as employees or as volunteers and those who visit the museum. Also, through the PD approach, participants have the opportunity to contribute their suggestions using their experience and knowledge. Finally, the ethnographic methodology will allow me to become immersed in the context of the museum and to gain valuable insight.
Participants
The research will be conducted in the Mineralogy and Petrology Museum of the UoA from 20 March to 20 April 2016. I conducted interviews, workshops, thinking aloud sessions as well as passive and participatory observations. The participants and the methods in which they participated are presented in Table 1. An overview of the methods will be presented in the next subsection.

Table 1: Participants

<table>
<thead>
<tr>
<th>Participants</th>
<th>Number of persons</th>
<th>Participated in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Museum’s employees</td>
<td>4</td>
<td>Interviews, Thinking aloud and Workshop</td>
</tr>
<tr>
<td>Artists</td>
<td>10</td>
<td>Interviews and Workshop</td>
</tr>
<tr>
<td>Volunteers PhD, master and postgraduate students, museologist</td>
<td>7</td>
<td>Workshop and Interview</td>
</tr>
<tr>
<td>Visitors Group 1: Director’s friends and the Director acting as a tour guide</td>
<td>25</td>
<td>Passive observation</td>
</tr>
<tr>
<td>Visitors Group 2: Students of 3rd High school class and staff member tour guide</td>
<td>40</td>
<td>Passive observation</td>
</tr>
<tr>
<td>Visitors Group 3: Students of 1st High school class and staff member tour guide</td>
<td>70</td>
<td>Passive observation</td>
</tr>
<tr>
<td>Visitors Group 4: Postgraduate students of Faculty of History and Archaeology and staff member tour guide</td>
<td>25</td>
<td>Passive observation</td>
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<tr>
<td>Sunday Mornings visitors, staff and volunteers</td>
<td>Up to 500</td>
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<tr>
<td>Sunday Mornings visitors children, staff and volunteers</td>
<td>70</td>
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<tr>
<td>Sunday Mornings visitors families, staff and volunteers</td>
<td>25</td>
<td>Participatory observation</td>
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People’s participation in my research was done after arrangement and their contribution was voluntary. In methods subsection below I will describe the participation at length.

Methods
In this subsection, I will first present the data collection methods and then the data analysis methods. Due to my use of ethnography, I decided to apply the following methods: observations, interviews, thinking aloud and workshops.

Data Collection
I started gathering empirical material on March 20th and the collection finished on 20 April. The methods were conducted in Greek and the language in which the thesis is written is English. That is why whenever I collected information from a method I made a transcript first in the Greek language and then I translated it into English.

Observations
Observation is the primary means that ethnographers have used to observe peoples’ everyday life and to understand their views (Crang and Cook, 2007, p.37). An observer can be passive or participative. The passive observer adopts a detached point of view, simply recording or taking notes, without actively taking part in the practices s/he observes.
Passive Observation:
The observations were conducted between 20 March and 17 April, 2016. Four different groups were observed: a group of middle-aged friends of the director of the museum, a group of 3rd year junior high school students, a group of 1st year junior high school students and a group of students of the School of Philosophy. These groups had already made reservations for the dates during which the research was being conducted, and were selected due to the diversity of their composition.

Every time before I began the passive observation, I informed the responsible leader of the groups about my research and asked for oral permission to be with them during the guiding tour. I documented the observations by keeping notes about visitors’ reactions towards the exhibits, the questions they asked the guide, their impression of the museum and their attitude towards their visit in general. My notes included answers to the following questions: Are they interesting in revisiting some of the exhibits after the completion of the tour? Do they want to be photographed with the exhibits? Do they want to buy a souvenir? There was no hesitation on the part of the groups to consent to my presence since there was no recording or taking pictures of them. On the other hand, I focused on taking pictures of the exhibits that drew the visitors’ attention the most, but only after they had left the museum in order to avoid including visitors in the pictures.

First group on 20th March:
The first group was a group of middle-aged people who were the director’s friends. For this reason, the guiding tour was conducted by the director himself, it lasted almost two hours and was detailed. After that, they spent half an hour in the conference room where they talked about the tour and before they left, they took commemorative photographs inside and outside the museum.

Second group on 21st March:
The second group comprised 40 third year junior high school students, aged 14-15 years old. They were accompanied by 3 teachers. The groups were divided into two groups. The tour started for both groups at the same time, but from different rooms in the museum. One guide was a PhD student and the other was an employee. I joined the group guided by the employee. The tour lasted 45-50 minutes. Then, the students had half an hour at their disposal to wander freely in the museum and take pictures.

Third group on 28th March:
The third group was a group of 70 first year junior high school students, aged 12-13 year old, accompanied by 5 teachers. The students were divided into two groups guided by an employee and a PhD student correspondingly. I joined the group guided by the PhD student. The tour lasted 45-50 minutes. Talking with their students after it, the teachers made connections between the information given by the tour guides and what students had been taught in school.

Forth group on 6th April:
The forth group consisted of 25 students of the School of Philosophy, Faculty of History and Archeology of the UoA. They were 19-21 years old and were accompanied by 2 professors. The guided tour lasted one hour. The first half was conducted by the director and the other half by an employee. After the tour there was
a discussion between the professors and the students over some rocks that were of special interest for their studies.

After the end of each observation I was allowed into the employees’ office, to edit my notes and make additions while discussing with the employees about each group of visitors. The field notes were later transcribed into a computer.

**Participatory observation:**

The participatory observations were carried out on three Sundays in April 2016. My research coincided with the “Sunday mornings in the Museum”. All three Sundays the museum was open to the public from 10.00-14.00, where they offered tour guiding and special events. The observations were conducted from 9.30-14.30 and I carried out participatory observation. I also included sketchy notes, which I transcribed the same day, including more details about what I had observed.

Each of the three Sundays, I adopted a different role as a participative observer so that I could observe the events and activities from a different point of view.

**Sunday 3 April**
On the first Sunday, I was a visitor like everyone else. The audience of this day was comprised of people of various ages, who participated in tour guiding. As I was following the tour guiding, I observed the impression that caused the exhibits to visitors. The program on the day included the opening ceremony of MinerARt, see Appendix B, and two guided tours: one of the museums’ exhibits by the director and the other of the artifacts by the museologist.

**Sunday 10 April**
On the second Sunday, I had the opportunity to work voluntarily in the museum. Children took part in three educational activities and I observed which activities and which exhibits were more popular with them and in what way.

**Sunday 17 April**
On the third Sunday I took my children to the museum and I joined them in the ‘Family activities’. That gave me the chance to observe how a whole family coming together interacts with the minerals used in this educational activity. At the end, my children and I talked about their impression of the activities in which we participated.

Additionally to the Sunday morning’s observations, I also had interactions with the staff while I was present in the museum. As this was a participant observation, I took the chance to become part of the context being explored, thus I developed certain relationships with the staff and had them share with me what is ‘going on’ in the museum (Hunt, 1989; Wax, 1983 cited in Crang and Cook, 2007, p.37). I kept notes of these informal discussions that I had with the staff on a daily basis.

**Interviews**
Interviewing has served as the main means that ethnographic researchers use in order to deal with different aspects of people’s everyday lives such as the social, cultural, political and economic ones (Crang and Cook, 2007, p.60). Since the primary aim in interviewing is to let people describe their own versions by using their own words, it
is necessary to encourage them bring to mind whatever they know about events and activities. Later on, specific questions can be asked to acquire information that the researcher deems important (Crang and Cook, 2007, p.69). The researcher can choose between ‘formal’ and ‘informal’ interviews as well as amongst fully structured, semi structured and unstructured ones (Crang and Cook, 2007, p.60). Semi structured and unstructured interviews give greater freedom to both the interviewer and the interviewee.

I carried out 15 semi-structured interviews. The 4 formal interviews with the staff of the museum were conducted in the museum’s conference room, and the 11 informal interviews with the artists were conducted in the exhibit halls. According to “Good research practice” (C.O.D.E.X., 2016), before the interview I informed the interviewees of the purpose of my research as well as about how and by whom the information will be used. Before the interviews started, I asked the interviewees of the formal interviews to read and sign the consent form, see Appendix C. The formal interviews lasted between one and one and a half hour. I used two sets of questions: for the director, see Appendix D, and for the staff, see Appendix E. These interviews were recorded and transcribed verbatim afterwards but they were not sent to the participants for further confirmation.

The informal interviews took place while the museum was closed to the public and the museologist with the artists were setting up their exhibits for MinerART. I informed them about my research and I asked for their oral permission to interview them. Each of these interviews lasted between 15 and 20 minutes. I used two sets of questions: for the museologist, see Appendix F, and for the artists, see Appendix G. I kept notes and as soon as I completed the interviews, I transcribed them onto my computer but I didn’t send them to interviewees for confirmation.

**Thinking Aloud**

Thinking aloud is a method used “for gaining firsthand experience with work practices” (Bødker, Kensing and Simonsen, 2009, p.250). The researcher observes a person who performs an activity and simultaneously talks about what s/he is doing or thinking. The researcher can encourage the actor during this procedure by asking questions in order to clarify everything. Video and audio recordings can also be used to document the data collection, however, the researcher has to take into consideration the time factor, since transcriptions made afterwards are very time-consuming (Bødker, Kensing and Simonsen, 2009, p.251).

Thinking aloud was used to indentify the specific criteria that a mineral needs to meet in order to become a part of the collection, in other words, what makes a rock more important than another one. How minerals are extracted and processed before they are exhibited was also examined. It was necessary for me to understand the content of the museum as well as its value better in order to use this information when exploring ways to attract visitors.

The first thinking aloud was scheduled on 7 April with the director of the museum, who explained to me how a mineral is extracted from the ground and ends up in the museum. This session was recorded after permission and later transcribed. The second thinking aloud session was actually unscheduled and was with a staff member who explained to me how one can make a geological rock section. Since it was
unscheduled it was not recorded but documented by field notes, which were later transcribed and stored on my computer.

Workshop
The workshop is a method in which the members of a group work together on a specific issue for a short time. It is a collaborative method with a strong connection to Participatory Design (PD). Participants work together to gather, understand and analyze information in order to generate new ideas. This initial brainstorming aims, as is the direction of PD, at imagining a utopian perspective of the current situation (Brandt, Binder and Sanders, 2012, p.152). In order to prompt the imagination of participants, additional people with experience and knowledge of the subject explored may be invited to a workshop. The techniques used in a workshop can be freehand drawings, collages, Dead Sea scrolls, affinity diagrams, role lists, communication models, timelines, design sketches or data models and the selection of these depends on the perspective the researcher wants to adopt each time (Bødker, Kensing and Simonsen, 2009, p.252).

I started looking for participants for the workshop ten days before it was conducted in the museum. Those interested gave me their email and we found a convenient meeting time and place for everyone. The workshop was held on 11 April in a conference room at the museum which I had set up so as to facilitate the whole process, see Fig. 11. Ten people participated in the workshop: 2 staff members, 2 artists and 6 students (PhD, master and postgraduate). The workshop lasted 2.5 hours. The discussions of the workshop were centered around the digital technologies that can be employed in the museum and in the ways they can be used to attract new visitors.

![Figure 11: The conference room reminiscent of the 1958 school class](My personal archive, 2016)

At the beginning of the workshop I welcomed the participants, thanked them for coming to the workshop. Next, I asked them to take a look at the consent form. Also, I said a few words about myself and my background and then gave them the floor so that they could introduce themselves, see Appendix H. After getting comfortable with
each other, we had a brainstorming session, talking about digital technologies in the museum and started discussing the emerging ideas while I kept notes of everyone’s ideas. We used these to make suggestions of how new visitors can be attracted by making use of those technologies. During the workshop each participant kept notes which they gave to me at the end of the workshop, see Appendix I.

I transcribed them and categorized all the suggestions made at the workshop. Two days later, I sent the categorized suggestions that emerged from the workshops to the participants. I asked them to take a look at them and see whether they were inspired and comment on whether they had new ideas after looking at them all summed up together. Three of the participants made some additions, sent them to me through e-mail so that I could incorporate them in the first notes and then I sent the whole document to all of them since some of them seemed interested in having those ideas for further developing them in the museum.

Data Analysis
The analysis of the data had to take into account that ethnographic research produces qualitative data. Lichtman writes that qualitative research “is usually a solo activity” (Lichtman, 2013, p.250), not because the researcher does it alone, but because the collected data will be unique according to the participants and the context of the research, and there will be no reference point to guide in their analysis and interpretation. Thus, the researcher must be very well prepared and organized in her/his research; since otherwise s/he will probably miss important information.

I chose to analyze the data by applying “The three Cs: coding, categorizing, and concepts” suggested by Lichtman (2013, p.251). I used Lichtman’s model to draw the figure that meets my research, see Fig. 12. As shown in this figure I coded the raw data collected and classified them into different categories. Then, I turned them into concepts, as it is illustrated in the following graph.

![Figure 12: Three Cs Analysis: Codes, Categories, and Concepts (Lichtman, 2013, p.252)](image-url)
This process according to Lichtman (2013, p.252) comprises 6 steps:

Step 1. Initial coding. Going from responses to summarizing ideas of the responses
Step 2. Revisiting initial coding
Step 3. Developing an initial list of categories
Step 4. Modifying initial list based on additional rereading
Step 5. Revisiting your categories and subcategories
Step 6. Moving from categories to concepts

Data Analysis Procedure
In step 1, the initial coding, I went through the transcribed interviews and coded notes from the observation, thinking aloud session and workshop, and extracted small sentences that resulted to 510 codes. These were transferred to a new document. In revisiting the initial coding, step 2, I went through these initial 510 codes again, deleted the duplicated ones, and unified the codes with the same meaning. After this procedure, the remaining codes were 431.

Moving to step 3, categories, I categorized the initial codes in relation to the aim and research questions. The initial categorization resulted in 68 categories. In step 4, again I revisited the initial categories and deleted duplicates and merged similar ones. After that there were 51 categories left. Finally in step 5, by revisiting the categories I made some small changes to subcategories and how they are expressed according to how the categories were now shaped and in relation again to the aim and research questions.

Finally, I condensed these categories into 7 concepts by connecting the categories together. Those were: economic crisis-budget, conditions-policy, the museum as a cultural cradle and society, the museum’s collections and exhibitions, visitors of the museum, guided tours and new digital technologies in the museum. Then, I interpreted these concepts and drew conclusions. I give a more detailed example of the abovementioned procedure in Appendix J.

Validity and Reliability
In order to judge the quality of a research we should define some criteria. Guba (1981 cited in Shenton, 2004, p.64) suggests four criteria to ensure the trustworthiness of a qualitative research: credibility, transferability, dependability, conformability. Below I explain how I tried to meet those criteria in my research.

Credibility refers to the level of correspondence of the findings of the research with reality. Since I am an employee of the UoA myself, I had the opportunity to evaluate the credibility of the participants’ involvement and narratives, and could also confirm them. The fact that the museum employees were my colleagues had a positive effect since they felt more at ease and could share their experiences without inhibitions. Besides, they were aware that I could recognize the economic problems they faced since they were similar to the ones that the university libraries face.

Also, to ensure the credibility of the data of the research I recorded the interviews as well as the conversations held in the workshops, transcribed them verbatim and I read them twice to ensure no mistake was made during this process. During the coding
process, I checked the codes thoroughly so that any possible alteration in meaning would be avoided.

Transferability refers to the level that the findings of the research can be applied to other situations. The research has the purpose of providing suggestions to attract visitors to museum. Due to the fact that the research is conducted in a specific museum at a specific time, the application of the outcomes in other situations will have to be accordingly adjusted since the context will be different. In the case of the UoA, the findings can be useful to 15 academic museums that are subject to the UoA and are bound by the same policies, thus there are similarities between them. Even in this case, the findings should be used with proper care, given the differentiations that exist due to the different content and resources of the museums.

Dependability refers to the reproduction capacity of the research and its outcomes. This is a criterion that differs greatly from quantitative to qualitative research since there are no countable data in qualitative research to reproduce. There is no way to ensure replication of the research and its findings considering that events such as the Sunday Mornings take place twice a year, the MinerART exhibition was the first one, the director of the museum will be retiring, and many other unique circumstances. For instance, the number of participants might be smaller and their nature different if someone decides to repeat this research during the summer. Moreover, the artists would not have been present had it not been the time of the MinerART exhibition. None the less, the detailed account of the context, conduct of methods and findings, can be seen “as a prototype model” (Shenton, 2004, p.71) that other researchers can use to repeat the research in a different context.

Confirmability refers to the level of objectivity of the research and the extent to which the findings are results of the data generated by participants and not the researcher's background. In qualitative research, of course, we cannot speak entirely about objectivity but by using this word I mean diminishing “the effect of investigator bias” (Shenton, 2004, p.72). During the research I paid daily visits to the museum, applying an array of diverse methods, communicating and observing visitors, employees and volunteers. In these interactions I tried to give my full attention to understanding the participants' comments and behaviors from their point of view, instead of imposing my personal explanations.

Qualitative research cannot be absolutely objective. In this case, since I did ethnographic research and immersed myself in the research context, it is inevitable that the interpretation of the generated data will be affected by the researcher and her/his background to a certain extent. In my case, the fact that I am employed at the UoA may perhaps affect my view of the data.

Ethical Considerations

When planning and conducting a research, the researcher is called upon to deal with some ethical considerations.

I am an employee at the Faculty of Philology of the UoA, however, I had to ask for permission from the director of the university museum in order to conduct my
research in the Faculty of Geology and Geoenvironment. I also had to request the consent of employees working at the Mineralogy and Petrology Museum, see Appendix C.

During this study I got in touch with several people in order to obtain the information that was necessary in my research. In my experience, whenever the word ‘research’ is uttered, it causes hesitation and fear to participants. This reaction is reasonable since ‘research’ always raises many questions such as where this information will be used, who I am going to be exposed to or whether participating will cause a problem to my work or to my personal life. Thus, “confidentiality and anonymity” towards third parties (Walsham, 2006, p.327) are the basis for a good cooperation and for creating a pleasant atmosphere. However, if someone searched systematically, they could find out who worked at the museum over the period the research was done.

I thought of not mentioning the museum’s name but it would still be easy for the reader to discover it since it is the only university museum in Greece with a collection of minerals and rocks. I chose to use the participatory approach, which involved my presence in the museum both during the tour guiding and while employees were working in their offices or laboratories. However, I neither impeded the flow of their work nor made them feel uncomfortable on any occasion. Before starting collecting data, I informed the participants of the aim of this research and assured them that all the collected data were going to be used exclusively for that purpose. I also explained to them that their participation in the research was voluntary and they could withdraw at any time without being accountable for it.

Those who were willing to participate in the interviews and workshops received a consent form that they had to sign. In that consent form, see Appendix C, I included my request for their permission to record the interview itself and the conversations that would be held in the workshops. Moreover, I chose not to take pictures of visitors during tour guiding for two reasons. The first one was that I did not want them to lose their spontaneity and the second one was that I did not wish to interrupt the flow of tour guiding.

Another issue concerning the visitors came up on Sunday mornings. Because the number of the visitors on Sundays came up to 500, it was impossible to request permission from each and every single visitor. Thus, having ethical dilemmas, I specifically concentrated on the exhibits when looking at the interactions between them and the visitors. This was also the reason why I took pictures of the exhibits that visitors looked at, and not the visitors looking at them, to further consider the visitors’ confidentiality. I took pictures of the exhibits that impressed visitors the most after they had left the museum and I did so beyond the visiting hours, when visitors were not present. The Mineralogy and Petrology Museum, is one of the rare cases of museums that allow photos of the exhibits to be taken. I did not record anything during the times when visitors were present and limited myself to taking notes.

The collected data were stored and only my supervisor and I had access to them during the empirical material. After its completion, the recorded files will be destroyed while I am not going to use the pictures given to me by the museum in any other research, without obtaining permission first.
The collected data were in Greek since all the participants were Greeks and I had to be very accurate while translating.

During this research I tried not to be biased and to leave behind my own beliefs and opinions as much as possible.
5. Empirical Findings

This chapter presents the findings of the research according to the concepts introduced in the previous chapter, a conclusive summary of the suggestions that came up during the research as well as the way the findings relate to them.

Adopting the process of the thematic analysis and examining the content of the data concerning the research questions, I came to some realizations. I had the opportunity to create an overall picture of the external factors that affect the university, the inside workings of the museum, the advantages and limitations of being subject to an educational institution, the value of the collection, the abilities and willpower of the staff to support the museum, and finally the current and possible future visitors of the museum. All these factors form a good basis for answering the research questions about the external factors that affect the museum and determining further use of digital technologies in the museum.

The 7 concepts that emerged from the thematic analysis present the external factors that affect the operation of the museum such as the economic crisis and the policies of the UoA, the role of the museum within society as a cultural cradle, and finally all those parts that constitute the museum in its wholeness such as the collections and exhibitions, the visitors of the museum and the guided tours. Finally, in regard to the research questions, what is presented is not only the current use of new technologies in museums but also their possible future uses, according to what participants proposed during the research.

Economic Crisis – Budget

The global economic crisis that arose eight years ago had a profound effect on all the sectors of the Greek state. The consequences of this situation became apparent very soon and the reality the citizens had to come to terms with was particularly cruel since the state provisions towards society were significantly decreased. One of the sectors that was severely affected was the educational one. The state budget, which up to that time financed the free public education, could not cover the basic needs of the educational institutes. The only solution for the Greek state to meet its obligations to its lenders and to cover the operational expenses of the Public sector was the decrease in the public expenditure.

This resulted in a dramatic reduction in financing educational institutes. In particular, the budget of the University of Athens decreased even up to 80%, which meant that it could cover its fixed expenditures with difficulty. The director explained the impact the reduction had on the museum in the following way:

“As you yourself can understand, with such a major reduction in the budget the university had to reevaluate its priorities, and guess who wasn’t on the top 5! A lot of academic museums and libraries are currently running on insufficient or no budget at all.”

The university museum employees as well as I who work in an academic library were very well aware of this issue. During the interviews and our chats in the museum, the
employees expounded on the changes the economic crisis brought about and one of the staff members said:

“I’m just going to tell you this, when I first started working here, the budget was up to 4,000 euros, then, when the economic crisis arose it suddenly went down to 1,000 euros. That is 1/4 of the initial budget! And it didn’t stop there. It was then lowered to 200 euros until finally we came to a round empty zero.”

Nowadays, the earnings of the museum come only from visitors’ ticket, which is 2 euros per person. Out of this amount, 15% is withheld for research at the university while the rest covers the museum expenditures. Besides these earnings, the museum occasionally receives subsidies and donations from companies or individuals with the same objectives. According to the policy of the museum, in the context of financial transparency, it does not accept donations in cash but only material donations. For example, the benefactor could pay for for the purchase of a new sample or for the construction of a showcase, etc.

The economic crisis had also consequences for the flow of visitors in the museum. All museum staff talked in detail about the reduction of visitors and one of them described what they faced as follows:

“Well, visitors have decreased, you know, and since we have no budget, visitors are the main source of income for us. However, you can’t always help it because visitors are also facing financial problems. For example, we have a lot of schools coming here, and you know, teachers call and say that they have students who cannot pay 2 euros for the entrance ticket. On the one hand, you can’t let everyone come in for free, but how can you refuse children the right to come to a museum? So we also have to make some compromises for better or worse.”

Taking into account that many possible visitors might not spend money to visit a museum they were unfamiliar with, according to what the staff and the volunteers told me, in an effort to attract new visitors, the museum organized “The Sunday Mornings at the Museum” with free admission. This was an extremely good advertisement of the museum leading to an increase in the number of visitors the last two years, which almost reached the same levels as before the crisis. Even so, the museum could not cover the gap that lack of funding had created.

This of course also affects the development of the museum. Despite the efforts the staff makes to overcome the difficulties, very often they feel frustrated as reflected in the words of one of them who confesses the following:

“There are days when we can’t see a way out, if you know what I mean. With no budget we can hardly think of the development of the museum. I cannot imagine that we will have chances any time soon to make radical changes and become a modern museum. We currently find it difficult to enrich our collection. Our last addition was five years ago, for crying out loud!”

Nowadays, in order for the museum to acquire a remarkable sample, it must spend 3,500-4,000 euros. However, this amount is far beyond its financial capacity. Also, there are more practical, everyday problems that the museum has to face.
What follows is an explanation as to how the museum covers its expenses, as it is given by the director:

“Well, you understand that keeping a museum running takes a lot of maintenance concerning the building. Right now, there is a leak in the roof. Thankfully, the repairs will be covered by the Faculty of Geology and Geoenvironment since there is no specific budget for us as a museum to cover these.”

Despite the adverse economic circumstances, the museum employees continue to have a vision and plans and they hope that at some point in the future the situation will change for the better. Using the means they have and with the volunteers on their side, they keep the museum doors open to whoever wants to become acquainted with it.

**Conditions – Policy**

Another determining factor for the operation of the museum that emerged from the analysis, is the conditions and policies imposed by the university. The UoA as well as every corresponding educational institute has a specific hierarchical structure and a number of rules and regulations that define its function and the decision making process. As a consequence, the *Mineralogy and Petrology Museum* cannot adopt policies outside the framework established by the university as a whole.

The hierarchical structure of UoA for issues concerning the museum is the following: Rector, Vice Rectors, Senate, Deanship, Faculty of Geology and Geoenvironment and the director with the three-member committee. The Senate makes some decisions for all the university museums of UoA, with which the museums must comply. However, it is the director who is responsible for the museum administration. He makes the final decisions for museums’ collections, events, etc. Nevertheless, when urgent issues come up, there is a three-member committee comprised of professors of the Faculty of Geology and Geoenvironment, which can help and support him. This committee has a purely advisory character.

Apart from the Senate and the director, the policy of the Faculty of Geology and Geoenvironment plays an important role in the operation of the museum since it determines the allocation of the staff. The staff of the museum consists of three employees, two of which belong to the Faculty itself. Even though they are employees of the museum, they have been asked by the Faculty to fill in for laboratory professors for courses of the Faculty, since there have been no new hirings of teaching staff for the last eight years and shortages are now appearing. The director explained:

“We are not exclusively museum staff, actually. The two of us also fill in for laboratory staff for the Faculty since there is no teaching staff available. So we act as professors too! You know it’s an interesting experience, but if you think about it, if the Faculty can’t hire teaching staff and retirements continue, we might end up being pulled out of the museum and work as teaching staff in the end. So what will happen to the museum then? You might be able to operate with a small staff but I’m not sure one employee in a whole museum can be regarded as staff anymore!”
The scheduled times of courses that require the presence of museum staff are not the only conflicts that occur due to the museum being subject to the university policies and Faculty needs. The days and hours the museum is open have been decided according to the facilitation of teaching in the interest of university students and the enhancement of the lessons by using remarkable samples. The museum is closed in the afternoons and at weekends, which makes visiting the museum difficult. It was only after the director’s request that the university granted permission to the museum to open six Sundays a year. Nevertheless, during this period, no means of public transport reach the museum, thus making access to it is difficult for those who do not own a car.

The Museum as a Cultural Cradle and Society
The role of the museum in society was also an important factor expressed in the research. The museums are not only collections of objects and works of art. They invest in human relations and they become part of the local communities as they try to embrace issues that concern our era. The role and the objectives set by each museum affect its function and its relationship with visitors and the community itself.

Greece is a country with a long history that begins in Antiquity. Ancient Greece has become a synonym of Greek culture and civilization. That is why the word ‘museum’ evokes marble pillars and statues, which constitute the peak of classical art. Though these may axiomatically be accepted as valuable cultural asset, whether a rock or mineral should be kept in a museum showcase may easily be called into question. The director of the museum elaborated on this matter, as follows:

“Of course the minerals are a part of our cultural heritage! It’s not only the mineral itself, but also the stories and people who are connected to it. Did it come from just around the corner or from some exotic place on the earth? Who dug it out and why? How did it take this shape when it could have been formed in an entirely different way? Was it part of a collection of someone famous or significant before it came here? Are there more where this came from?”

Being part of the cultural heritage of the country and being closely connected to history, figures and culture of Greece, the Mineralogy and Petrology Museum qualifies as a cultural cradle. The museum is unique in Greece as regards the geological content of its exhibition. Parts of this exhibition also come from unique donations from distinguished figures not only of Greece but also of other foreign countries. Additionally, the museum has a specialized staff, which plays a significant role in the operation of the museum at all levels. According to the information I gathered during my research, the employees have Geology Diploma, Masters and PhD. This means that they have a deep knowledge not only of the exhibits but also of the scientific field of Geology.

The current policy of the museum, which belongs to an academic institution, is directed towards supporting education. This does not concern only students of the university, which the museum belongs to, but also school students. The museum aims to arouse the interest of the latter in the world of geology. Consequently, it is of the highest importance to make it accessible also to others than university employees. In
addition, this museum has unique educational programs that constitute a model for other academic museums.

This educational orientation is evident in the consciousness of the staff who supported the concept that the museum is related to society as an educational organization. This was emphasized not only by the director but also by the other participants. The fact that the museum belongs to the UoA and that its main body of visitors consists of school and university students strengthens the educational orientation. None the less, the employees who participated in the workshop started to think during our discussion what other directions the museum might take and what relations it could develop with the local community. One of them stated:

“We had never considered until now that we could attract people from the surrounding municipalities. We always had a strong educational orientation.”

This outcome illustrates that with the promotion of the museum in nearby municipalities, not only would it be able to attract new visitors, but also open up to the local community. By providing its services to a larger audience, the museum gains important support, which can be very useful in times of need for the museum, especially now that due to the economic crisis many cultural institutions face the possibility of closing down.

The Museum’s Collection and Exhibitions
Aside from the external to the museum factors identified, concerning the internal ones, the collection of the museum was mentioned by all participants –staff, volunteers, artists– as an important asset to the museum. The plethora and variety of the collections of the museum can act like a magnet to attract different kinds of visitors. The identification of the visitors according to the kind of collections provides a basis for attracting new visitors and promoting the pieces of the collection that have a greater impact on each audience. The information for the connection between visitors and collections was mainly identified through the observations. This will be illustrated below.

For instance, a group of very attentive middle-aged men and women was very enthusiastic about the collection of Charitov, Greek Consul of the Russian Empire, with 555 samples of minerals and precious stones from Russia and Siberia, see Fig. 13.

Figure 13: ‘Beryl’ precious stones from Russia and Siberia
(Internal Documents of Museum, 2016)
The story behind this collection is as follows:

The Greek Consul of Russia Charitov was engaged to Alexandra Romanov, niece of Tsar Nicholas II of Russia. In their engagement they exchanged precious gifts and his future wife gave him a collection of minerals called ‘Beryl’ which they can turn into the precious stones of ‘Emerald’ or ‘Aquamarine’. A few years later, Alexandra got sick and died. Charitov suffered greatly from the loss of his wife and he couldn’t even look at the gifts she gave him, thus he decided to donate the collection to the UoA. He set only one condition: the collection should always be on display for visitors to see. This term was the one that saved the collection from potential transfer to a museum abroad during the period of turbulence in Greece (Field notes, Observation 20 March 2016).

After seeing the specific collection which includes Emerald and Aquamarine, see Fig. 14 and 15, the women in the group asked questions about the value of the jewelry and about how one can distinguish between a fake and an original stone. The director offered a few tips on how to avoid buying fake jewelry very willingly and the audience was thrilled. Some of them commented that it would be interesting to watch a more comprehensive lecture about how someone can distinguish the gemstones from the fake stones and urged the Director to organize it. This could be an incentive to visit the museum again.

![Emerald and Aquamarine](image1)

Figures 14 and 15: Emerald on the left side and Aquamarine on the right side
(My personal archive, 2016)

On the other hand, young students were attracted by a more exciting collection, that of the volcano of Santorini (called Thera in the past), an island in the southern Aegean Sea, see Fig. 16 and 17. This volcano is still active and a strong seismic tremour can cause a strong volcanic eruption in Santorini anytime. The following narrative of the collection is also directly related to the junior highschool history classes that the students attend. This fact aroused their interest even more. The tour guide began the narration as follows:

In ancient years between 1600-1500 BC, one of the largest eruptions of the world devastated the island of Thera, the islands around it and the Minoan civilization. A tsunami reached the coast of Crete and everything was covered with high temperature ash. The people in that period had developed a great culture and they were very wealthy. They had three-storied houses with drainage and bathroom in each one of them, something that even many centuries later wasn’t available in most European countries. Unfortunately after the eruption nothing of these was left (Field notes, Observation 28 March 2016).
Since students already knew about the Minoan civilization and the volcano of Santorini, they were able to answer the guide’s questions on the volcano, which excited them. This interaction makes the tour more interesting not only for the students but also for the tour guide. The questions addressed to the audience enrich the tour and maintain its interest.

One of the groups I observed was high school students. They were very impressed by the industrial minerals and their role in everyday life, see Fig. 18 and 19. They asked a lot of questions about their value and specific uses of each industrial mineral. They also seemed very surprised by the answers and the fact that minerals can be found in everyday objects they use e.g. aluminum is found in beverage cans and graphite in pencils.

Related to my observation were the university students of the Faculty of History and Archaeology of UoA. They took a strong interest in the Lavrio mine finds, see Fig. 20 and 21. The Lavrio mine has 400 kinds of minerals out of the 4000 ones discovered in the world.
The most impressive, eye-catching Stalactite from Smithsonite in the world comes from this mine and is displayed in one of the museum collections, see Fig. 22. It is unique because it is composed of silicon dioxide and not calcite as is the case with the rest of stalactites.

The history of the Lavrio mine is of particular importance for archaeologists, as it is one of the ancient mines in Greece and is directly connected to ancient Greek history. The manager who is one of the people who have visited Lavrio mine galleries many times in the past narrated the following story:

*The Lavrio mine was the main source of wealth for Athens in the 5th and 4th BC since it had large silver deposits. The Athenians used them to cut coins and build their fleet,*
which at the time comprised 70 ships. The mine wealth enabled them to increase the number of ships to 200, and thus, they were able to intercept the Persian navy in the naval battle of Salamis (480 BC). This naval battle is of extremely historical importance since if Athenians had not won, the development in Greece would have come to a standstill and the history of Western civilization would have been different (Field notes, Observation 6 April 2016).

There were some collections and exhibits that seemed to be poles of attraction for all visitors. Most of them were in awe while the younger started whistling at the magical sight of fluorescent and phosphorescent minerals, see Fig. 23.

![Figure 23: Fluorescent and phosphorescent minerals (Internal Documents of Museum, 2016)](image)

These minerals are rather indifferent under normal lighting. But when placed in a dark room under UV lamps, they transformed into something unique. It is as if they were touched by a magic wand and suddenly acquired striking colors, see Fig. 24 and 25.

![Figures 24 and 25: A mineral under normal light on the left and the same mineral under UV lamps on the right (Internal Documents of Museum, 2016)](image)

Build on all the observations, the collection that was the most amazing to visitors was the one that introduced the number of elements that exist in the human body, such as chromium, arsenic and lead, which of course are the same as the elements found in minerals, see Fig. 26. These elements pass from the environment through the food to human organism. This made them realize that every human intervention in the
environment directly affects humans. Thus, if people pollute the environment this pollution makes a circle and returns to human beings.

![Image of a museum display]

**Figure 26: The human body**
*Internal Documents of Museum, 2016*

Furthermore, none of the visitors remained unmoved at the sight of the Swarovski copy, see Fig. 27 and 28, the biggest diamond in the world. The director made a funny comment by saying that this collection is interesting for the ladies because they love diamonds and for the gentlemen because they pay the bill for the diamonds. Then he continued the narrative:

*The biggest white, polished diamond ever found in 1905 in an African mine weighed approximately one and a half kilos (530,4 carats). Its name, Cullinan I, came from the owner of the mine, Sir Thomas Cullinan. This diamond was given as a present to King Edward VII. The man who took over the splitting of the diamond was the well-known cleaver Joseph Asscher. The story goes that it took him three years to decide the exact point where he would hit the diamond and the first time he attempted it, he failed because his tool broke. The second time was successful; however, as soon as he separated it into two pieces, he fell unconscious. This original diamond yielded 9 big pieces and 96 small ones. The second one in size is on the queen Elizabeth’s scepter (Field notes, Observation 21 March 2016).*
A different kind of visitors of the museum was the artists who participated in MinerARt. In the interviews all the participants emphasized that the texture, shape and colors of the minerals are a source of inspiration for all kinds of artists. They could not believe how beautiful pieces of mineral are created by nature and they feared they could never overcome this perfection. For instance showcases such as the one portraying the colors of the rainbows with different minerals placed one next to another was one exhibit that intrigued them in that way, see Fig. 29.

Moreover, the MinerARt exhibition as well as periodic collectors’ exhibitions seemed not only to attract new visitors due to their uniqueness and renewed pieces, but also to provide an incentive for visitors to engage with the staff by proposing new ideas as to what the museum could do next. A member staff told me in the interview that many...
visitors were thrilled by the MinerARt. Furthermore, some of them suggested to the
director and to them that next year the museum should organize a photo exhibition
inspired by its exhibits. S/he also continued using her/his newly acquired knowledge
on the connection between art and science, which s/he thought were entirely separate
until now:

“Art uses science to get inspiration and science in turn, uses art for exposure.”

Finally, out of this daily contact with the staff and the exhibits, I spontaneously came
up with some ideas and suggestions, which I shared with them. First of all, I
suggested incorporating into the exhibition guiding tour, numerous laminated copies
of the pictures depicting the transformation of the building from a warehouse to a
museum, so the visitors can see how the space has changed and how much work was
needed by the management and staff of the museum.

Additionally, when a staff member told me that in National Geographic magazine an
article was written for the Smoky Quartz, one of the exhibits of the museum, see Fig.
30, I thought that it would be very interesting to put the magazine next to the display
case so that the visitors can read it.

Another suggestion resulted from MinerARt. One of the MinerARt exhibits could also
be incorporated into the permanent exhibition. A device which channels electricity to
a quartz crystal and through oscillation produces a unique sound for each mineral, see
Fig. 31. As the actress said:
“This way, we can listen to the voice of the mineral and realize that it is something alive just like us.”

This would not only be an interesting sight for visitors, but a chance for the students of the Faculty to see this phenomenon close up. The incorporation of this device in the exhibit was also something the staff had thought of doing.

Finally, I want to say that from what I was told by the participants and from what I observed during the tours, the museum’s collection is very attractive. Regardless of their knowledge on the subject of mineralogy and petrology, people of all ages were fascinated by different exhibits, each one for her/his own reasons. The staff also told me in the interviews that many students, who visit the museum with their teachers on educational school excursions, express the desire to revisit the museum with their parents and ask them about the opening hours. It could be a great advantage that the museum can use for its own benefit.

During the workshop, the staff and the volunteers emphasized that the collection is the great advantage of the museum. They also believe that if they can promote this collection through digital technologies, then the museum will be able to attract larger audiences.

**Visitors of the Museum**

In the identified theme of exhibitions and collections it was obvious now that until recently the museum had a clearly educational direction concerning the audience it was trying to attract. When I asked the museum staff during the workshop whether they had ever considered attracting a new audience besides schools, one of them told me:
“The museum belongs to an educational institution and it is natural, according to our opinion, to have a purely educational character. However, the economic crisis made us think that we need to change orientation. This year for the first time, we promoted the museum on a website that appeals to tourists who visit Greece. It was a new beginning.”

During the workshop, we had an extensive discussion on who visits the museum today and who could visit it in the future and we found out that there are several categories of people who may be attracted by the museum.

One of the volunteers, who is chief of Boy Scouts, said:

“Scouts love nature and take care of the environment. A visit to this museum would be very interesting to them because they can see and learn many new things about the earth and its treasures. If you want, I could inform Scout Groups about the existence of the museum and the educational programs that offers.”

The volunteer’s proposal was welcomed by the staff and they said they wanted his help to inform the Scout Groups.

One of the artists also added the following about the potential visitors:

“The exhibits could inspire all those involved in the art. Personally, I felt charmed since the first moment I entered the museum so I urged my colleagues to visit it. However, there is need for a more organized promotion through the social media or webpages which interest the artists.”

The view expressed by artists, turned participants’ attention to another group, those who are studying at the School of Fine Arts or in colleges that teach jewelry making, photography, interior design, etc. Thus, their students and their teachers could actually become frequent visitors of the museum. After all, the MinerARt, which received very positive feedback as stated by the participants, showed that art which intertwined with the mineralogy and petrology science brings excellent results. This played a key role in the staff’s decision to contact the aforementioned colleges.

My suggestion for the museum to attract new visitors was to try to open up to people from nearby municipalities and promote collections such as the one which has minerals and rocks used in our everyday lives, or environmental programs which are relevant to everyone. The staff said that they will come into contact with nearby municipalities to propose cooperation so that citizens can learn about the museum and visit it.

Although at the beginning of the workshop most of the participants believed that the audience of this museum is very specific, and museum collections could not have so many different recipients, through the participation and the exchange of ideas among people with different backgrounds, they all came to the realization that eventually there are many options. The staff and volunteers were excited by the prospects emerging and they said that they will try to reach out all these different groups.
Guided Tours
Another internal factor that constitutes one of the most important features of the museum is guided tours. The staff and the director of the museum are responsible for these tours, therefore it is important that all of them are geologists with master’s degrees and PhDs and have deep knowledge of the museum’s collections. When I asked them to talk to me about the tours, they all said:

“Our tours adjust to the audience. We can guide from preschooler children up to scientists of mineralogy and petrology field with the same ease and maintain their avid interest.”

The research illustrated that a tailored tour is very important since it provides the information which is relevant to the visitors and also at the level of their understanding. The fact that the staff can adjust guiding when introducing the same exhibit to an elementary school student or a senior university student means that the museum provides high quality tours.

However, doing ethnographic studies gives also the possibility to experience the activities in the research settings. The staff claimed that they can adjust the tours to the public, but this was something that I had the pleasure of witnessing myself when conducting the tour observations.

Moreover, if requested, the employees organize tours oriented to specific topics such as environment, volcanoes, minerals from Lavrio and so on, or tours for blind or disabled people. For this reason there are some exhibits outside showcases in order for these visitors to be able to touch them, see Fig. 31.

Figure 31: Concave Amethyst from Brazil (My personal archive, 2016)
I also asked the staff and the director whether they found it tiring to conduct the same tour, for instance for several school groups which may come the same week. All of them told me that there is no tour that is the same as another one. The interaction between the guide and the visitors is the element that makes each tour unique. They explained that new questions or comments may come from different students even if they are at the same level of education. This is something that makes the tours stimulating for the guides as well.

**New Digital Technologies in the Museum**

New digital technologies in the museum was another identified theme. I discussed it extensively with the participants throughout my research since it was directly associated with one of my research questions. It is an issue of particular interest because the staff seems to have a good knowledge of what digital technologies can offer to a museum and how the museums with similar collections employ digital technologies. One of them explains:

"We visited the exhibition of the mineralogy museum in Munich, and you cannot imagine all the things we saw! There were digital microscopes where you could observe different cuts from minerals and equipment for jewelry design. Of course this was in the context of a major exhibition. But it was really impressive and I was thinking that our museum still has a long way until it reaches the point of using so advanced digital technologies."

Another employee of the museum commented on the limited options available to the museum’s website:

"I guess you must have seen our webpage. You can’t exactly say it’s the most exciting place to visit on the web. It’s not very attractive I guess, and it’s not easy to include all the information we want on the current format. It would be nice if we could add more things to make it livelier."

During the workshop we discussed with the participants the digital technologies already used by the museum and those that the employees would like to apply to modernize it so as to present its collections in a more attractive way. Thus, the following subtopics emerged: current and future use of digital technologies.

**Current Use of Digital Technologies**

During the interviews, the staff told me that digital technologies are not particularly used in this museum not because they do not want to but because there is lack of money due to economic crisis. They are certainly aware that the collection and the guided tours of a museum could be enhanced by the use of digital technologies. That is why they feature a video projection of the Mid-Atlantic Ridge, which shows how mineral samples were collected at the bottom of the Ridge. What scientists have found about them is incorporated in the collection and that makes traditional showcases assume a different character. This is the only digital technology used within the museum right now as far as the enhancement of the collection is concerned. During the interview, one of the employees recounted how they managed to obtain this video:
“The video was offered to us by a Faculty member who used it in his own research, and the editing was done by a friend for free. It was a great opportunity for us because we had the chance to enrich our collection even though our budget is tight, and visitors seem to enjoy it.”

Digital technology is also used in the promotion and communication part. The museum is promoted through the websites of the Faculty and the University. It also has a Facebook page which is updated by its employees weekly or monthly, depending on the current events, and has a lot of photographic material from the guided tours and events.

In addition, in previous years, the museum sent information about the educational programs that offers to public schools through the Ministry of Education. According to what the staff told me, this was the first year that the invitation of the museum was sent to schools by the Ministry by e-mail, and not by mail, and for that reason the arrangements for guided tours for schools started as early as the end of September, whereas in the previous years they started in January. The museum also sent e-mails this year to private schools and to pre-schools and kindergartens to invite them to the museum’s tours and events for children.

Overall, there is no great use of digital technologies currently in the museum. This could also be due to the staff’s deep-seated belief that without financial support it is impossible to employ digital technologies or any technology applications. Nevertheless, in the workshop the suggestions of the participants demonstrated a willingness to discover new ways that would allow them to adopt digital technologies that could support the operation of the museum.

**Potential Future Use of Digital Technologies**

The staff, as it is mentioned in the interviews, considers the application of digital technologies necessary for the modernization of the museum since technology is part of our everyday lives. During the workshop a lot of ideas and suggestions concerning possible future uses of digital technologies in the museum came up. The ideas varied in terms of the kind as well of the purpose of digital technology.

One of the first ideas that came up was the presence of the museum in Google maps. One of the participants belonged to the Boy Scouts mentioned that when a group of boy scouts searched for the museum in Google maps in order to see how they could go there, they realized that the museum does not exist as a landmark. This came out as a serious shortfall and the participant suggested that this is something simple to be fixed quickly and with no cost when the volunteer said:

“Yesterday we were actually searching for the museum with the boy scouts in Google maps but we couldn’t find it. I went to the address of the museum to check if it’s there on the map, but it’s not registered as a museum, which is a shame. It doesn’t cost anything and it really doesn’t take that much time to do it.”

Another suggestion regarding the Google services was to use Google form, or a similar service, to register children for the events and actions. Registrations are currently being made by telephone and this is not only overly time-consuming since
people calling assume that the staff can inform them about the current events on the phone, but also confusing since a lot of mix ups can happen.

The museum’s webpage was also mentioned by the staff members. The webpage is in need of updating in terms of content and design. A suggestion that came up was to introduce interactive games for the young and the old, such as crossword puzzles, acrostics, printable crafts, digital drawings and so on. This would attract visitors to the page and show the fun side of the museum.

Also, in the webpage of the museum there could be a feedback form either with specific questions or free form, which would allow visitors to make comments on their experience in the museum and help the staff and director plan upcoming events and the way the exhibitions are structured. One of the member staff said:

“\textit{I happened to see that other webpages have something like a short of questionnaire on the visitor's experience in the museum. I realized that the questions were pertinent to what we need to know and it would be nice if we could have feedback directly from the visitors.}”

Another issue with the webpage was that the current official webpage of the museum is subject to the university’s webpage guidelines, meaning that there are some kinds of limitations on what can be featured in the museum’s webpage. For that reason, participants suggested that there could be a separate webpage of ‘friends of the museum’ featuring things such as book presentations without implying any connection between the university and the specific publisher.

Another thing that could be featured on the webpage of the museum is the souvenirs that are being sold. These souvenirs are very popular with visitors but are only available to see in the museum shop. An e-shop or even a simple presentation of the souvenirs on the webpage including a description of the minerals used and how they were made could really spark visitors’ interest.

Another suggestion for viable solutions at low or no cost was the design of an electronic poster that could be distributed for free through e-mail to other organizations that may be interested in visiting the museum, such as art universities, photography schools, art conservation schools, jewelry design schools. This poster could be a generic one addressing general audience or one of more specific nature including collections and events that correspond to the recipient’s interests.

A similar suggestion was to create a simple weekly newsletter which will include the news of the museum and its events that would be sent by e-mail to subscribers.

Another kind of online promotion suggested was the “Sunday Mornings” which are free for the visitors. They could be advertised on webpages that follow free events and actions. Those webpages have become very popular in the last years since people are looking for cost-free ways to spend their time.

In addition to organized webpages, another suggestion was to mobilize personal connections that maintain blogs relevant to education, art or similar subjects, and ask for an article promoting the museum and its actions in an informal tone. At a more
formal level, articles could also be sent to free press newspapers, which frequently feature cultural news.

The webpage of the museum could also be featured in the context of a give and take relationship with other museums, namely it would also host the webpages of those museums and vice versa. Visitors of other museums would be likely to be interested in exploring the webpage of the museum.

The museum could also be featured on the webpages of nearby municipalities as well as on electronic panels, which are situated in different places in the municipality and inform people of bus schedules or parking lots. Messages inviting people to the museum could be incorporated there.

There were also suggestions for the communication part of the museum. After I informed the participants that in the university library there is a live chat application, which allows webpage visitors to directly contact the librarian, we discussed how the museum staff could support a live chat application during working hours.

The Facebook page could also be used more frequently to give a stimulus to Facebook followers. The Facebook page is mainly active when events and actions take place, but new weekly features such as “the mineral of the month”, which would present exhibits of the museum on a monthly basis, would keep the museum’s presence vividly present on its followers’ pages. One of the volunteers explained:

“We could promote a different mineral from our collection each week or month. Oh! And you know, actually, minerals come in many different forms, so we could say for instance that this month is dedicated to amethyst and then post pictures from different forms of amethyst, which people might not have seen.”

YouTube could also be used to upload videos from the inside of the museum or its exhibitions, as well as from the events and actions. Videos could also be uploaded to provide tours for people who cannot physically be there, or even through live streaming in special cases.

There could also be videos to enhance the tours of the museum, either by incorporating videos from the archives of the museum next to popular exhibits such as the Santorini volcano or by creating 3D videos of minerals, and the processes of their extraction and processing.

Another suggestion for supporting the visitors who cannot attend the guided tours which are supported by the staff was to have a mobile application that would present the exhibits and have additional material. Such an application could be made by the Informatics Department of the university in the context of a thesis. QR codes could also be used to for some exhibits so visitors who come without attending the guided tours can directly see information on the exhibits. During the workshop, one of the employees explained that the staff is not always available for the tour of individual visitors due to its increased obligations towards the museum and the Department of Geology and Geoenvironment. That is why she posed the following question:
“What if we could have a mobile application for those who come independently? You know, because they don’t have a guide, and not everything is written down on the labels, so they could have something like a private tour through their mobile phones whenever they like.”

The Department of Informatics could be a permanent co-operator of the museum. The Department of Informatics could design and apply digital technologies in the context of the specific museum. This could benefit both the Department of Informatics since it will use real data to apply digital technologies and the museum itself as it will have the chance to be technologically equipped.

There were a lot more suggestions proposed that were not directly related to digital technologies but were very creative and made use of the museum’s current resources. Those suggestions could also receive support at some point from ICTs depending on how their future application may take place.

**Conclusion**

In this section I presented the empirical findings of the four methods that I used in my research which were divided into seven themes related to each other. The variety of methods and the participation of people from different backgrounds provided different points of view and therefore a spherical perspective of the museum and the way it functions.

The first theme explains how the economic crisis initially reduced the funding of the UoA and by extension the museum’s budget. Apart from this the reduction in the number of visitors added one more problem for the museum to deal with.

The second theme is related to the context in which the museum operates. The *Mineralogy and Petrology Museum* is a university museum, thus it faces the problem of being subject to the policies of the UoA. That means that it lacks freedom as to designing its own webpage as it wishes, deciding the prices of tickets, or providing access to visitors on the days when the university is closed.

The third theme describes the important role of the museum not only in relation to education, but also in relation to citizens and society.

The museum’s collections and exhibitions are shown in the fourth theme. Unique exhibits capture the attention of the visitors and enchant them, regardless of age and background.

The visitors are the heart of the museum as it can be seen in the fifth theme. They give life to the museum and support it financially. Besides the pupils and the university students who usually visit it, there are several other groups of people who could become new regular visitors.

The tours offered by the museum are presented in the sixth issue. The qualified staff can present the exhibits to visitors of all ages in a way that catches their attention.
Finally, the seventh theme features the digital technologies already used in the museum and several proposals for their possible future use, made by the participants.

In the next chapter I am going to discuss all these empirical findings gathered in relation to previous research and I will interpret them according to the questions I posed at the beginning of this research.
6. Discussion

In this chapter a discussion is made on the connection of the research findings with the research question, the research in itself and other topics that resulted from the research.

My interest in museums and the role they play in our society prompted me to do this research. I knew the museums only as a visitor and now I had to understand the entire context in which they operate and this posed a challenge for me. I also wanted to see what it feels like to be a researcher conducting research in an unfamiliar field (Blomberg et al., 1993, p.141).

The ethnographic methodology and participatory design approach that I used were significant guides on my way to becoming familiar with my research context. The implementation of multiple and various methods from ethnography and the participatory approach were determining in me becoming immersed in the museum world and acquiring knowledge.

My purpose was firstly to identify the external factors that affect the museums. Then, I wanted to find out how the museums that are affected by these external factors can use digital technologies to attract new visitors to ensure their sustainability. The data gathered from my systematic research have been presented in seven subjects in the previous chapter. Now I will discuss these themes in combination with the previous literature attempting to highlight various perspectives.

**Economic Crisis - Budget**

There are several external factors that can affect a museum, but the economic crisis was the one that brought about the big reversal not only in Greece but also throughout Europe. Siegal (2013) mentioned that it is a great paradox that Europe, which is considered the cradle of western civilization, had to cut down on cultural budgeting in the face of economic crisis. This applies more notably to Greece whose ancient history has provided the basis for many of the western culture’s achievements. This issue might not be as easy to resolve by just attracting new visitors to the museum, but making the public aware of the beauty of visiting a museum and befriending it, is a good approach to ensure that the danger of shutting down a cultural establishment will not go unnoticed by society.

Unfortunately, in times of economic crisis the cultural sector is the one that suffers first. This is partly understandable because if a country finds it difficult to meet the basic needs of its citizens, then it cannot cater for sectors considered less important. This view is also supported by the Italian Finance Minister Giulio Tremonti when he says that culture is not something that can be eaten (Siegal, 2013, p.41). Something similar but on a smaller scale is happening to the Mineralogy and Petrology Museum. After the dramatic budget cuts by the government, the university cannot meet its basic needs and for this reason it does not fund museums. On the one hand, this seems a hard decision, but on the other there is no alternative solution.
Mudzanani (2015, p.337) suggests that museums broaden their strict educational character and try to contribute to the economic development by taking a more active role. A good way for museums to accomplish this is by creating partnerships with other museums, institutions or organizations or by finding donors or sponsors themselves. Since the Mineralogy and Petrology Museum belongs to the UoA, it has various cooperation possibilities. First, it can create a permanent cooperation with the Department of Informatics of the UoA. This Department can design and materialize digital applications for the museum. Then, it is possible to cooperate with some of the museums of the UoA and create combined tours with them in order to attract more visitors. In addition the museum can be promoted through the webpages of the surrounding municipalities.

Similarly Lindqvist (2012) said that acquiring a budget for a museum whose public funds have been increasingly reduced is not only a matter of attracting private investors. A budget can come from many sources and the relationship with visitors can be a great support for this. Long-term relationships with visitors like “friends associations” are the best investment for the museum (Lindqvist, 2012, p.10). Not only because visitors can provide a significant income, but also because they can also support the museum by promoting it and making it a part of their lives.

The economic crisis is like a grey cloud over the Mineralogy and Petrology Museum right now, as it is with most cultural institutions, but it can also provide an incentive for creativity. Difficult times call for making the most of current resources, for example a unique collection or an expertized staff. Innovation is often the result of such difficult situations where people have to find solutions with limited resources. This limitation is exactly what sparks creativity and one can look for new uses of old resources or new combinations. The Mineralogy and Petrology Museum can seek supporters from the academic, the business and the artistic communities in order to build strong relationships with them. Specifically, it can engage with other Faculties and Departments of the UoA, other academic museums of the UoA, educational institutions, Schools of Art, chambers of commerce, tourism organizations, government agencies and surrounding municipalities.

**Conditions - Policy**

The University of Athens is the oldest university of Greece, thus its organizational culture has been shaped in a period spanning decades. That means that it is harder for it to make changes in its policies and culture since it has an established presence, than if it were a more recent organization.

None the less, in order for the university to be sustainable in the economic crisis, but also adjustable to developments in education and educational institutions, there is a need to renew the policies and change the organizational culture. The academic museums are all affected by the policies of the UoA to which they have to adjure. That has its benefits but also its restrictions.

The lack of independence of the museums to take initiatives is often due to the UoA policies. These policies can no longer sustain the museums in their current environment. A new administrative initiative is necessary to revitalize the museums and take steps towards opening up the museums to the public. The academic museums
are often either unknown to the public or unpopular, even though most feature notable collections.

Common actions of the academic museums of the UoA could also help attract visitors. There are museums with similar subjects to the mineralogy museum such as zoology, paleontology ones, which could combine their collections and staff to make joint activities and events and enrich one another’s actions. Were (2010) presents the case of University College London’s (UCL) where he describes the case of London College. The college decided to change its policy and approach towards surrounding communities, something that was important for the sustainability of its museums.

**Museum’s Collections and Exhibitions**

The collection of the museum is one of its most prominent features. It contains many unique pieces, it has many connections to historical events and personalities, but it is also very attractive not only due to the samples’ beauty but also their presentation. The collection is also often enriched by periodical collector’s exhibitions which add new material and give an incentive to visitors who have already seen the permanent exhibition to return. Another invigorating injection to the museum was the MinerARt exhibition which was a bold movement since it combined the museum and its minerals with something outside the scientific field that is art.

On the occasion of the MinerARt exhibition, everyone in the museum had the same thought in their mind: “the modern art and the boring geologists”. They could not imagine how art and science could be combined. They were delighted to see the artifacts that were created, especially the ones they could relate to and understand better, but also how well the exhibition was received by the visitors who actually proposed new ideas for exhibitions. After these reactions, the staff decided they would like to conduct MinerARt every year, inviting new types of artists, for instance photographers or musicians, and see how they will interpret their collections.

This was an incentive for the museum to attract new visitors. Besides promoting the exhibition itself digitally when it is on, the exhibition could also become totally digital through tools such as the one developed by the National Technical University of Athens (NTUA), the Metadata Interoperability Services (MINT), which allow the creation of digital collections.

**Visitors of the Museum**

In the minds of most people, museums are linked with education. This strict educational character has been examined by various researchers. Hein (2005) argues that there is need for the museums to broaden their educational character. Mudzanani (2015) also explores how museums can serve other roles than the strictly educational one and Were (2010) claims that the museums from strictly educational should become more open.

The *Mineralogy and Petrology Museum*, has a strong educational orientation which stems from its subjection to the UoA. Its visitors mainly consist of university students, especially from the Faculty of Geology and Geoenvironment, and groups of school
students. Though the staff of the museum is aligned with this educational orientation they were not hesitant in including new types of visitors.

Opening up to the local community is one new orientation for the museum. Of course this means that the policies of the museums for example concerning opening hours will have to be reformed to allow for people outside the academic society to have access to the museum. There are, of course, examples of other university museums who attempted opening to local societies as it is the case of the University College London’s (Were, 2010).

Black (2016) noted that in the UK 50% of museum visitors are tourists. The local audience finds no interest in visiting the museum of their region. Museums should understand the needs of the local communities and should try to attract them by applying various practices in order to make them regular visitors.

Through the MinerARt exhibition, the Mineralogy and Petrology Museum has made an opening towards the artistic audience. This was a big step for the museum, however, the director dared to take the risk, although there were major doubts about its success. The employees could not really imagine how art could be combined with science. Despite concerns the exhibition was very successful and became a stimulus for future projects. One of the employees at the end stated:

“Art uses science to get inspiration and science, in turn, uses art for exposure.”

Not only were the artists who participated in the exhibition charmed by the museum, but also other artists who were invited to attend the exhibition found interest in the museum and its collection.

Finally, tourists are also a new possible audience for the museum. Greece is a popular destination for cultural tourism but it is also a place of a lot of geological activity. Visiting a geology museum could then become a unique destination for tourists who are mostly visiting archeological spaces. Besides, the geological wealth and the historical elements of the collection are not unrelated. For instance, the Santorini volcano, which is a popular destination for tourists, was also the destructive force that annihilated the Minoan civilization.

**The Role of the Museum – Guided tours and New Digital Technologies**

Museums are places that preserve and highlight cultural heritage and for this reason their role in society is considered important. The knowledge hidden within benefits future generations so it should be an integral part of the local community. When a museum connects with the local community and the everyday lives of people, it becomes present in the minds of people as a place, which acquires significance for them and is part of their lives. This way, a museum becomes less vulnerable to difficult situations such as the economic crisis, since it has the public on its side.

Additionally, museums are considered areas with educational character. However, this strict context seems to be adapted to the new needs and expectations of visitors. Hein (2005), Mudzanani (2015) and Were (2010) propose that the museums extend their
educational orientation in order to attract new visitors. This movement combined with greater openness to society will prove to be beneficial both for the museum and for the audience. To become part of the community, the museum needs to adjust to the ever-changing society. Since nowadays society is characterized by a strong technological development, the museum also needs to bring in technology with the purpose of attracting and communicating with people, as well as presenting its collections and its activities and events.

However, is it easy for a museum to design and implement digital technologies? Witschey et.al. (2006, p.25) argue that it is not equally easy for all people to comprehend and use the technologies applied to museums. They even stress that the museum must first decide on the information it wants to give to the public, the kinds of sources to be used and finally the technology that will support this project and will match the audience it serves.

Since visitors are a vital part of museums, before applying digital technologies, museums must deeply understand their audience. This is a view supported by several researchers and with which I agree. Camarero, Garrido and Vicente (2015) claim that it is very important not only to understand visitors’ needs but also to try to stimulate and excite them. Similarly, Black (2016) points out that if museums want to attract visitors from the local communities, the most important factor to take into account is the needs and desires of potential visitors. Skov and Ingwersen (2014) go a step further and explore the visitor’s web search behaviour. They want to understand what kind of information people are searching on the museum’s website to be able to serve them better.

A similar philosophy has been developed in the Mineralogy and Petrology Museum. This is evident especially in the guided tours, which are totally visitor-oriented and give the opportunity to visitors to participate with comments and questions. Considering each time the visitors’ age, knowledge and interests, the qualified staff manages to provide targeted guided tours. The result of this practice is the best and most comprehensive presentation of museum collections to the public, which always leaves with the best impression.

A new trend that appears is the effort of the museums to include visitors in the design process. If visitors who will be the direct beneficiaries of digital technologies express their expectations and desires, then digital technologies will fully meet their needs. Mygind, Hållmans and Bentsen (2015) explored how ‘external participants’ can contribute to the different stages of designing an exhibition. Furthermore, Hansen and Iversen (2013) tried to motivate young students to participate in the creation of a learning platform. Another research involving adolescents, professors and researchers was conducted by Dindler et al. (2010). The children used various digital technologies in order to explore how they can participate in interactive museum exhibitions. Another example is the research done by Yiannoutsou and Avouris (2012) who examine the visitors’ experiences regarding the use of mobile games in four museums. Munro (2014) also describes an ethnographic research where groups of society members along with the staff shared their opinions about specific issues. Finally, through ethnography, Unal (2012) explored which of the exhibits attracted a specific group of students.
In the *Mineralogy and Petrology Museum* there has been no similar effort, but the exchange of views and the design suggestions made during the workshop had a positive effect on them. They saw that through participation it is possible to find solutions to many issues and they expressed the wish to include workshops in the culture of the museum from then on.

What is the role of digital technologies in a museum? Are digital technologies alone the solution to the problems a museum faces? Digital technologies are not a panacea, but are gaining more and more ground in museums. Parry (2013) claims that the development of technology affects the cultural section, thus museums decide gradually to integrate digital technologies in their collections. Spector (2013), on the other hand, discusses how technology should be used to improve the learning process. Equally important is the research related to the social media. Stuedahl and Lowe (2013a) make use of small scale prototypes in order to explore communication through social media in museums. In another research Stuedahl and Lowe (2013b) involve students as participants to explore the museum through mobile applications. An additional use of mobile technologies in museums is the one that Arvanitis (2005) presents. Mobile technologies are used to lead the museum “outside the walls” and make it accessible even to the most distant visitors. Moreover, Eghbal-Azar (2016) argues that the use of mobile guides is becoming increasingly popular with those visiting historical sites, botanical gardens, zoos or museums. Finally, MacFadden (2008) illustrates that technology in the 21st century offers various means like interactive screens, educational games, videos, etc., which are very attractive for the audience since they make exhibits more comprehensible.

In the case of the *Mineralogy and Petrology Museum*, some technological initiatives exist, and the staff is more than willing to adopt technology in communicating with the public and to enhance its exhibition. None the less, the initiatives are sporadic and don’t belong to a unified plan for implementing technology in the museum.

The ideas and suggestions that emerged from this research could be discussed and evaluated by the administration of the museum to produce a plan which will include specific milestones and goals in order for the implementation of technology to become a part of the operations of the museum.

**Reflections**

**Methodology and Methods**

Ethnography is a research methodology that demands a deep immersion in the context of research and requires time for relationships to be built between researchers and people. The time I spent in the museum was a time when the museum offered a lot of activities such as the Sunday mornings and the MinerARt exhibition, which took place for the first time, in contrast to other periods when only scheduled guided tours took place. This gave me the chance to experience in a short period of time the activities that would usually span months. Also, the intense activity contributed to me getting closer to the people of the museum quicker. This was a fortunate coincidence that allowed me to collect a lot of data while conducting my research.
When planning the research, I had considered conducting first the interviews to get to know the staff and then the observations. Because there were already scheduled guided tours when I started the research, I decided to start with the observations and then continue with the interviews. This turned out to be a good choice since when I first mentioned interviews and recordings to the participants they all seemed hesitant, but after having spent time in the museum through the observations and developing relationships with the staff, interviews followed naturally and no one was reluctant to being recorded.

Also, I had no idea I would discover the artists in the museum as well as the MinerARt exhibition. Their presence provided me with additional participants that had a different role and perspective than the staff and volunteers of the museum, thus in a way they enriched my data.

During the observations, I had the chance to take on several different roles. I went to the museum as a researcher, a volunteer, and a visitor with my family. I realized that each time I had a different perception of the museum and by being an outsider at first and by taking on all these roles I could take a more spherical view of the museum and the people working in it.

When I conducted the interviews with the staff members, I noticed that all of them had a common perception of the situation the museum was in, the types of issues related to policies and management of the museum, their relationship amongst them, the current use of technology and the value of the collections. However, each one had some individual concerns that deviated from the common issues brought up. In the interviews with the artists, I also noticed they all had a common interest in the exhibits which they all found fascinating, but according to their background they had different comments to make. This was also evident in the way their impressions were expressed through their very different artifacts.

What made an impression on me during those interviews was that it felt more like a confession than an interview. They were quite relaxed and trustful while expressing themselves, making me feel I was their confidant and at the same time a member of the museum.

The workshop was another plan that changed in the process. I had initially planned to conduct the workshop with volunteers, but after realizing the plethora of the people in the museum – staff, volunteers, artists – I decided to include everyone in order to get their various viewpoints.

It was the first time for all participants to come to a workshop and their main motivation was not the belief that the workshop would actually produce something useful for them, but rather to help me with my research. For that reason, when the workshop started, everyone was disheartened attributing their dejection to austerity. I make mention of this just to show that their attitude changed as the workshop unfolded and that the scheduled one hour of helping out the researcher turned out to be a full two and a half hours of active engagement and enthusiasm. At the end of the workshop everyone wanted to stay a bit more because they felt they had not yet said everything they would like to contribute. They actually said they would start having workshop type of meetings from then on, which attests to their eagerness. However, I
believe in order for this to work there should be someone to coordinate them and keep their motivation going.

**The Staff and Guided Tours**

Though this research worked towards exploring technologies, I realized that one of the most important factors for the museum’s operations is its amazing staff. Not only did they have the expertise to support the collection at all levels by preserving it, presenting it on tours and managing it, but also they were willing to work voluntarily beyond their working hours, just as they do on Sunday mornings, in order to bring people to the museum and make them familiar with its content. The love and commitment of the museum staff became apparent to me when looking at their desks and personal space, which was taken over by all sorts of minerals.

The museum staff is also very open in accepting new things and fight against their hesitations. For instance, they put on the MinerARt exhibition, used new computer programs, or even participated in my research.

The staff was very helpful to me and allowed me complete access to museum areas other than the exhibit halls such as labs. They also provided me with information and material I asked, such as information from their archives and photographs. This takes us back to what we saw Huvila (2013) says in Chapter 3, that is that the collections and documented resources are not the only source of information and knowledge in museums, but the people who make up this cultural organization also play a significant role.

The fact that the staff has expertise and a great love for what they do makes the guided tours unique. They can adjust the guided tours to the needs of visitors each time, which is a great asset to the museum.

It was really a great experience working with them.

**The Experience of Conducting this Research**

As I found myself almost living in the museum for a month since I visited it daily and developed relationships with the people in it, I started feeling as a part of the museum myself. I believe that this is also due to the way the people of the museum also saw me. It felt like I was working with them instead of working on them and everything seemed to fit in, like puzzle pieces coming together.

Even though museums were not an unfamiliar place for me, conducting this research introduced a brand new world of museum possibilities. I had innumerable ideas about what could take place in the museum from then on, but also about what I could personally do by using my skill in the museology field.

The application of methods was rather stressful since I worried whether participants would show up in the first place, with what attitude they would come to participate in the methods, and how they would feel when participating. None the less, I was extremely fortunate since all the staff, volunteers and artists were more than willing to participate in my research. Especially the artists had no kind of obligation to participate since they did not belong to the museum staff and could have easily rejected my proposition.
During the interview, one of the interviewees asked me what I expected to get out of this research. I explained to her that I wanted to see how the engagement of a researcher could provoke a change in making design suggestions for the museum. Calling a professional to help the museum attract visitors might not have worked if s/he had not been immersed in the context. I personally found myself being amazed at the many new things I learned about the museum through this research, which I would not have been able to imagine before. Through the employment of ethnography and participatory design, I could see things in the museums from the staff’s, volunteers’ and artists’ viewpoints and be part of a mutual learning process, as I would share my knowledge with them and they would share theirs with me.
7. Conclusion

In this final chapter a conclusion of the research is drawn, the contribution of the research is stated and suggestions for further research are given.

The public of the 21st century, which is familiar with digital technologies, has now expectations from the museums and its exhibitions. A small label explaining the exhibit will not satisfy the youth using cutting-edge mobile applications. Examples of other museums which have employed digital technologies may become comparative measures in the minds of visitors when judging which museum to visit. Certainly, digital technologies are not the only solution to attracting new visitors to a museum; however, they can function as a card up one’s sleeves, which can be used at the appropriate time.

Through the use of ethnography and participatory design, I have tried to engage various participants related to the Mineralogy and Petrology Museum, in order to find out how digital technologies can contribute to attracting new visitors. We came up with several suggestions on how digital technologies can be employed. The museum staff was very excited about this turn of events and some of the suggestions were taken up the next day. My findings showed different factors that affect the topic such as the economic crisis which affects the budget of the museum, the policies to which the museum is subject to because of the university, the relations of the museum with society, the popularity of specific exhibits and collections, the visitors and last but not least the museum staff. All these factors play a role in designing digital technologies for the museum. They can be either supportive or inhibitory, or they can simply provide inspiration for new ideas.

Since this was an ethnographic research, the perspective of the museum that was described in this thesis could very well have been entirely different if another researcher had done it, in another time, with different participants. The presence of the director who will be retiring next year, the plethora of activities that happened to take place in the time of the research and the turn towards innovations in the museum through the MinerART exhibition are characteristics that defined this research.

Contribution of the Study

First of all, this study suggests ways in which the educational and cultural institutions can sustain themselves in these times of economic crisis. This is done by showing how various ideas can be found to make new designs by using only the available or at least plausible resources. Austerity is not only an inhibiting factor but also one which boosts creativity and innovation since it demands current resources to be used to their fullest and in perhaps other ways than those usually expected.

Furthermore this research has also shown that co-operations amongst museums or organizations outside the museum can provide new ideas and solutions. The workshop, which allowed participants to come together, renewed interest and created optimism for the future of the museum. Co-operations with the artists of MinerART also provided fresh innovative ideas. These have paved the way for a new approach to be adopted by the museum staff.
The research also makes a contribution with the use of ethnography and Participatory Design in museums in the Greek context. There has not been a case yet of using either ethnography or participatory design –at least explicitly stated– in museums in the Greek academic literature.

Moreover, the visitors will also savor the fruits of this research since any benefits the museums gains are also consequently benefits for the visitors. The employment of digital technologies to attract new visitors is in itself a way to discover what visitors find interesting and what their preferences are. Thus, in this way the museum will have a more clear idea of what visitors expect from the museum and how they can provide it for them.

Finally, this research has contributed towards supporting the Mineralogy and Petrology Museum in learning how to manage some of its operations through simple use of technology, how to engage its staff in participatory practices to gain the perspectives and experience of everyone in the museum and how to promote and advertise the museum without having to look for the currently elusive financial resources.

**Further Research**

The museum has an archive dating back to 1837 which includes material connected to the collections and exhibits of the museum, such as geological maps, cartography of old mines and handwritten letters of the donations made to the museum. This material could be used to create a digital archive to support the exhibitions by adding new stories about the minerals. It can also function as an independent digital collection of the museum for visitors to view online.

Inclusion of the visitors through participation practices in the museum is also a suggestion for further research. As one of the interviewees said:

“It’s not only the museum that leaves its marks on the visitors, but the visitors also leave their marks on the museum”.

Though examples of participatory practices are included in the research, there are still many aspects to be explored and there is room for research in Greece to be enriched, since all examples come from the international context.

Similar research could take place in the other academic museum of the UoA to see what differences can be identified by the different subjects of the museums, and whether this plays a role in the employment of technologies. Differences in the museums could also provide additional information which might be unique to a museum but none the less prove to be helpful to other museums as well.

Moreover, this thesis can be a stimulus and pave the way for research in places open to the public such as theme parks, zoos, galleries, archives, libraries, etc. that wish to apply digital technologies in order to increase the number of their visitors.
Finally, beyond these research suggestions which belong to the IS field, it would be interesting to see how one can use this thesis to commence research in a different scientific field. All the examples of various correlations between science, art, history, education, entertainment and so on, make one wonder of the endless possibilities that different scientific fields can see in the same space, such as the different perspectives from which the artist of MinerARt saw the same minerals and produced pieces of art which were unique in themselves but had the same origin.
References
References


Internal Documents of Museum, 2016.


My personal archive, 2016.


Appendices
Πρωινά Κυριακής στο Μουσείο Ορυκτολογίας

Με εκπαιδευτικές δραστηριότητες, διαδραστικά παιχνίδια και ξεναγήσεις δωρεάν για όλη την ηλικία. Για να γνωρίσουμε μικροί και μεγάλοι από κοντά τον υπόροχο κόσμο των ορυκτών και των πετρώματων.

Κυριακές 3, 10 & 17 Απριλίου,
10 π.μ. - 2 μ.μ.
στο Τμήμα Γεωλογίας & Γεωπεριβάλλοντος,
Πανεπιστημιούπολη Ζωγράφου (είσοδος από Ολυμπιακό Πάλιμα).

Παράλληλα, παρουσιάζεται η ομαδική έκθεση τέχνης MinerArt, με έργα εμπνευσμένα από την κρυσταλλική δομή, τα σαγηνευτικά χρώματα και την εκτυφλωτική λάμψη των δειγμάτων του Μουσείου.

Εγκαίνια έκθεσης:
Κυριακή 3 Απριλίου 2016 10.00 π.μ.

Ορες Λειτουργίας: Δευτέρα-Παρασκευή 9.00-14.00 και Κυριακές 10.00-14.00

ΔΩΡΕΑΝ είσοδος και συμμετοχή στις δράσεις για όλη την ηλικία.

Απαραίτητη η δήλωση συμμετοχής στις δράσεις, καθημερινά 09.00 - 16.00,
στα τηλέφωνα: 210-2774112, 4190
email: mineralmuseum@geol.uoa.gr
www.facebook.com/MineralogyAndPetrologyMuseum
Appendix B

Poster of MinerART

The Museum of Mineralogy and Petrology invites you to the opening of the art exhibition:

MinerART

Participants:
Olga Mpougdanou
Panagiota Koroniou
Sophia Kyriakou
Nikos Marinis
Anda Petranaki
Mimi Petropoulou-Dimitrakaki
Yiota Kotika
Efi Fouriki
Vasiliki Sagkioti
Christos Skourtis

Curator:
Eftychia Kalokereti
MSc Museologist

Opening: Sunday 3rd of April 2016, 10.00 am
Monday to Friday 9.00-14.00 & Sundays 10.00-14.00
Faculty of Geology and Geoenvironment
University Campus, Zografou
Appendix C (1)

Informed Consent Form

Research topic
“Use of Technology in museums”

Researcher
Kyriaki Papadopoulou, Master Program in Information Systems, Linnaeus University, Sweden.

Purpose of the research
The purpose of this research is to build on the experience of the museum staff that conducts guiding tours and is in direct contact with the audience. The information gained directly or indirectly from visitors will be invaluable since I will use it to make proposals for the use of technology in the museum. These suggestions will be of benefit not only to the specific museum but also to the society as a whole. I am going to use the participatory approach which is characterized by a democratic basis as “designers and users can learn from and about each other”. Participants have the opportunity to interact and this constitutes a benefit for everyone.

Description of the research process
During this research I will observe the interaction of visitors with the museum exhibits. Then, I will conduct interviews to gain information about the staff’s experience regarding their contact with the public. At the end, I will organize a workshop in which there will be discussions of the different ways technology can be used in the museum in order to increase the number of visitors.

The benefits of the research and the benefits to you
University of Athens has sixteen museums facing a significant reduction in their budget. The research that will be held in one of these museums could provide a solution to this problem and pave the way for other museums seeking ways to address similar problems. Also, the research results will be of benefit to other places open to the public such as galleries, libraries, etc. The employees of the museum will benefit from the research because through the participatory process they will have the chance to propose and implement their ideas about the presentation of the exhibits and the organization of events and activities. Visitors will also have the opportunity to see significant exhibits, dating from 1837, in a different way with the support of technology.

Risk and discomfort
This research does not contain elements that may cause discomfort to the participants. The participant’s names will not be revealed to ensure confidentiality and privacy. Additionally, any pictures that may be taken during the workshops will not depict the participants.
Participant’s rights
The participation is voluntary and the participants may withdraw at any time without being held accountable for it. Furthermore, the analysis of the collected data from each participant will be available to him/her upon request.

Access to interview and workshop material
The collected data will be processed only by the interviewer, her supervisor and her examiner, and they will not be shared with third parties. All collected data will be used only for this thesis and they will be destroyed upon its completion.

Questions about research
The participants have the right to ask any questions about the research before, during and after the interviews. Additional information can be provided by contacting the researcher via email (Kyriaki Papadopoulou kp222gg@student.lnu.se).

Consent
I understand and agree with the above statements.
Yes
No
I understand that my participation is voluntary and I can withdraw from the research any time without giving any explanations.
Yes
No
I understand that I can ask the researcher to remove any data provided by me without any explanations.
Yes
No
I consent to participate in the research study and I allow you to use the information that I will provide in your master thesis.
Yes
No
I agree to audio record our interview/our discussions during workshop.
Yes
No

Date of Interview: ____________ Place: UoA

Participant’s Name: ___________________________________________

Participant’s Signature: __________________________________________

Researcher Name: Kyriaki Papadopoulou
Signature: __________________________________________
Appendix C (2)
Informed Consent Form (in Greek)

Τίτλος έρευνας
«Η χρήση της τεχνολογίας στα μουσεία».

Ερευνήτρια
Κυριακή Παπαδοπούλου, Master Program in Information Systems, Linnaeus University, Sweden.

Ο σκοπός της έρευνας
Ο σκοπός αυτής της έρευνας είναι να αξιοποιήσει την εμπειρία του προσωπικού του μουσείου, το οποίο κάνει τις ξενεγήσεις και έρχεται σε άμεση επαφή με το κοινό. Οι πληροφορίες που παίρνουν άμεσα η έμμεσα από τους επισκέπτες θα είναι πολύτιμες για εμάς, προκειμένου να κάνουμε προτάσεις για τη χρήση της τεχνολογίας στο μουσείο, κάτι που θα οφελήσει όχι μόνο το μουσείο αλλά και την κοινωνία γενικότερα.

Επιπλέον στην έρευνα αυτή, θα εφαρμόσουμε τη συμμετοχική προσέγγιση (participatory approach) η οποία έχει μια πολύ δημιουργική βάση δεδομένου ότι "οι σχεδιαστές και οι χρήστες μπορούν να μάθουν από και για τον άλλον". Τα ενδιαφέρομενα μέρη έχουν την ευκαιρία να αλληλεπιδράσουν και αυτό είναι ένα άλφας για όλους.

Περιγραφή της ερευνητικής διαδικασίας
Στα πλαίσια της έρευνας θα παρατηρήσουμε την αλληλεπίδραση των επισκεπτών με τα εκθέματα του μουσείου. Στη συνέχεια θα διεξάγουμε συνεντεύξεις από τις οποίες θα αντλήσουμε πληροφορίες σχετικά με το ποια είναι η εμπειρία του προσωπικού από την επαφή του με το κοινό.

Έπειτα θα διεξάγουμε μια ομαδική συνάντηση για να σκεφτούμε και να προτείνουμε τρόπους εφαρμογής της τεχνολογίας στο μουσείο, προκειμένου να ανεξάρτητα την επισκεψιμότητά του.

Τα οφέλη της έρευνας και τα οφέλη για τους συμμετέχοντες
Το Πανεπιστήμιο Αθηνών έχει δεκαετές μουσεία που αντιμετωπίζουν σημαντική μείωση του προϊόντος του μουσείου. Η έρευνα, η οποία θα πραγματοποιηθεί σε ένα από αυτά τα μουσεία θα μπορούσε ίσως να δώσει κάποια λύση στο πρόβλημα αυτό και να ανοίξει το δρόμο και στα άλλα μουσεία για να αναζητήσουν τρόπους αντιμετώπισης των προβλημάτων τους. Θα είναι επίσης χρήσιμη μια τέτοια έρευνα σε χώρους ανοικτούς στο κοινό, όπως γκαλεριές, βιβλιοθήκες κλπ. γιατί αν ακολουθήσουν τα ίδια βήματα θα μπορούσαν να κάνουν εποικοδομητικές αλλαγές.

Οι υπάλληλοι του μουσείου θα οφελθούν από την έρευνα, διότι μέσω της συμμετοχικής διαδικασίας θα είναι σε θέση να προτείνουν και να εφαρμόσουν τις ιδέες τους σχετικά με την προβολή των εκθέματων της συλλογής και τη διοργάνωση εκδηλώσεων και δραστηριοτήτων.

Οι επισκέπτες πάλι θα έχουν την ευκαιρία να δουν σημαντικά εκθέματα που χρονολογούνται από το 1837 από μια διαφορετική οπτική γωνία ή με ένα διαφορετικό τρόπο με τη βοήθεια της τεχνολογίας.

Κίνδυνοι και ενόχληση
Η έρευνα δεν περιέχει στοιχεία που είναι πιθανό να προκαλέσουν ενόχληση ή κινδύνους στους συμμετέχοντες. Τα ονόματα των συμμετέχοντων δεν θα αποκαλυφθούν για να διασφαλιστεί η εξερεύνηση και να προστατευτεί η ιδιωτική τους ζωή. Επίσης, οι φωτογραφίες που θα ληφθούν κατά τη διάρκεια της έρευνας δεν θα αποτυπώνονται στους συμμετέχοντες.

Δικαιώματα συμμετέχοντος
Η συμμετοχή είναι εθελοντική και οι συμμετέχοντες μπορούν να υπαγορεύσουν οποιοδήποτε όρα χωρίς να δόσουν καμία εξήγηση. Επίσης, η ανάλυση των δεδομένων θα είναι στη διάθεσή των συμμετέχοντων εάν το ζητήσουν.

Πρόσβαση στα δεδομένα
Τα δεδομένα που θα συγκεντρωθούν θα χρησιμοποιηθούν μόνο από την ερευνήτρια, την επιβλέπουσα καθηγήτρια και την εξετάστρια και δεν πρόκειται να κοινοποιηθούν σε τρίτη πρόσωπα. Όλα τα δεδομένα θα χρησιμοποιηθούν μόνο για το σκοπό της ερευνητικής εργασίας και θα διαγραφούν αμέσως μόλις αυτή ολοκληρωθεί.

Ερωτήσεις σχετικά με την έρευνα
Οι συμμετέχοντες έχουν το δικαίωμα να θέσουν οποιοδήποτε ερώτημα σχετικά με την έρευνα πριν, κατά τη διάρκεια και μετά τις συνεντεύξεις και τις ομαδικές συναντήσεις. Επιπροσθέτως, οι συμμετέχοντες μπορούν να επικοινωνούν με την ερευνήτρια για κάθε επιπλέον πληροφορία μέσω email (Κυριακή Παπαδοπούλου kp222gg@student.lnu.se)

Συγκατάθεση
Κατανοώ και συμφωνώ με τα παραπάνω.
Ναι
Όχι
Κατανοώ ότι η συμμετοχή μου είναι εθελοντική και ότι μπορώ να υπαγορεύσω από την έρευνα οποιοδήποτε όρα χωρίς καμία εξήγηση.
Ναι
Όχι
Κατανοώ ότι μπορώ να απαγορεύσω τη δημοσίευση οποιοδήποτε τμήματος των πληροφοριών που έχω δώσει, χωρίς περαιτέρω εξήγηση.
Ναι
Όχι
Συμφωνώ να συμμετέχω στη έρευνα και σας επιτρέπω να χρησιμοποιήσετε τις πληροφορίες που θα παρέχω για τους σκοπούς της ερευνητικής εργασίας σας.
Ναι
Όχι
Συμφωνώ να ηχογραφηθεί η συνέντευξή μας/ οι συζητήσεις μας στο workshop.
Ναι
Όχι
Ημερομηνία συνέντευξης: ____________ Τόπος: ΕΚΠΑ
Στοιχεία συμμετέχοντος: ________________________________
Υπογραφή συμμετέχοντος: ________________________________
Ερευνήτρια: Κυριακή Παπαδοπούλου
Υπογραφή: ___________________________________
Appendix D (1)

Director’s interview questions
- Please can you tell me about your educational background? And tell me about your working life experiences.

Organization - is the theme here:
- Can you tell me how this university museum is organized?
- What are the duties/ responsibilities of each employee?
- And how do you manage it?
- How many people are employed?
- How do you recruit the staff and the volunteers?
- Do you have regular meetings with the Dean?
- Do you have regular meetings with the staff?
- Do you have other roles in this Faculty?
- How is your cooperation with the museum’s staff?
- How do you exchange views on scientific issues and how do you discuss with them the problems that you address?
- Could you please tell me what is the budget of this museum and if it has other financial resources. Did you notice any changes due to the economic crisis?

Exhibits, visitors and guiding tours - is the theme here
- Tell me about the exhibits of your museum.
- What is the most significant or unique exhibit?
- Do you have a permanent collection at the museum or you hosted temporary exhibitions from time to time?
- How often do you renew your collections of exhibits?
- What is your favorite exhibit?
- How many stories could you tell me related to museum’s exhibits? Which is your favorite?
- Can you tell me how many visitors do you have each year? Which is mainly your audience?
- Can you describe me your experiences from the audience? Do you remember something which impressed you?
- How does it feel when you repeat the same guiding tour?
- Whose idea was to organize the exhibit of modern art inspired from museum’s collection?
- What are your impressions of the modern art exhibition?
- Which of these artifacts impressed you more?
- What is your experience from the cooperation with the artists?
- Could you please tell me your opinion about the connection between science and art?
- Have you thought about ways that could bring new visitors to the museum?
- Digitization take place in the society as well as in museums, can you tell me if and how you use digital technologies/ICT in you museum?
- Who decides how the museum will be promoted on the Internet and what will be posted on the museum’s website? Who does this job?

**Future - is the theme here**

- Tell me the benefits of being a member of UNIVERSEUM (European Academic Heritage Network)?
- Has any of these museums addressed financial problems? Did it change its policy?
- How do you imagine the museum in five years from now?
- How do you imagine yourself away from the museum?
- What would you change in the museum if you had the resources? What is your vision?
- You have mentioned a plan that you have about the establishment of a ‘Natural History Museum’ in the city center. Have you discussed this idea with your colleagues from the other Departments?
- Is there anything you want to add or to ask?
Appendix D (2)

**Director’s interview questions (in Greek)**

- Παρακαλώ μπορείτε να μου μιλήσετε για τις σπουδές σας και την επαγγελματική σας εμπειρία;

**Ωργάνωση**

- Μπορείτε να μου πείτε πώς είναι οργανωμένο αυτό το πανεπιστημιακό μουσείο;
- Ποια είναι τα καθήκοντα/ευθύνες του κάθε εργαζόμενου;
- Και πώς το διαχειρίζεστε;
- Πόσα άτομα απασχολούνται στο μουσείο;
- Με ποια κριτήρια προσλαμβάνετε το προσωπικό και τους εθελοντές;
- Έχετε τακτικές συναντήσεις με τον Κοσμήτορα;
- Έχετε τακτικές συναντήσεις με το προσωπικό;
- Έχετε άλλες αρμοδιότητες σε αυτό το Τμήμα;
- Πώς είναι η συνεργασία σας με το προσωπικό του μουσείου;
- Πώς ανταλλάσσετε απόψεις πάνω στα επιστημονικά θέματα και πώς συζητάτε με τους συνεργάτες σας τα προβλήματα που αντιμετωπίζετε στην καθημερινότητα;
- Μπορείτε να μου πείτε μου ποιος είναι ο προϋπολογισμός του μουσείου; Έχει άλλους οικονομικούς πόρους; Παρατηρήσατε κάποιες αλλαγές λόγω της οικονομικής κρίσης;

**Εκθέματα, επισκέπτες και ξεναγήσεις**

- Μιλήστε μου για τα εκθέματα του μουσείου σας.
- Ποιο είναι το πιο σημαντικό ή μοναδικό έκθεμα;
- Έχετε μια μόνιμη συλλογή του μουσείου ή φιλοξενείτε και περιοδικές εκθέσεις από καιρό σε καιρό;
- Πόσο συχνά ανανεώνετε τις συλλογές των εκθεμάτων σας;
- Ποιο είναι το αγαπημένο σας έκθεμα;
- Πόσες ιστορίες θα μπορούσατε να δημιουργήσατε με αφορμή τα εκθέματα του μουσείου;
- Ποια είναι η αγαπημένη σας;
- Μπορείτε να μου πείτε πόσους επισκέπτες έχετε κάθε χρόνο; Ποιο είναι κυρίως το κοινό σας;
- Μπορείτε να μου πειράξετε τις εμπειρίες σας από την επαφή σας με το κοινό; Θυμάστε κάτι που σας εντυπωσίασε;
- Πώς είναι να επαναλαμβάνει κάποιος την ίδια εμπειρία;
- Ποιος είχε την ιδέα για την οργάνωση μία έκθεσης μοντέρνας τέχνης εμπνευσμένη από τη συλλογή του μουσείου;
- Ποιες είναι οι εντυπώσεις σας από την έκθεση Μοντέρνας τέχνης;
- Ποιο από τα έργα σας εντυπωσίασε περισσότερο;
- Ποια είναι η εμπειρία σας από την συνεργασία σας με τους καλλιτέχνες;
- Πείτε ποια είναι η γνώμη σας για τη σχέση της επιστήμης με την τέχνη.
- Έχετε σκεφτεί τρόπους που θα μπορούσαν να προσελκύσουν νέους επισκέπτες στο μουσείο;
- Η ψηφιοποίηση εκτείνεται τόσο στην κοινωνία όσο και στα μουσεία. Θέλετε να μου πείτε, αν και πώς μπορείτε να χρησιμοποιείτε τις ψηφιακές τεχνολογίες / ΤΠΕ στο μουσείο σας;
- Ποιος αποφασίζει πώς θα προωθηθεί το μουσείο στο διαδίκτυο και ποιες πληροφορίες θα αναρτηθούν στην ιστοσελίδα του μουσείου; Είναι κάποιο συγκεκριμένο άτομο που κάνει αυτή τη δουλειά?

Μέλλον
- Πείτε μου τα πλεονεκτήματα του να είναι το μουσείο μέλος του UNIVERSITY (Ευρωπαϊκό Ακαδημαϊκό Δίκτυο Πολιτιστικής Κληρονομιάς).
- Αντιμετώπισε κάποιο άλλο από αυτά τα μουσεία οικονομικά προβλήματα τέτοια, ώστε να αλλάξει την πολιτική του;
- Πώς φαντάζεσαι το μουσείο σε πέντε χρόνια από τώρα; Ποιο είναι το όραμά σας;
- Πώς φαντάζεστε τον εαυτό σας μακριά από το μουσείο;
- Τι θα αλλάξατε στο μουσείο, αν είχατε οικονομικούς πόρους; Ποιο είναι το όραμά σας;
- Μου είχατε αναφέρει το σχέδιο για την ίδρυση ενός ‘Μουσείου Φυσικής Ιστορίας’ στο κέντρο της πόλης. Έχετε συζητήσει αυτή την ιδέα με τους συναδέλφους των άλλων Τομέων;
- Υπάρχει κάτι που θέλετε να προσθέσετε ή να ρωτήσετε σε όσα είπαμε;
Appendix E (1)

Staff’s interview questions
- Please can you tell me about your educational background? And tell me about your working life experiences.

Organization - is the theme here:
- Can you tell me about your responsibilities in this museum and in the Faculty?
- How is your cooperation with your colleagues?
- How is your cooperation with your director?
- How do you exchange views on scientific issues and how do you discuss with the director or your colleagues the problems that you address?
- Could you please tell me what is the budget of this museum and if it has other financial resources. Did you notice any changes due to the economic crisis?

Exhibits, visitors and guiding tours - is the theme here
- Tell me about the exhibits of your museum.
- What is the most significant or unique exhibit?
- Do you have a permanent collection at the museum or you hosted temporary exhibitions from time to time?
- How often do you renew your collections of exhibits?
- What is your favorite exhibit?
- Can you tell me how many visitors do you have each year? Which is mainly your audience?
- Can you describe me your experiences from the audience? Do you remember something which impressed you?
- How does it feel when you repeat the same guiding tour?
- Whose idea was to organize the exhibit of modern art inspired from museum’s collection?
- What are your impressions of the modern art exhibition?
- Which of these artifacts impressed you more?
- What is your experience from the cooperation with the artists?
- Could you please tell me your opinion about the connection between science and art?
- Have you thought about ways that could bring new visitors to the museum?
- Digitization take place in the society as well as in museums, can you tell me if and how you use digital technologies/ICT in you museum?
- Who decides how the museum will be promoted on the Internet and what will be posted on the museum’s website? Who does this job?

**Future - is the theme here**
- Have you ever heard about UNIVERSEUM (European Academic Heritage Network)?
- How do you imagine the museum in five years from now?
- What would you change in the museum if you had the resources? What is your vision?
- Is there anything you want to add or to ask?
Appendix E (2)

Staff’s interview questions (in Greek)
- Παρακαλώ μπορείτε να μου μιλήσετε για τις σπουδές σας και την επαγγελματική σας εμπειρία;

Οργάνωση
- Μπορείτε να μου πείτε πώς είναι οργανωμένο αυτό το πανεπιστημιακό μουσείο;
- Μπορείτε να μου πείτε ποιες είναι οι υποχρεώσεις σας απέναντι στο μουσείο και στο Τμήμα;
- Πώς είναι η συνεργασία σας με τους συναδέλφους σας;
- Πώς είναι η συνεργασία σας με τον διευθυντή του μουσείου;
- Πώς ανταλλάσσετε απόψεις πάνω στα επιστημονικά θέματα και πώς συζητάτε με τους συνεργάτες σας τα προβλήματα που αντιμετωπίζετε στην καθημερινότητα;
- Μπορείτε να μου πείτε ποιος είναι ο προϋπολογισμός του μουσείου; Έχει άλλους οικονομικούς πόρους; Παρατηρήσατε κάποιες αλλαγές λόγω της οικονομικής κρίσης;

Εκθέματα, επισκέπτες και ξεναγήσεις
- Μιλήστε μου για τα εκθέματα του μουσείου σας.
- Ποιο είναι το πιο σημαντικό ή μοναδικό εκθέμα;
- Έχετε μια μόνιμη συλλογή του μουσείου ή φιλοξενείτε και περιοδικές εκθέσεις από καιρό σε καιρό;
- Πόσο συχνά ανανεώνετε τις συλλογές των εκθεμάτων σας;
- Ποιο είναι το αγαπημένο σας εκθέμα;
- Μπορείτε να μου πείτε πόσους επισκέπτες έχετε κάθε χρόνο; Ποιο είναι κυρίως το κοινό σας;
- Μπορείτε να μου περιγράψετε τις εμπειρίες σας από την επαφή σας με το κοινό; Θυμάστε κάτι που σας εντυπωσίασε;
- Πώς είναι να επαναλαμβάνει κάποιος την ίδια ξενάγηση;
- Ποιος είχε την ιδέα για την οργάνωση μια έκθεσης μοντέρνας τέχνης εμπνευσμένη από τη συλλογή του μουσείου;
- Ποιες είναι οι εντυπώσεις σας από την έκθεση Μοντέρνας τέχνης;
- Ποιο από τα έργα σας εντυπωσίασε περισσότερο;
- Ποια είναι η εμπειρία σας από την συνεργασίας σας με τους καλλιτέχνες;
- Πείτε ποια είναι η γνώμη σας για τη σχέση της επιστήμης με την τέχνη.
- Έχετε σκεφτεί τρόπους που θα μπορούσαν να προσελκύσουν νέους επισκέπτες στο μουσείο;
- Η ψηφιοποίηση εκτείνεται τόσο στην κοινωνία όσο και στα μουσεία. Θέλετε να μου πείτε, αν και πώς μπορείτε να χρησιμοποιείτε τις ψηφιακές τεχνολογίες / ΤΠΕ στο μουσείο σας;
- Ποιος αποφασίζει πώς θα προωθηθεί το μουσείο στο διαδίκτυο και ποιες πληροφορίες θα αναρτηθούν στην ιστοσελίδα του μουσείου; Είναι κάποιο συγκεκριμένο άτομο που κάνει αυτή τη δουλειά;

Μέλλον
- Έχετε ακούσει για το UNIVERSEUM (Ευρωπαϊκό Ακαδημαϊκό Δίκτυο Πολιτιστικής Κληρονομιάς);
- Πώς φαντάζεσαι το μουσείο σε πέντε χρόνια από τώρα; Ποιο είναι το όραμά σας;
- Τι θα αλλάξει στο μουσείο, αν είχατε οικονομικούς πόρους; Ποιο είναι το όραμά σας;
- Υπάρχει κάτι που θέλετε να προσθέσετε ή να ρωτήσετε σε όσα είπαμε;
Appendix F (1)

Questions for discussion with the museologist

- Could you please tell me about the first time you visited this museum?
- What was it that impressed you?
- Have you ever been in a mineralogy and petrology museum before? Why?
- You are the person who inspired the MinerARt. Would you like to tell me how this idea came up?
- Do you have any suggestions or plans for future events at the museum?
- What is your experience of your cooperation with museum’s staff?
- Could you please tell me your opinion about the connection between science and art?

Appendix F (2)

Questions for discussion with the museologist (in Greek)

- Παρακαλώ μπορείτε να μου μιλήσετε για την πρώτη φορά που επισκεφτήκατε το μουσείο;
- Τι ήταν αυτό που σας έκανε εντύπωση;
- Είχατε επισκεφτεί στο παρελθόν μουσεία πετρολογίας και ορυκτολογίας; Γιατί;
- Είσαστε το άτομο που εμπνεύστηκε τη MinerARt. Θέλετε να μου πείτε πώς προέκυψε αυτή η ιδέα;
- Έχετε κάποιες προτάσεις ή σχέδια για μελλοντικές εκδηλώσεις στο μουσείο;
- Ποια είναι η εμπειρία σας από την συνεργασία σας με το προσωπικό του μουσείου;
- Πείτε μου ποια είναι η γνώμη σας για τη σχέση της επιστήμης με την τέχνη.
Appendix G (1)

Questions for discussion with the artists

- Could you please tell me about the first time you visited this museum?
- What were you impressed by?
- Have you ever been in a mineralogy and petrology museum before? Why?
- What was the exhibit that inspired you most in order to create your artifact?
- Would you suggest to other artists that they should visit museums displaying minerals and rocks? Why?
- What is your experience of your cooperation with the museum’s staff?
- Could you please tell me your opinion about the connection between science and art?

Appendix G (2)

Questions for discussion with the artists (in Greek)

- Παρακαλώ μπορείτε να μου μιλήσετε για την πρώτη φορά που επισκεφτήκατε το μουσείο;
- Τι ήταν αυτό που σας έκανε εντύπωση;
- Είχατε επισκεφτεί στο παρελθόν μουσεία πετρολογίας και ορυκτολογίας; Γιατί;
- Από ποιο έκθεμα εμπνευστήκατε το έργο σας;
- Θα προτείνατε σε άλλους καλλιτέχνες να επισκεφτούν μουσεία που εκθέτουν πετρώματα και ορυκτά; Γιατί;
- Ποια είναι η εμπειρία σας από την συνεργασία σας με το προσωπικό του μουσείου;
- Πείτε μου ποια είναι η γνώμη σας για τη σχέση της επιστήμης με την τέχνη.
Appendix H

Welcome and introduction in workshop

Hello everyone!
I would like to thank you very much for accepting my invitation to participate in this workshop. Before we start, could you please read carefully sign the consent form?

(I had already placed in front of each participant a folder with blank pages A4 and the consent form. I gave them a few minutes to sign it, then I collected the consent forms and I turned on the voice recorder.)

I would like to thank you once more for accepting my invitation to participate in this workshop. Since you have no previous participation in a workshop, I hope to be a pleasant experience for you.

Most of us already know each other; nevertheless I would like everyone to say a few words about her/himself because we come from different workplaces and have a different background.

My name is Kyriaki Papadopoulou and I am a librarian at UoA in School of Philosophy since 2003. I have also worked in 5 more libraries before here and I have experience of different types of libraries and different disciplines.

Last year I started my Master titled “Master programme in Information Systems” and now I must gather the data for my thesis. You read in the consent form the details about my research so today I am assuming the role of the researcher and also I will facilitate the conversation in this workshop.

Now it is your turn to continue…
Appendix I

Workshop notes
Digital Technologies in Museums

- "Digital Technologies in Museums" by [Author]
  
  1. Introduction
  2. Overview of Digital Technologies
  3. Case Studies
  4. Future Trends

E-mail: [Email]
Digital Technologies in Museums

Workshop 2018

[Handwritten text not clearly visible]
### Appendix J

#### Example of coding

<table>
<thead>
<tr>
<th>Description</th>
<th>Category</th>
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<tbody>
<tr>
<td>2 euros is a good price for the visitors</td>
<td>Tickets</td>
</tr>
<tr>
<td>2 euros are not sufficient for the museum</td>
<td></td>
</tr>
<tr>
<td>Common price of ticket for all academic museums of the UoA</td>
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</tr>
<tr>
<td>In the <em>Paleontology Museum</em> there is an extra 2 euros for activities</td>
<td></td>
</tr>
<tr>
<td>Main income: tickets from school visits</td>
<td>Income</td>
</tr>
<tr>
<td>15% of income goes to the UoA for research budget</td>
<td>Economic Crisis</td>
</tr>
<tr>
<td>85% of ticket income goes to cleaning, minor repairs, activity supplies</td>
<td></td>
</tr>
<tr>
<td>Several sponsors and private donations</td>
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</tr>
<tr>
<td>Private businesses</td>
<td></td>
</tr>
<tr>
<td>Cannot accept money as donations – payment of invoices</td>
<td></td>
</tr>
<tr>
<td>Decrease of visitors</td>
<td></td>
</tr>
<tr>
<td>Relatively cheaper than other activities</td>
<td>Economic crisis</td>
</tr>
<tr>
<td>There are students who can’t afford the 2 euros ticket</td>
<td></td>
</tr>
<tr>
<td>Teachers call for reduction of ticket price</td>
<td></td>
</tr>
<tr>
<td>Less souvenirs being bought</td>
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<tr>
<td>Reduced from 4000 euros to 1000, then to 200 then to zero</td>
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</tr>
<tr>
<td>There’s always something that needs to be paid off</td>
<td>Budget</td>
</tr>
</tbody>
</table>
# Appendix K

## Declaration Form

![Linnaeus University Logo](image)

**Declaration – Submission of the Thesis**

This form should be included in the thesis. Before you sign please see [http://refbib.linnaeus.ac.uk/english/what-is-plagiarism/](http://refbib.linnaeus.ac.uk/english/what-is-plagiarism/) where you found information about plagiarism and check also the Harvard System of referencing [http://libweb.anglia.ac.uk/referencing/harvard.htm](http://libweb.anglia.ac.uk/referencing/harvard.htm)

<table>
<thead>
<tr>
<th>Name</th>
<th>Kyriaki Papadopoulou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td></td>
</tr>
<tr>
<td>Degree/Project Master Level</td>
<td>5IK50E</td>
</tr>
</tbody>
</table>

**Did you write the thesis alone or in cooperation with someone?** Tick one of the boxes.

<table>
<thead>
<tr>
<th>X</th>
<th>I am the sole author of the thesis.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The thesis is co-authored with other students, and together we are responsible for the entire project.</td>
</tr>
<tr>
<td></td>
<td>The project report is co-authored with other students, and I am responsible for part of it. The parts I am responsible for are specified in the project report.</td>
</tr>
</tbody>
</table>

I declare that in my/our thesis, 1

1: did not re-use my previous work without referring to it
2: did not use others work without referring to their work (e.g. course literature, scientific publications, other types of articles, websites or lecture material)
3: use the references and quotes in a proper way
4: included all references and resources in a reference list

I am aware that not citing and using references in a correct way may be considered as plagiarism.

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<th>Signature</th>
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