

Towards A Knowledge-Sharing Space in Interior Design: A Case Study of Roman Theatre Design

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Abstract

This paper presents the results of a collaborative research project that combines the fields of interior design, architecture, conservation of built heritage, archeology, history, communications and computer science. This study of new methods of experimentation will enable us to define and validate new orientations in the way we understand structure and transfer acquired knowledge about a given significant space. The objective of the project is to present the various experiences obtained during the interpretation of interior spaces, and in particular theatres, while adopting an interdisciplinary vision in the development of interior design education and outreach initiatives to better reflect the richness and subtlety of theater design. More specifically, it involves acquiring, through historians' knowledge and archaeologists' accurate documentation, as well as information and communication technologies (ICT), an understanding of the consequences of successive occupations of a Roman theater on its current condition. It also seeks to gain a better understanding of the construction techniques and know-how of the Ancients. Another objective of this project is to introduce collaboration between various disciplines as a tool capable of helping us understand theater design while drawing lessons from the past. This work will reflect on how to respond to certain challenges using the example of the experiences acquired at a Roman theater located in the ancient city of Byblos in Lebanon, a city included in UNESCO's World Heritage list since 1984.

Introduction

The objective of this presentation is to highlight a new reality in research on interior design, stemming in particular from the introduction of computers in design activities and from collaborative design. More specifically, we want to present research methods that would benefit from using computers as a tool for reflection and for unifying the disciplines involved in design. In the past several years, we have witnessed a shift in thinking, not only to explain the world, but also to understand the condition of its transformation. This allowed us to develop other forms of knowledge, making questionable the separation between knowledge and know-how, between those who think and those who act. Design is no longer seen as visual representation or a project model, but it is also viewed through its procedural and collaborative aspect.

In addition, interior design plays an important role in the overall design world and the research works that we present illustrate its contribution to interdisciplinary and collaborative research. In this conceptual framework, design, while distinctive, is not a separate field: in many other areas the same questions arise, especially on the role played by knowledge in design practices. Based on qualitative approaches, we have developed a methodology for observing the process of collaborative design that takes into account the evolution of the project during all of its phases in order to define the design process.

Our research was preceded by a study of the state of the art in the field, as well as by comparative research on approaches to collaborative design and computer-aided design. We also analyzed researches on teaching methods in design schools. In these preliminary studies we observed that, in education, for example, studios use computers by putting great emphasis on the visual side of design, to the detriment of the cognitive approach and know-how - an imbalance that we wanted remedied by new digital devices (Figure 1). The exploratory approach of our research also revealed some aspects of the digital medium that may benefit the design process, in particular its use as a tool for reflection, a model of reflective practice (Schön, 1983). It was also interesting to uncover some new knowledge and skills that will help professionals develop their own design approach.

Through these reflexive approaches we show how this research relates to other areas of interior design beyond historic preservation. And as noted in a very recent research report: "The creative performance of the design teams shows a difference between the initial brainstorming stage and the subsequent more in-depth discussion stage." (Kwon & Jang, 2013).

Finally, this study presents the evolution of collaborative research towards the analysis of the project, and more specifically towards the unifying theme of "knowledge in design", which offers a glimpse of new avenues for design exploration. These avenues include cognitive science and taking an interest in the thinking process, material and immaterial technical objects, as well as in virtual situations. Finally, the design process involves as many points of view as there are observers and as many approaches as there are authors.

1. The Byblos Roman theatre as a challenge for collaborative design

The proposed project focuses on the recollection of the history of the theatre in Byblos: [Translation] "One stone, two houses, three ruins, four gravediggers. A garden, flowers [...]." Thus begins the inventory poem written by Jacques Prévert (2003). If we could make a list of all the elements that can reveal know-how, perhaps we would obtain a similar list, a bit strange and disjointed. But then, how could we communicate this know-how "list" as regards the theatre of Byblos? Know-how is the technical skills or abilities mixed with experience in the pursuit of a profession such as that of the interior designer. After observing the city and recalling its past, several questions come to mind such as: how can we restore know-how, restoration being by definition the act of giving back to something its original form? But is it a matter of restoring know-how or should we attempt to transfer it differently?

There is a risk that the list that we propose to draw up, such as the one in Prévert's poem, might grow longer. The tales and legends that our ancestors once told around the fire could also fit into this list. Know-how, e.g. the specific gestures of the fortress builder, the stonemason's techniques or the methods used by fishermen and others could be added as well. The list of this past, sometimes intangible world is therefore an extensive one and it is the risk of losing its trace that is at the origin of this research. The purpose of our research is not to draw up a know-how inventory, but rather to propose a way to transfer it: How can we communicate the invisible? How can we make visible what we cannot see but can imagine when looking at the ruins of Byblos? And how can we develop new approaches to transfer these skills? These are the questions that our research will attempt to answer with an innovative work methodology, the Grounded theory method.

The Byblos project is a genuine laboratory to create new approaches for the enhancement of the "memory" of the place. The proposed project calls on our imagination to recreate the spirit of Byblos theater, a place where so many cultures were developed over the centuries. The spirit or the memory of an interior space is relevant in design process allowing us to see how the know-how is changing and allowing to identify in order to the importance some problems related for example to visibility and acoustic.

Located north of Beirut, the city of Byblos boasts a number of lively, ancient neighbourhoods, as well as an archaeological site where excavation work has unearthed a succession of abandoned cities revealing long vanished civilizations (Jidejian, 2004). "The chief attraction of Byblos for visitors is the superposition, in the same site, of ruins spanning 7,000 years of history." (Dunand, 1973) Over the course of history, the site served as a quarry for successive civilizations. Such was the case with the Roman theatre, which was used as a supply source of stone by the Crusaders and whose origins date back to 218 A.D. Today, only the first five tiers and the stage remain. When it was first excavated, the theatre faced the setting sun. It was moved and rebuilt near the sea by archaeologists, and is now located at Early Bronze Age period levels. (El-Khoury & al., 2006)

The idea for this research arose from the study of certain places, of which sometimes only ruins remain, but that are important enough to warrant further exploration: these ruins represent a know-how that can be applied nowadays and that we can resume in a knowledge-sharing space. There are multiple definitions of knowledge-sharing space, and this a subject of ongoing debates among the various disciplines involved in its creation. In our case, we define it as a virtual place where all the experiences on the Roman theatre are gathered as a result of active collaboration and teamwork. (Figure 1)

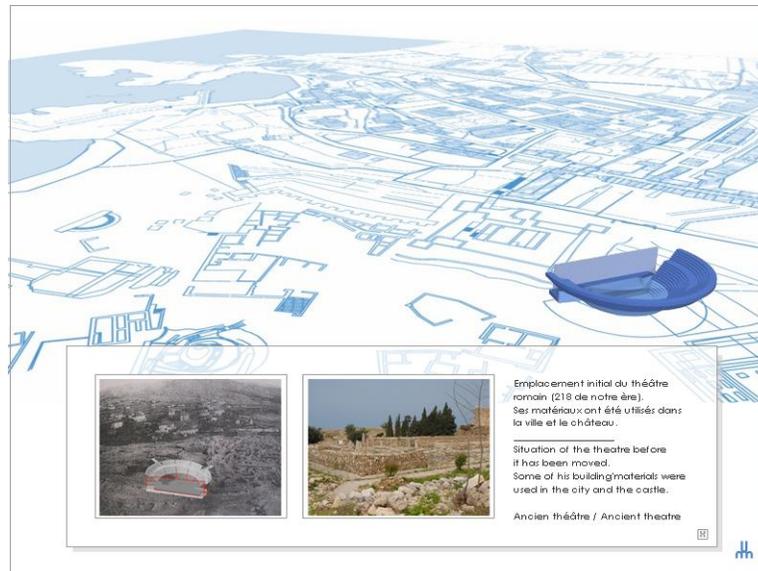


Figure 1: The knowledge-sharing space : a virtual web-space presenting the Byblos Roman theater experiments

The Byblos site was chosen for our case study because of its characteristics that qualify it as a "dynamic cultural site" that is to say, a site that offers a superposition of several layers of history and know-how. We therefore decided that this location was the most suitable for our research.

As part of our research, we assembled some useful information and reviewed documentation on heritage preservation in order to familiarize ourselves with the subject. We studied various charters and agreements concerning architectural heritage preservation (UNESCO, 1994). This enabled us to grasp the importance of understanding heritage and its significance and to conclude that the purpose of our research should not be to define heritage but rather to focus on some of its facets, basically those related to design and in particular interior design of a theatre as regards sight lines for the spectators. It is important to consider the problem of visibility in theaters and how this can affect the quality of our experience as spectators; and to understand that visibility is a major problem to avoid while designing the interior of a theater (Figure 2)



Figure 2 : Étude de visibilité dans les théâtres (El-Khoury, 2005)

One of the main objectives of our research has been to gain an understanding of theatre design in order to demonstrate how, using new methods of representation, we can attempt to virtually represent the know-how of the Ancients: what is and what used to be. The physical reconstitution of monuments is now regulated. The Venice Charter, which preceded the one adopted in Victoria Falls in 2003, states “that architectural heritage must be considered within the cultural context to which it belongs, that conservation and restoration of architectural heritage requires a multidisciplinary approach, and that the latter is not an end in itself but a means to an end, which is the building as a whole.”

It is therefore essential to have a multidisciplinary-collaborative approach that combines different fields and lead to the main research question: How collaboration between disciplines (interior design, architecture, the conservation of built heritage, archeology, history, communications and computer science...) can lead to the realization of a model of the Byblos Roman theatre? (Figure 3), and how this interactive model will help us understand theatre design and thus draw lessons from the past. In other words, if an appropriate collaboration between disciplines involved in theatre design, is adopted, it is possible to better understand the design process.

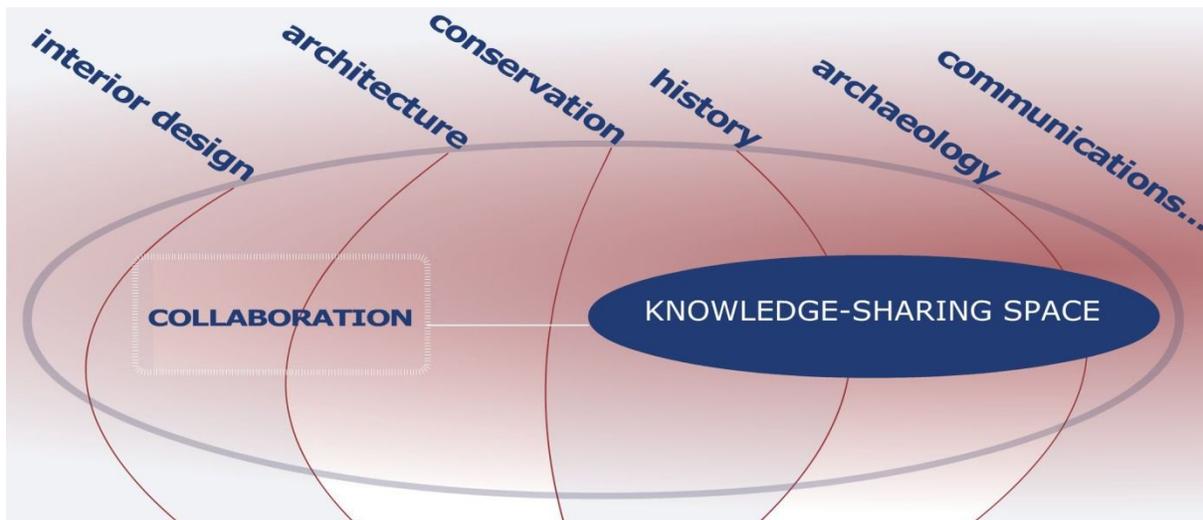


Figure 3: Diagram showing the organisation of this research

2. Research methodology

The process of collaboration is the only way to work in this kind of project and as well explained by M. Zahedi “To discover ways to approach the multi-disciplinary team in order to access the needed knowledge for the project, Research through Design (RtD), also called Project-grounded research was used. This allows the researcher/designer to conduct research in a real-world context. The study focuses on real problems, the design process, its context and the interactions of the people involved while progressing with the client’s project. In effect, the boundary between theory and practice is eliminated. Design theory becomes part of the project and its implications during the project’s development are observable. In such situations, both research and project progress iteratively.” (Zahedi & Sharlin, 2012)

To better understand how to collaborate and the value of collaboration we firstly define the bases of the argumentation that supports the theme of our research. And, secondly, we highlight the avenues chosen among the paths of research that were explored. The collaborative work approach is based on the Grounded theory method and draws its inspiration from researches on environments and people. It targets the inventory of literature at a cognitive level rather than at an explanatory level, leading to open research objectives. In this process based on inductivism, the theoretical and experiential mind of the researcher is brought to the forefront. (Mucchielli, 2004) Grounded theory is augmented by turning to other research in the same field of study during the initial stages. However, the literature is not directly used as a base to follow a trend, because it requires from the researcher to develop his own analysis and to disregard set precedents. These strategies reinforce the data as well as the ideas ensuing from them.

The data collected are not analyzed through a traditional quantitative verification approach, but they enable the development of comparisons and observations that raise these efforts beyond a single end by doing spadework that may mistakenly be considered as verification work.

This theory advocates an interpretation of often innovative data without explicitly aspiring to a final and complete interpretation. Data are collected during an observation of facts from which the researcher will draw a set of themes that will lay the foundations of its set of problems.

In addition to the potential of creating communication between disciplines, this research project opens new possibilities of expression and experience. The various disciplines involved in the enhancement of interior design education — history, archaeology, architecture, urban planning and others — come together and generate debates and discussions to propose solutions that integrate their combined expertise. It also helps to re-create and remould a monumental complex without having all the information and to test hypotheses that we would otherwise be unable to validate without the participation of the disciplines involved in this project.

In order to study the Byblos' Roman theatre, a preliminary experiment was undertaken based on a multidisciplinary research strategy that begun with a historical study. The knowledge of the historian as well as that of the archeologist was essential while conducting this research. Their contribution was the main source of information because we lacked sufficient data on a building that dated A.D. 218.

We had to compare the Roman theatre of Byblos to other Roman theatre in the world where we noticed that this particular civilization used same proportions for their theatres. We also had to search for ancient manuscripts, such as those of archaeologist M. Dunand, archives and sometimes poetry such as that of the Poet Lucretius (99 B.C. - 55 B.C.) The latter likens the *Velarium* placed over the theatre to a multicolored cloud that gives forth a crackling noise, resembling fluttering pieces of paper, as it flaps. (Izenour, 1996) In fact tensile structures were originally positioned over the public spaces centuries ago. The purpose of such a structure was, according to archeologist Dunand (1973), to protect the audience from the heat of warm summers. In witness to this fact, holes that support these protective structures were found in the stones on the first steps of the Roman theatre of Byblos. (Figure 4)



Figure 4: The Roman theatre of Byblos A.D. 218 nowadays and its virtual copy showing the holes that used to support protective structures (velarium) in the stones of the first steps

We even had to examine old paintings to imagine what the *Velarium* placed over Roman theatres would be like. (Figure 5)

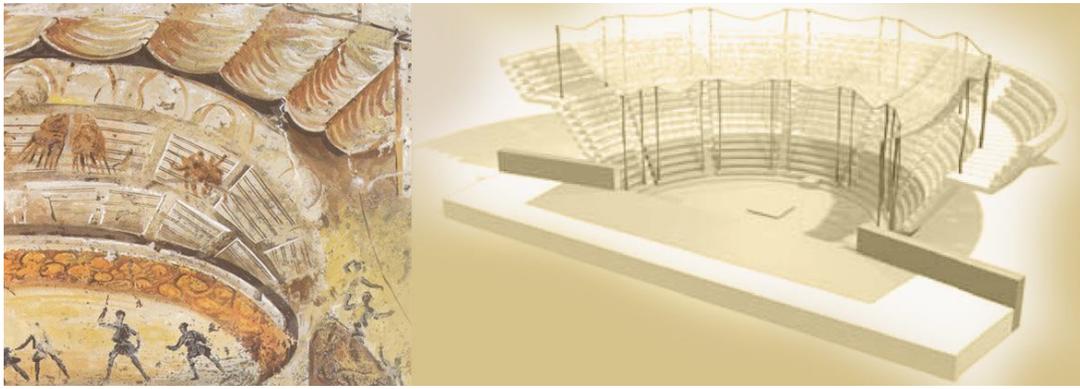


Figure 5: Detail of a painting illustrating the *Velarium* dressed over the Pompeii amphitheater in A.D. 59 next to the digital model of the Roman theatre of Byblos (A.D. 218) (Connolly, 1998)

The main challenge while working on the Roman theatre of Byblos project was to recreate and remould a monumental complex without having all the necessary information and testing hypotheses that would have been impossible to validate without the collaboration of the various disciplines previously mentioned. Because of the lack of information concerning drawings, one of the most valuable contribution was the input of the archeologist and historian.

3. Theatre design through the ages

The important role of the historian and the expert in the conservation of built heritage is to communicate their knowledge on the history of theatres. As regards the history of theatre design, it should be noted that it is a vast topic to explore. Although opinion is divided as to the origins of theatre, for the purposes of this historical overview, we will select Greek theatre as our starting point. Anthropologists nevertheless consider that its roots can be traced back even further, to ancient rituals, myths and ceremonies. By its very nature, theatre is meant to be seen and heard, not read from a book. It is a performance that occurs in a place and a space around which a group of people gathers to watch and listen. (Appia and Craig, in Couty, 2001) Seeing and hearing are the most important senses for the theatre audience. According to G.C. Izenour (1996): "Every performed art is a performer-audience shared experience entirely dependent upon the sensations of seeing and hearing. Anthropology teaches that in the long chain of human evolution these two senses developed gradually and at widely separated times. Seeing came first and for fundamental survival of the race is the more important..." For R. Neutra, theatre, from the Greek *theatron*, is a *spectatorium* — a space for seeing and watching, as well as an auditorium — a place for hearing.

But the space does not elicit a response from these two senses alone: it is replete with what the other senses trigger in millions of receptors. As a result, the architects of the day needed to appeal to clients through more than the five senses. Neutra describes the theatre as an *espace thermal* ("hot space") where the temperature rises at the same time as the curtain, kindled by hundreds of human beings from one act to the next. (Neutra in Polieri, 1990) In Vitruvius's writings, he explores the architecture of the theatre and the evolution of the stage in particular, studying its overall form based on observations of Greek ruins. According to historian O.G. Brockett (1999), the discovery of vestiges of circular-shaped stages in Crete led to a re-examination of the assumption that the orchestra had always been square or rectangular in form. The first evidence of the layout of the Greek theatre emerged in the analysis of the Theatre of Dionysus (6th century BCE), located in the sanctuary of Dionysus Eleuthereus, on a hillside at the foot of the Acropolis. The Theatre of Dionysus is composed essentially of the circular orchestra (the dance floor), around which the audience sat or stood on the slope of the hill to observe whatever tragedy was being presented. (Brockett, 1999) Ultimately, this discovery casts some doubts on the existence of an exclusively square or rectangular orchestra, as some theories on the origins of the shape of the stage had suggested. (Brockett, 1999) The Romans thus contributed to the well-being of the audience, by providing a theatre that offered an optimal level of visual comfort. (Figure 6)

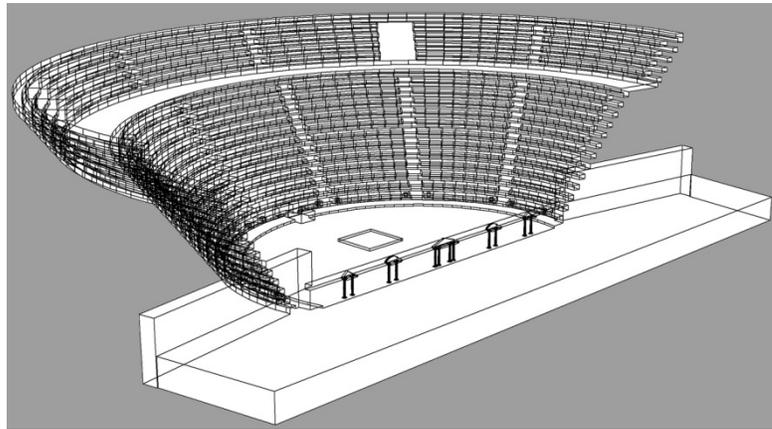


Figure 6: Reconstruction of the Roman theatre, 3D model (N. El-Khoury, 2006)

The Romans also took into account weather conditions when deciding on the location of their buildings and, in particular, their theatres, which in addition to providing good visibility, also boasted excellent acoustics. (Brockett, 1999) Moreover, they integrated the slope of the theatre into their design.

Their careful attention to ensuring that all spectators had a clear view of the stage is emphasized in the writings of Vitruvius. He stresses that the height of the stage should not exceed five feet, so that the people sitting in the orchestra can see the movements of all of the actors. (Vitruvius, Book V, Chapter VI, in Choisy, 1971)

In order to ensure a good overall view of the stage, the Romans adjusted the slope of the *cavea* and imposed geometric constraints on the design to produce a clear sightline. As a result, the typical Roman amphitheatre, the Thysdrus amphitheatre in particular (Tunisia, 2nd century CE), featured a slope with some 40 to 50 gradients. (Figure 7)

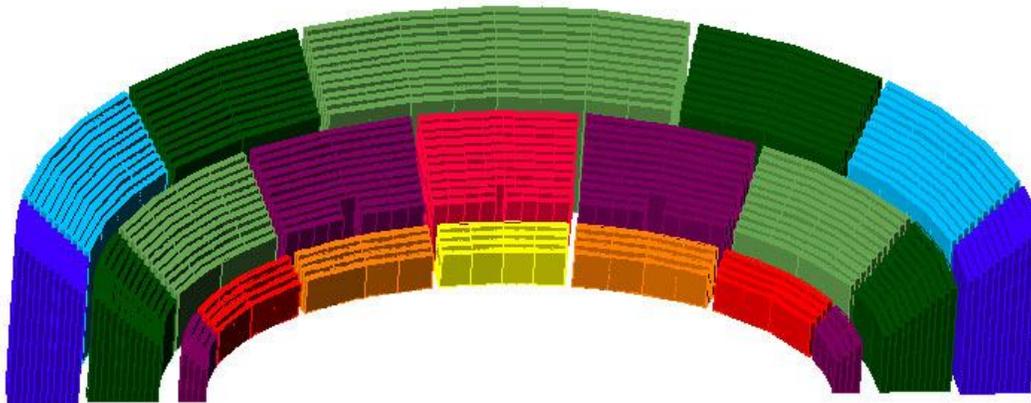


Figure 7: Model of the Thysdrus Roman amphitheatre (2nd century CE) drawn with the Autocad software and illustrating with colours the quality of visual comfort. (El-Khoury, 2005)

The audience is a fundamental part of the theatre. Incidentally, it should be pointed out that while in the Greco-Roman era spectators were seated, in the Middle Ages they frequently stood, in the portion of the marketplace designated as a performance area. In fact, M.C. Hubert (2000) states that there was no real theatres during medieval times.

Medieval spectators' visibility was shaped by where they themselves chose to gather in a public space around a makeshift stage. By changing where they stood in relation to the stage, they could find a position to accommodate their needs. Their place was therefore not tied to a fixed point. Unlike the Medieval style of theatre, which engaged the audience directly, the new concept introduced with the Renaissance severed the link that had been forged in the Middle Ages between the spectators and the action on stage. M.C. Hubert (2000) outlines the major aspects of this change, explaining that the frontal view that had been initiated in Ancient Rome was necessary because it was the only approach compatible with an enclosed theatre.

As a result, from that point onward the audience was placed in front of the performance instead of around it as it had been the case with the Greeks and in the Middle Ages. (Hubert, 2000)

Therefore, it was only in the Renaissance that the audience was enclosed in rooms, the main features of which being a single-point perspective and several tiers of balconies and boxes in a U-shaped configuration around the stage. Architects had created a radically new layout that replaced the spherical model of Ancient Greece with a cubic concept that drew a clear distinction between the audience and the performance. (Hubert, 2000) With this defined boundary between the spectator and the stage, audience members' field of vision would become conditioned. No longer would they crowd the stage as was the custom in the Middle Ages to "get a better look." Instead their sightline would vary depending on the obstacles in front of them.

4. Experimentation and communication

This historical study helped us understand theatre design and particularly Roman theatres. Our goal was to understand and reconstruct a place through the collaboration of different disciplines. In these valuable conditions of collaboration, the use of computer models that allow for realistic simulations and real time movement through virtual spaces becomes relevant. Little by little, a physical environment is expressed through digital 3D spaces and a kind of architecture that is virtual and dematerialized sees the light and affords us a better understanding of the construction of a theatre. The use of new information and communications technologies (ICT) enables an exploration involving the simultaneous use of simulation and experimentation.

Knowledge in ICT for this project played an important role as they will not compromise the heritage value of a site by physically reconstructing it. (UNESCO, 1994) This had been the case of the Roman theatre of Byblos (A.D. 218), which we used as a case study and which, as previously mentioned, was moved and rebuilt near the sea by archaeologist M. Dunand in the 1930s. (Jidejian, 2004) This strategy allowed the development of augmented reality experiences in order to make us feel present within old constructions as well as on the actual archaeological site. Although many current studies have focused on reading the past using ICT (Vergnieux, 2003, Dave, 2005 Gutierrez, 2005, Saleh, 2005), the avenues for research identified in the context of this work arose from a system of collaboration, that led to the creation of semantic models. (De Paoli & Bogdan, 1999)

As already pointed out in a previous paper (El-Khoury, 2006), "Such a model allows us to produce figurations with all the characteristics belonging to a single family of objects in order to illustrate the result of a procedure or process, and to find relationships among theatres based on their method of construction; in addition, it makes it possible to verify the validity of a rule characterizing a set of objects, thereby ensuring a dialogue between the various actors and the model. Figuration consists of a series of three-dimensional scenes that act as a metaphor for constructive and temporal reality" (De Paoli & Bogdan, 1999)

The activity of comprehension and communication inside this dynamic virtual historical space is more intuitive and effective than using only abstract technical data for plans and orthogonal views. Furthermore, with ICT, we are able to remotely access these augmented realities. (Figure 8)

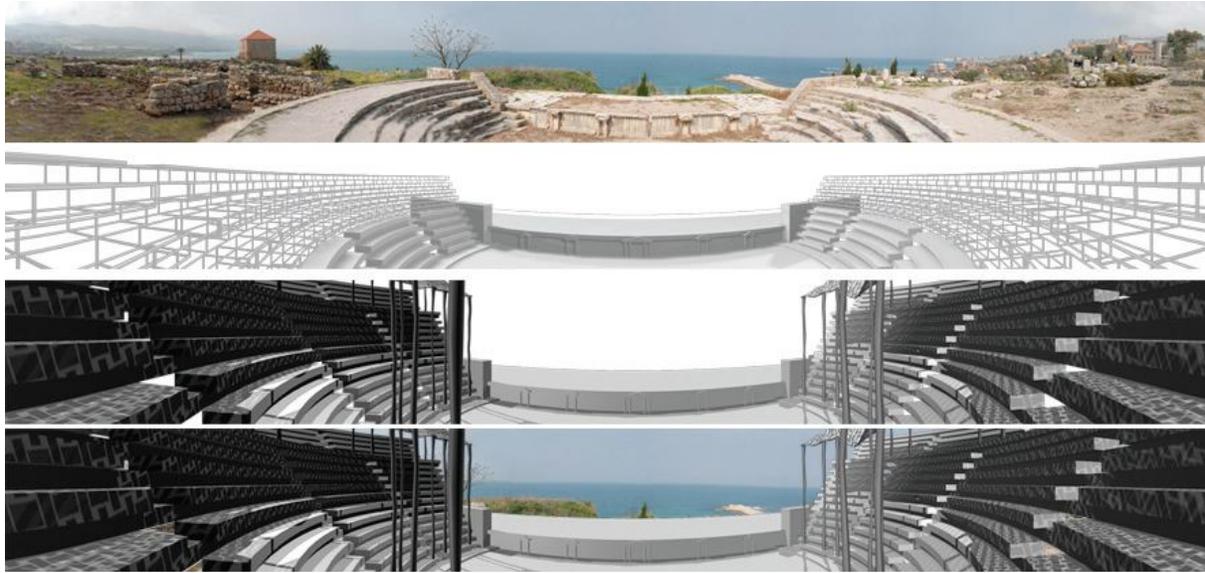


Figure 8: Augmented realities composed of cylindrical panoramic views of the real site using QTVR. (El-Khoury 2006)

The result is an approach that integrates various design process “operators” to enable the use of appropriately structured figurations that can be manipulated, transformed and organized into a figuration of the object. This process is somewhat similar to the reuse of architectural knowledge in the creation of an architectural work. In designing a new project, architects use fragments of knowledge derived from ancient structures, whether these fragments are reutilized, or simply projected. The design is then based on the memory of a previous interpretation, since the extraction of reusable knowledge can be achieved through an interpretive process. (Léglise, 2000)

This collaboration project involves several disciplines: architecture, interior design, urban planning, history, archaeology, communications and, undoubtedly, other areas as well. Interactive teamwork raises some of the most fundamental research challenges: how to bring together all of these competencies around a common objective: the enhancement of heritage and design.

The way in which these objectives were achieved will likely have an impact on the current work methods of the designers and especially interior designers involved in the development of a project, as they can now benefit from the integration of information relating to the know-how of archaeologists, architects and historians to colligate a memory and propose new methodological orientations in interior environment.

5. Conclusion

In the practice of design, working with knowledge means aiming at developing new knowledge about design, its process and the end product. We find that in collaborative work we are no longer in a situation where we can see how design operates, but in a situation of defining the way design should operate. We also find that designers have, depending of the times and the work tools, changed the paradigm and that computers can be a rallying factor for a shift in design methods.

These findings allow us to conclude that traditional means of imparting design: plans, sections and perspectives are not interpreted the same way by the different stakeholders: historians, archaeologists, architects, communicators; these means do not, up to now, enable the transfer of the designer’s knowledge and know-how during the design collaborative project.

Our research therefore focuses mainly on the development of new methods to organize information that are necessary for the definition of the interior spaces.

It also deals with the description of what we call the 3rd eye, that is to say, linking the different views of concerned stakeholders, in a narrative form that provides links between different kinds of information.

Achieving these goals means to help redefine the current working methods of designers and allow the integration of information associated with very different types of knowledge:

- The know-how of archaeologists to compile a memory and propose narratives;
- the know-how of architects to express spaces and logical or physical relationships;
- the knowledge of researchers to describe the “memory” and propose collaborative work methods;
- The knowledge of scientists to determine the computer language to be used.

As it can be seen, these goals are innovative in many ways and they propose a totally new collaboration between researchers and professionals.

As Fleischmann wrote: “While collaborative practice is identified as one way forward in the current debate on the future of design education, on the other hand, the exact way in which such collaborations are managed on the ground is less well defined, particularly in undergraduate design education.” (2013)

Finally, the design approaches of the project tend to be open in order to accommodate, at a very early stage in the process, various stakeholders who are not architecture experts and who are not familiar with the language and functional representations used by designers. Thanks to collaborative work, design is increasingly becoming a constantly evolving information space, a living memory.

This research shows the importance of collaborative and multidisciplinary design. Interior design has acquired a multidisciplinary status and it is in this direction that schools should prepare future programs of study. As emphasized by Nelson and Stolterman “Genesis is ongoing. As human beings, we continuously create things that help reshape the reality and essence of the world as we know it. When we create new things – technologies, organization, processes, environment, ways of thinking, or systems – we engage in design.” (Nelson & Stolterman, 2012)

This paper argues that the use of new technologies (ICT) and the interest in heritage are an example of “design the way” to allow a culture of inquiry and action.

As outlined in other multidisciplinary researches (El-Khoury & al., 2006, 2010; De Paoli & El-Khoury, 2012), “through this work we explored different avenues to achieving the goals set forth in the research project. Our initial desire to enhance heritage sites led us to delve further into the concept of heritage and review previous work that had been done on the topic.” (El-Khoury & De Paoli, 2010) This reflection process enabled us to define the themes for the Byblos research project by orienting its focus on the case of the Roman theatre. We realized that, although they are two different entities, the archaeological site and the medieval city of Byblos share a common heritage.

We reflected on the types of solutions that could be brought to bear. Our conclusion is that research must not lead to the automatic generation of solutions.

Rather, its aim is to provide a means of understanding spaces for the enhancement of local architectural heritage, using information and communication technologies. The reconstitution of a building facilitates not only the understanding of its ruins, but also the dialogue between professionals and non-experts.

The creation of 3D models provides a new opportunity for both researchers and the public to better understand the intangible aspects of heritage spaces. This work opens up perspectives for research that we will touch on briefly. These can be organized around two distinct poles:

The first relates to the future of heritage education, which is an essential function of a site such as Byblos if it is considered as a museum. From this standpoint, the question of how knowledge will be transmitted in the future is at the forefront, and researchers are asking themselves what type of museum should evolve in the years ahead. Will we see an “info-highway museum” in which data can be manipulated but not modified? Or a “museum without walls” that will be able to reach people wherever they are? (Allard and Boucher, 1997)

Heritage education is a key element in the creation of an open museum space, as in the case of Byblos, which opens onto the city. Knowledge is thus transferred in a kind of museum entertainment.

The second pole is the adoption of an “interdisciplinary vision in the development of conservation and outreach initiatives to better reflect the richness and subtlety of the content.”(Allard and Boucher, 1997) The various disciplines involved in the enhancement of heritage — history, archaeology, architecture, interior design, urban planning and others — come together and generate debates and discussions to propose solutions that integrate their combined expertise.

Research perspectives are not limited to these two poles but extend to other areas as well. For instance, the results of this research project could be used for pedagogical purposes, to demonstrate in particular the importance of a multidisciplinary approach in the new curriculum in interior design. Teaching the history of vanished heritage sites could be made more accessible by means of models to aid in our understanding of these sites and to design new interior spaces.

It is in this direction that we continue our methodological experimentation. “Our aim is to contribute to the advancement of knowledge by integrating the expertise of the various disciplines involved in the enhancement of heritage sites, which can only be enriched as a result. ITCs become a unifying element between these different fields and thereby help to facilitate the process of shared decision making.” (El-Khoury, 2006)

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