

Reggio Calabria, Museum of itself. Project for an interactive Museum of the City

Reggio Calabria museo di sé stessa. Progetto per un museo interattivo della città

The city of Reggio Calabria, its local context and the history that in this last century distinguished it, assumed an important role in determining the proposal of the project of a virtual museum of the city, which reminds its configuration before the earthquake.

This research started in 2014 and it is about the reconstruction of a city that has been deleted by the earthquake of 1908, and about the retrieval of the historical memory and of the place's identities.

The project deals with the creation of urban paths with a strong multimedia effect. For this reason we asked to Franz Fischnaller to describe in a brief interview some of his more important experiences of virtual museums realized through new generation systems, able to link urban sites to digital entertainments adapted to recreate historical lost paths.

La città di Reggio Calabria, il suo contesto territoriale e la storia che in quest'ultimo secolo l'ha caratterizzata, hanno avuto un ruolo importante nella determinazione della proposta per il progetto di un museo virtuale della città, che ricordi la sua configurazione pre-terremoto.

Si tratta di una esperienza iniziata nel 2014, sulla ricostruzione di una Reggio che è stata cancellata dal sisma del 1908 e, cosa ben più difficile e necessaria, della ricomposizione della memoria storica e della identità dei luoghi.

Il progetto tratta della realizzazione di itinerari urbani ad alto impatto multimediale e per questo si è chiesto a Franz Fischnaller in una breve intervista di raccontare alcune delle sue più significative esperienze di musei virtuali realizzati attraverso sistemi di nuova generazione, capaci di accostare ai siti urbani di oggi opportuni digital entertainments adatti a ricreare percorsi storici perduti.



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Andrea Manti

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key words: Virtual Museum, Memory, Photo-modeling, Digital Reconstruction, Digital Entertainment.

parole chiave: Virtual Museum, Memoria, Fotomodellazione, Ricostruzione digitale, Digital Entertainment.

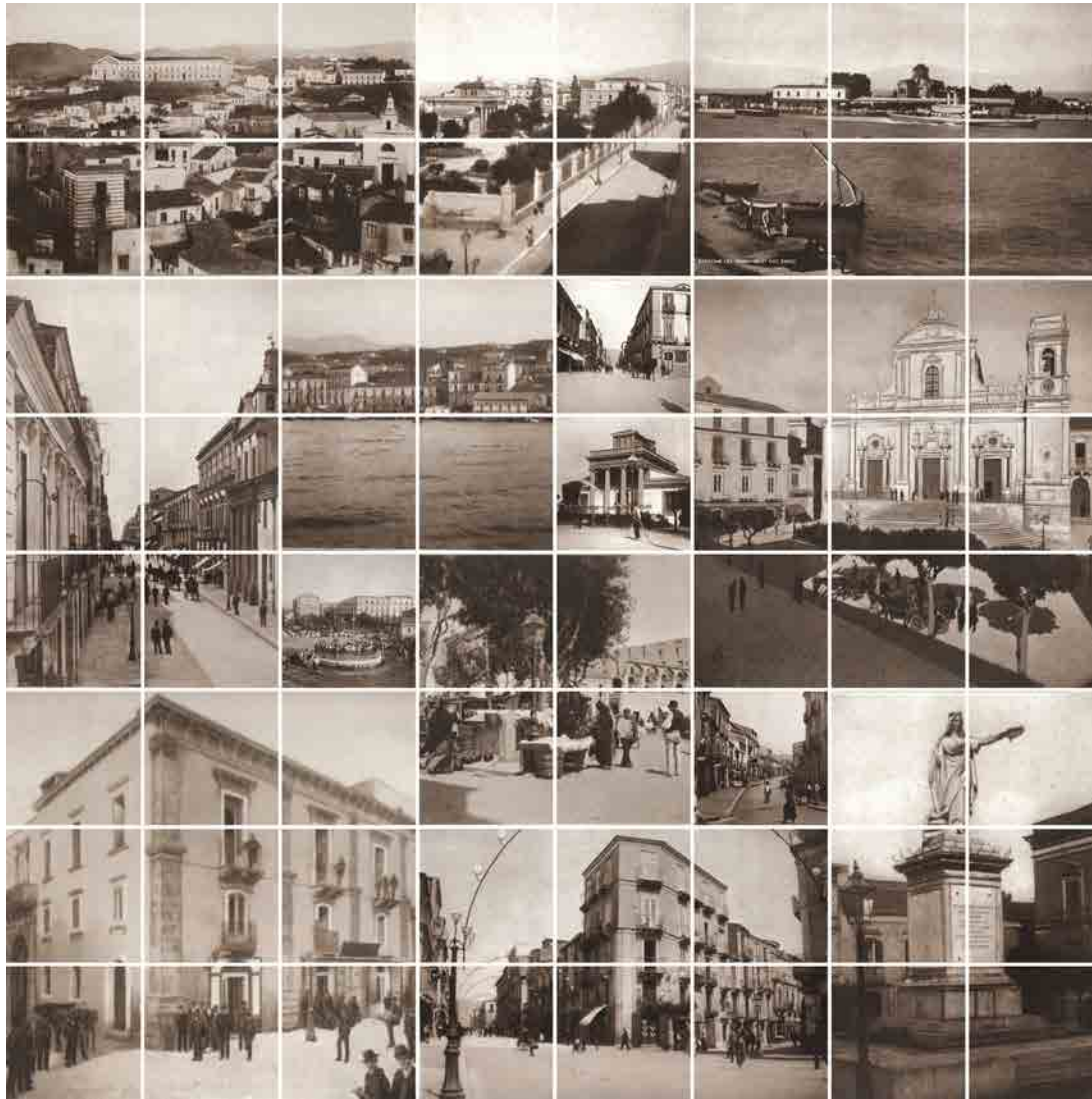


Fig. 2. Reggio Calabria before 1908. Source photo: the Municipal Historical Archives and State Archives, Reggio Calabria.

2. THE DIGITALIZATION OF THE ARCHIVES AND OF THE EVIDENCES

The University of the Studies 'Mediterranean' of Reggio Calabria, on May 2013 received a huge collection of more of 300 pieces, as temporary storage, from the National Archaeological Museum and from the Municipality. These has been found or saved during the demolition of the city of Reggio Calabria after the earthquake of 1908. It's an heritage of the memory that comes to the light after a long silence, to present itself to the academics and of the citizens to give testimony of the town's history and to reanimate the conscious of the materiality and the concreteness of 'pieces' directly coming from disappeared buildings, attesting the quality of the architectural and building happening until the XIX century.

This set of testimonies could be profitably linked and 'crossed' with the cognitive data coming from other 'fragments' of the regional and city's history, those as much precious built starting form documents, drawing and projects stored both at the State's Archive and at the District's Historical Archive. The collection proves the importance of documentary heritage that reveal the inherit potentialities -with historical and museum pursuits - with the material testimonies of the disappeared architectures.

The temporary depot of the finds gave the chance to make an accurate three-dimensional survey with the aim to catalogue and make them useful in a virtual environment. This activity allowed us to integrate a process of survey with that of cataloguing, 2D and 3D models, obtained with the photo-modelling technic. One of the main objective of the project was the creation of a digital archive, to enforce during the time. The archive allows to control, to know, to explore and better understand the studied evidences. The data stored at its inside have been acquired and elaborated in few time using above all low coast equipment. The technique of the photo-modelling, convenient for time's reasons, able to give three-dimensional visualization in virtual environment, spread the modality of consumption of the digital reconstructions and it got dragged the audience though a more direct and rapid communication.



Fig. 3. Reggio Calabria, 1908. Source photo: the Diocesan Historical Archive, Reggio Calabria and Archives of Civil Protection, Rome.

3. THE MAKING OF VIRTUAL PATHS

The set of analysed pieces is linked with the urban history of Reggio starting from the XVI century. The archaeological and sculptural elements and the graphic and documentary testimonies mainly concerns the late 700's and 800's of the reconstruction after the first earthquake of 1783. The huge cadastral plan of 1903, looked after the District's Archive, precisely furnishes proof about the consistency of the city the eve of the earthquake in 1908. This is an instrument of crossing comparison with data coming from the collection of architectural fragments and from the other documentary sources, for the reconstruction of the *forma urbis*, and realized with the plans and the intention that came in succession during the XIX century. For these reasons, today we can deeply study the urban and building history of the city, coming to a real virtual reconstruction of the Reggio after the 1908 and, above all, to the creation of a Museum of the city, composed thanks to a virtual collection of recovery pieces.

First step: urban path's recognition

The recognized field is the historical centre of Reggio Calabria. On this we could define some paths for a virtual museum tour that is focused on the relevant places on the base of the after-earthquake city.

Second Step: locationing and using of the interactive systems

With the specific signals placed in front of the interested buildings, we create some markers linked to a specific App for tablets and smartphones. With the virtual interaction, we can visualize the ancient map of the old city and, from the different position of the user, the consumer identifies the geo-referential rebuilt-building that have an historical relevance.

Third step: virtual reconstruction

On the current urban system has been overlapped the nineteenth-century layout on which it has been placed, with three-dimensional reconstruction, some important historical artefacts. The user, crossing the device o the signalled building could visualize the historical evidences thanks to AR systems.

Fourth step: digital entertainment

Each user, visualized the building, will be able to use the three-dimensional reconstructions placed in a stra-

tegic way useful to spread the historical and touristic communications about some parts of the city. For these is available a programmed audio-guide in different languages that gives the info about the artefact.

An important action to promote the integrated knowledge of the cultural heritage and of its context, to become a cultural, social and economical growth factor of the urban system in which it is placed.

The research favoured technologies based on the use of easy tools, low coast and/or open source. The 3D models are not a mere and aseptic digital transposition, but as an action able to operate analytical processes and of synthesis to understand and to know structures, shapes and all the configurations that the history deleted.

4. ART, MEMORY AND INNOVATIVE PERFORMANCES: AN INTERVIEW TO RANZ FISCHNALLER

We asked to Franz Fischnaller to tell us, by means of a brief interview, his idea about Virtual Museum also rapport to his experience of digital urban art. Shortly, his activity has as grounds a multimedia creative process, which explores many subjects, like for example visual art, technology, science, new media design, cultural heritage, human and social sciences [1].

In this context, we want to talk about the innovation line of digital urban paths adopted by some European cities, linked to the innovation area 'Tourism and Culture'.

Can you expand on the topic referred to the impact that new media, the information and digital technologies and the amplification senses and the enhancement of our capacities have?

To provide an answer to your question, even if on a general and partial basis I would like to make a step back recall what I had stated in my book *e-Art*:

In the article *Unlimited Technology Requires Synergic Morality* Peter Russell, British author of *The Global Brain*, *Waking up in Time*, *The Consciousness Revolution* sustains the following: technology can be considered as an amplification of our innate capacities. In essence, the amplification of the potential inherent in the human thumb:

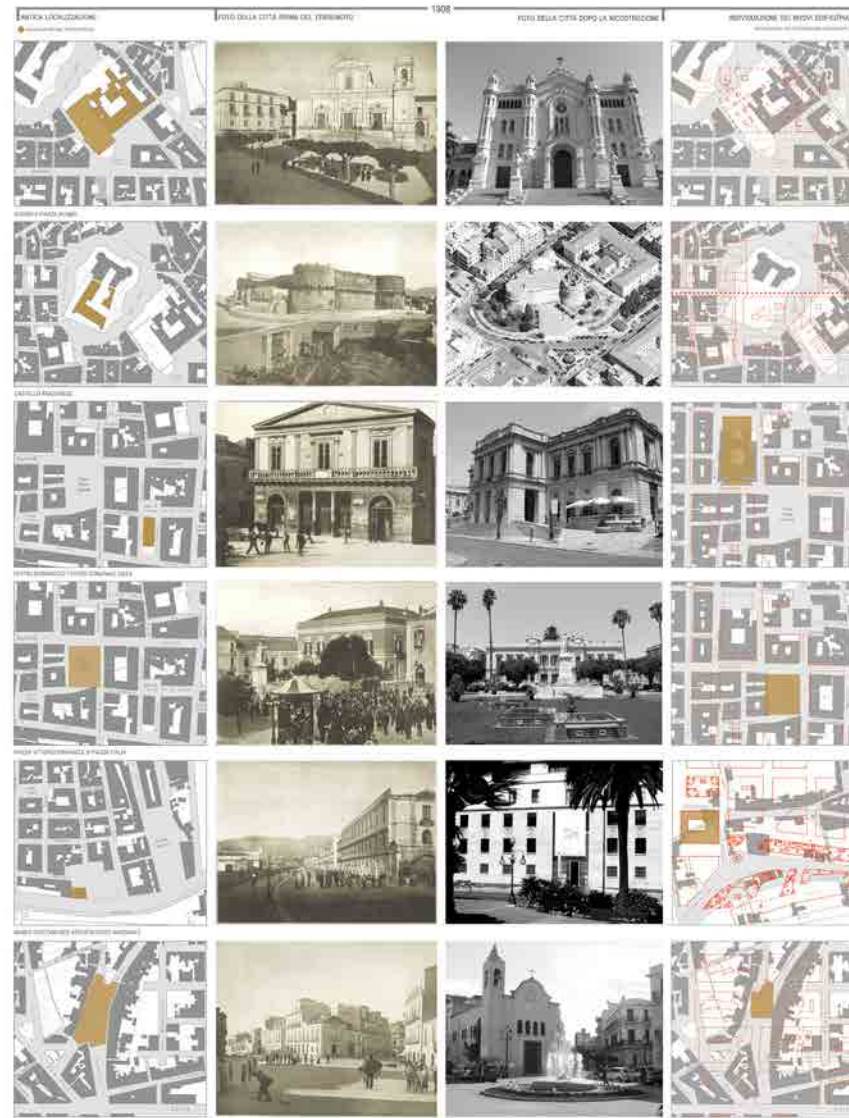


Fig. 4. Analysis of ancient localization of some parts of the city of Reggio Calabria (Squares / Historic Buildings) and identification of the buildings rebuilt after the earthquake according to the De Nava Plan.

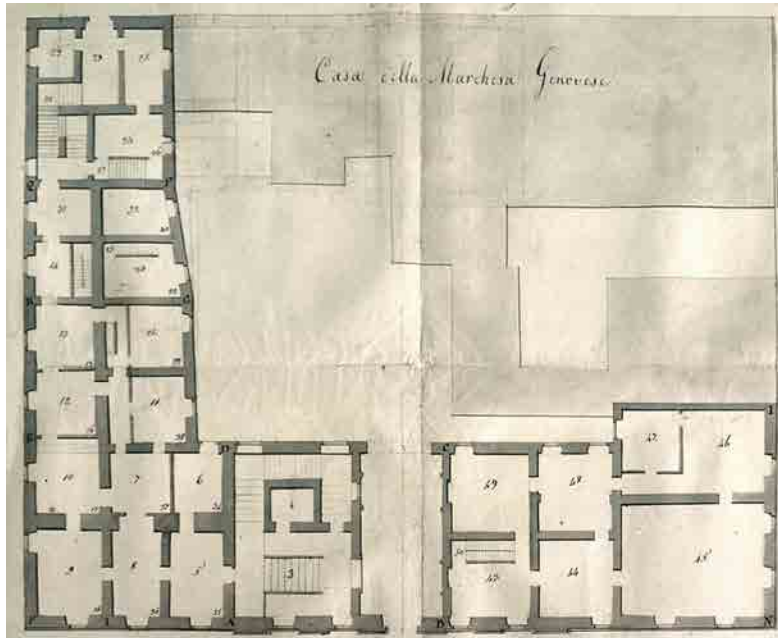
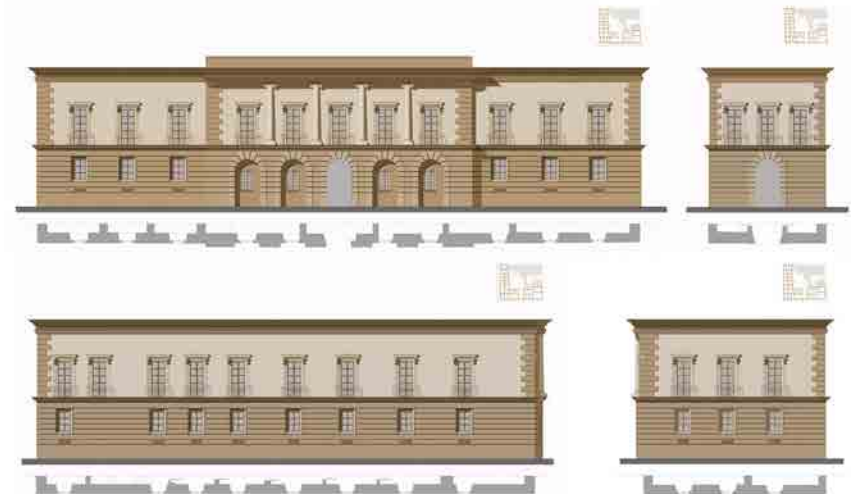
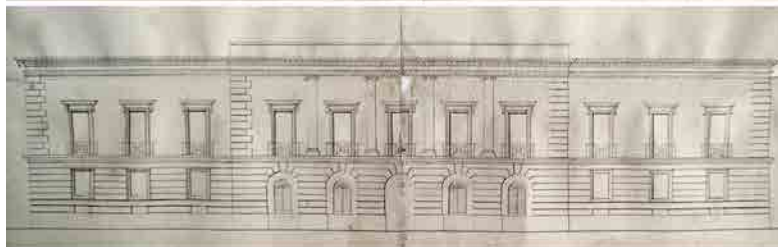


Fig. 5. Palace of the Inland Provincial, destroyed by the 1908 earthquake. Graphic documentation and localization on the cadastral map of 1890.

Fig.6. Graphics project and three-dimensional reconstruction of the Palace of the Inland Provincial.



In essence all technology can be considered as an amplification of our innate capacities. One ability that makes humanity unique is our opposable thumb – a thumb that can rotate fully about its base, allowing it to be put in direct opposition to each of the fingers. This unique feature allows us to grasp objects of varying shapes and sizes, manipulate them, and perform delicate operations with them. It transforms the human hand into one of the most elegantly skillful biological organs ever evolved.

These hands have led us to become one of the most proficient and prolific tool-users on the Planet. We moved from hammers to axes, clothes, boats, wheels, windmills, steam engines, telephones, computers and space vehicles. All of this technology is, in essence, the amplification of the potential inherent in the human thumb.

In addition to amplifying the power inherent in the human thumb, we have also amplified our other unique asset – language and our ability to share ideas. Unlike other creatures we do not have to learn everything anew; we can learn from each other. With the advent of language we began learning together as a single species.

Why the use of new media and advanced technology in the field of cultural heritage is important?

The cultural heritage sector (CH) practices are rapidly and progressively growing depending upon digital media, technology tools and advanced visualization systems for the development and implementation of innovative CH works (tangible and intangible) data for its display and dissemination. It is essential, from one side, that those researching and working in the field of cultural heritage apprehend, the relevance of the social, cultural, creative and innovative implications, and from the other, is needed to know the major principles and the frameworks that sustain these technologies in order of exploiting these to the full.

The experience has demonstrated that new media technologies combined with arts, humanities, social science and cultural heritage can contribute to the development of best practice in and out of the museums, benefiting the field, transcending and enriching the practices in cultural heritage learning and communication. Among others, it has provided a fertile context for cross-disciplinary collaboration for the design and development of innovative works (i.e. novel designs, immersive interactive experiences engaging audiences efficiently) as well as contributing to the implementation of a new kind of digital heritage storytelling that revisits the ancient and classical arts, the cultural heart of past societies, enhancing the visitor's experience.

Can you expand on the need to focus on Cultural Heritage Tourism as a tool of economic, social and cultural development and the relevance of Digital Media and IT Knowledge management for new generation cultural tourism industry models?

It is unquestionable that we are living in a world that has evolved considerably, from a generation ago. The Media and its evolution is one of the main factors of change and developments and a driver of growth in many economies. These developments have also provided various opportunities, new industries, new business models that are generating substantial income flows and jobs, contributing directly to economic development in many countries. "Cultural Heritage Tourism is a tool of economic development that achieves economic growth through attracting visitors from out-

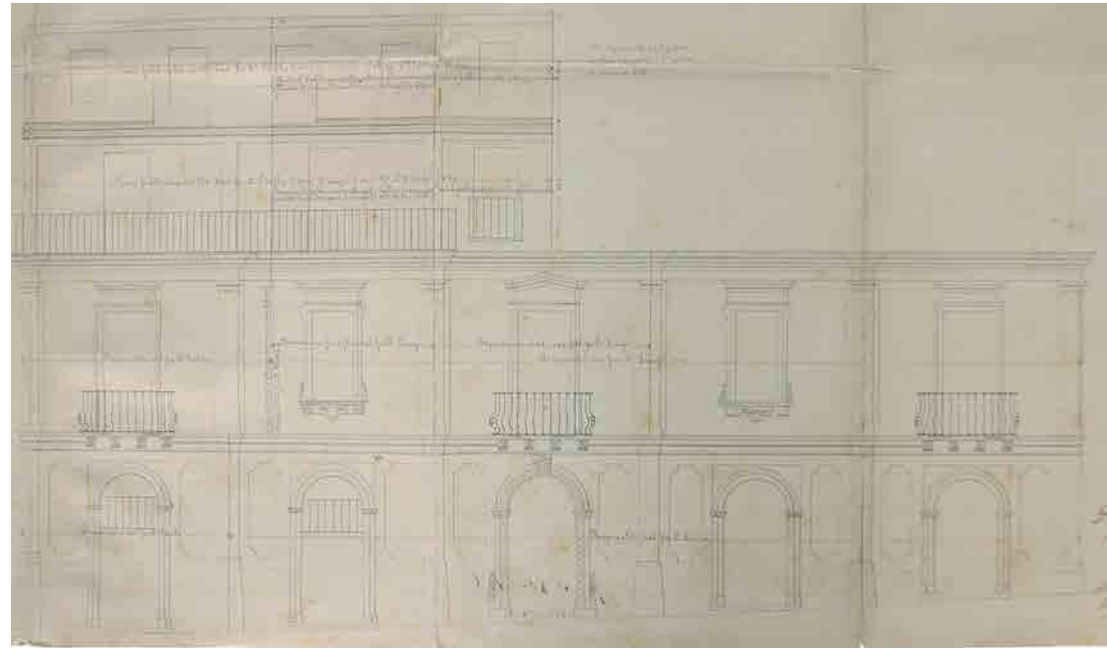


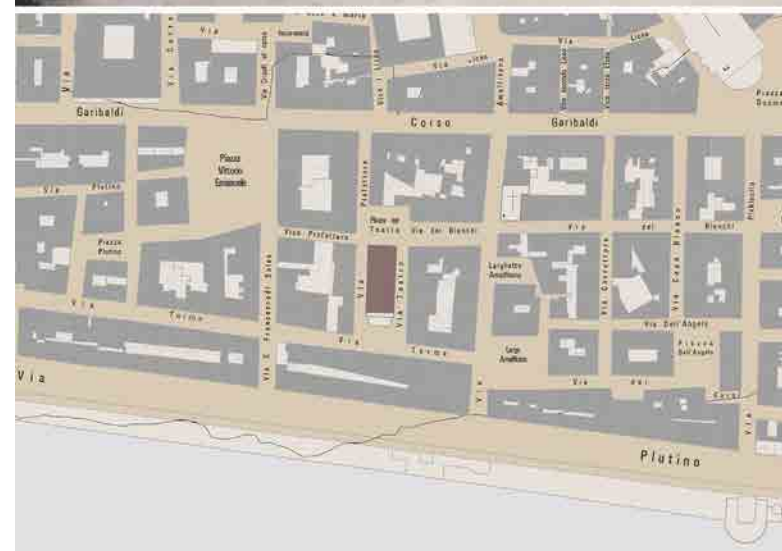
Fig. 7. Daga Palace, destroyed by the earthquake of 1908. Graphic documentation and localization on the cadastral map of 1890.

side a host communities, which are motivated wholly or in part by interest in the historical, artistic, scientific or lifestyle/heritage offerings of a community, region, group or institution“ (Silberberg 1995) [2].

The digital media (The Media) combined with technological changes (i.e. content, software, hardware, devices, platform and medium) has rapidly expanded and proliferated. The consequences of which have affected content, platforms, and devices. The developments in the Media are also having striking effects and a growing central roles in contemporary social life: Penetrating and transforming society, increasing access to knowledge, contributing to social and cultural life and becoming key components of democratic structures. The continued expansion of media, networks and interactive applications, together with the falling cost of access and devices, are enabling millions of people in the world to be “connected” and projected onto the global media space, linking groups with shared interests and concerns from different countries and continents. Analysis suggests that around a billion new

Fig. 8. Graphics Project and three-dimensional reconstruction of the Daga Palace.

Fig.9. Daga Palace. Application of Augmented Reality and repositioning in the three-dimensional model of the finding number XX21 Limestone shelf of the nineteenth century with acanthus shaped leaf.



customers are entering the global marketplace. New technologies and the global reach of the Media have challenge traditional businesses and their methods: Forcing us, to reformulate long-held concepts, to review and replace existing business schemes and economic development models. It is clear that the Media had become a precious infrastructure for the knowledge economy, for educational and cultural activities, including the tourism industry, cultural heritage

market, Cultural Tourism and industries. To what regards digital Media and IT Knowledge management and the cultural tourism industry; the cultural tourism industry is being influenced by the adoption, use and development of Digital Media and Information Technology (IT) Knowledge management, changing the shape and nature of traditional global distribution and destination marketing systems in the tourism industry. The technological/media shifts are having profound

impacts on the perception, consumption and construction of new approach of cultural heritage tourism strategy and their development outcomes. Cultural Heritage Tourism can be considered a valuable tool of economic, cultural, social and heritage development. Further, let's not forget that cultural tourism considers a transformational catalyst accelerating change, designed to stimulate visitor economies and generate physical, social and culture benefits. The growth of the cultural tourism & creative sector will be fuelled by innovation in technology. We need to address the media challenge to the level it deserves ... Tourism is widely recognized for its tangible outcomes (job creation, tax revenues) as well as its less tangible outcomes (quality of life)... International tourism is the world's largest export earner and an important factor in the balance of payments in most nations" (United Nations World Tourism Organization 2007)... "In economic terms the cultural industries sector is one of the fastest growing sector of the world economy. Best estimates value the sector at 7 per cent of the world's gross domestic product and forecast are put at 10 per cent growth per annum¹. This growth is accounted for by rapid techno-economic change in products, distribution & marketing ..." [3].

How relevant is the creative and efficient use of new media and advanced technology for Italy's cultural heritage patrimony?

The Cultural tourism is one of the substantial and growing global tourism markets that allow and empower economic and social contribution, and well-being in and within societies.

As experts sustain, through the use and implementation of minded, flexible, strategic and sustainable development polices and plan of tourism -including cultural and heritage tourism, can bring enormous benefit to a knowledge-based economy, and social development of a country. It can open different types of business, expand economic opportunities, stimulate trade and capital investment, create jobs and entrepreneurialism for the workforce and what is most important, it can contribute to protecting heritage and cultural values.

The cultural heritage tourism on different sectors have emerged worldwide as leaders, providing for contem-

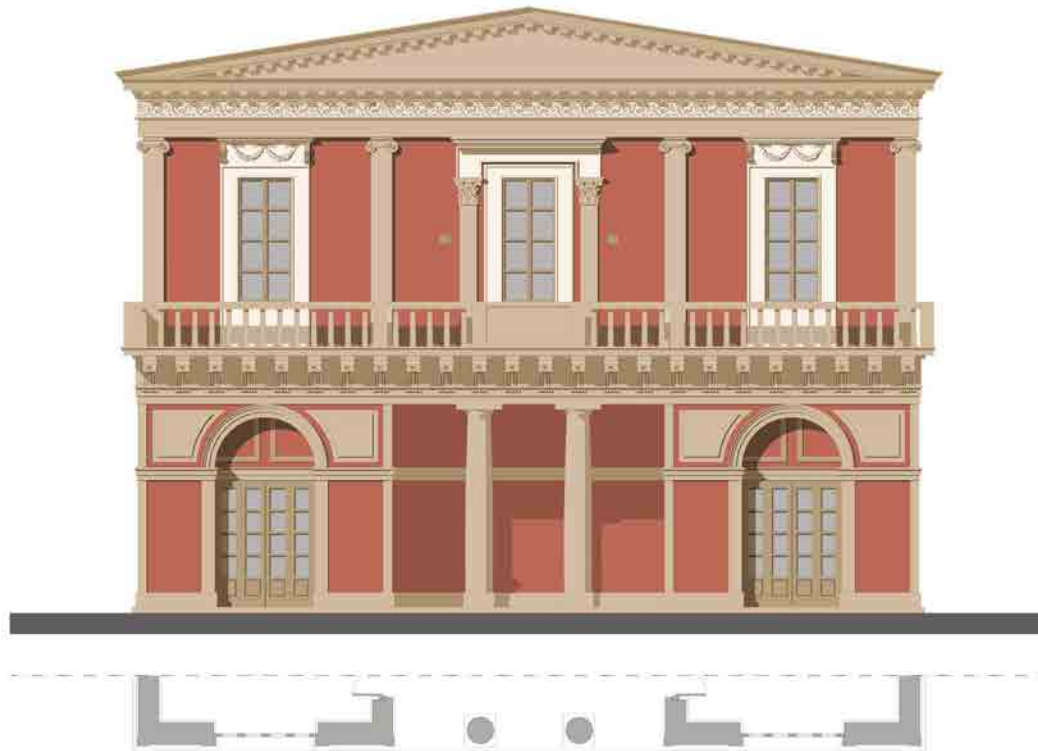


Fig. 10. Municipal Theater realized by the Engineer Stefano Calabrò Anzalone in 1817, photos taken before the year 1908 (by Italian Photographic Society in 1909, page 235) and localization on the cadastral map of 1890.

porary purposes, providing opportunities for sustaining traditional and contemporary cultural values. In March 2000, the EU Heads of State and Government meeting at the European Council in Lisbon agreed on an ambitious goal, to build up a new model and strategy for a creative Europe and which was making the EU by 2010: *“The most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”*.

Within this content the advancement of the new Information and Communication Technologies (ICT) and the Digital Media are playing a fundamental role. Among others in the understanding and preservation of cultural heritage (bringing new possibilities and ways of communication) and valuable possibilities in the Cultural and heritage sectors, including the cultural and heritage tourism (physical-“real”, digital and virtual).

Cultural Tourism in a Digital Era is an ongoing fast track challenge for cultural heritage and society to take in high consideration. The digitization activities have a positive impact on the society, by making the cultural heritage more accessible to the citizens, and by generating benefits to the content owners.

In terms of tourism and cultural heritage patrimony, Italy is one of the countries on the planet that can boast in a prominent way for its large and valuable cultural – tangible and intangible, archaeological, artistic patrimony and natural heritage.

Is in questionable that cultural, archaeological assets, artistic patrimony and heritage sites of excellence in Italy and heritage sites (cities, towns, villages, monument sites, museums, etc.), are found in abundance.

Various Italian “branded” cities and “monuments can be considered some of the most visited cultural tourism sites worldwide, a guaranteed success inherited from the past, which nowadays is a source of substantial income flows and jobs.

Within this framework that cultural, historical and “analogue” tourism is a valid business in Italy, it shall be less resistance or “distraction” to focus on global, minded and strategically and give the proper importance to the cultural and historical digital tourism and (among others) to the virtual technologies in the museum and to the new generation virtual archaeological



Fig. 11. Graphics Project and three-dimensional reconstruction of the Bourbon Municipal Theatre.

type of edu-entertainment.

Based on the solidity of what is taking place in the “analogue” cultural and tourism market, that’s important the use of the digital resources.

Wouldn’t it be natural to enrich these resources, to use the digital resources for more extended and consistent basis and manage this potential treasure with the joined forces of the new technologies on more, hence allowing massive exportation of arts in digital and interactive formats? This could create not only new sources employment and development of the country in the field of education, information, culture and art, but also new tendencies and new markets, new forms of business in the fields of entertainment and interactive media. Building up new strategic tourism models, reinforced with the creative use of the Media can make a difference for Italy. This can, among others, generate income flows and jobs that contribute directly to the economy.

To expand the borderline what is today practiced on natural basis Innovative design and management for the Arts, Cultural Heritage, Media and Creative Industries are needed, to establish a more efficient industry-led learning model for professional learning and to increase the level and development of professional best practice in a highly competitive and rapidly evolving workplace, industry and market related to: Art, technology, digital media, cultural heritage, cultural tourism, museums, cultural centres, learning centres, Edu-entertainment centres and the cultural creative industries, from a global perspective and with emphasis on the international market, will be timely and necessary [4].

5. THE MUSEUM OUT OF MUSEUMS. THE VIRTUAL CITY

From the interview of Franz Fischaller, which takes up and motivates the reasons of the use of ICT for new cultural tourism routes, one can draw important insights on contamination between historical, technical fields related to media representation and social and economic asset that animate the cultural tourism.

The combination of mythologies of survey, drawing, science, digital media applied to the humanistic ben-

ches of knowledge (as the history, the art and the archaeology) developed some good practices of researches, to a dimension not only morphological about the architecture, but above all oriented to a semantic qualification.

It concerns a planning that has the pursuit to create innovative models of Digital Entertainment that represent the added value for the dissemination of knowledge.

The research’s challenge, after the words of the Professor Franz Fischaller, is that to promote, in a scientific

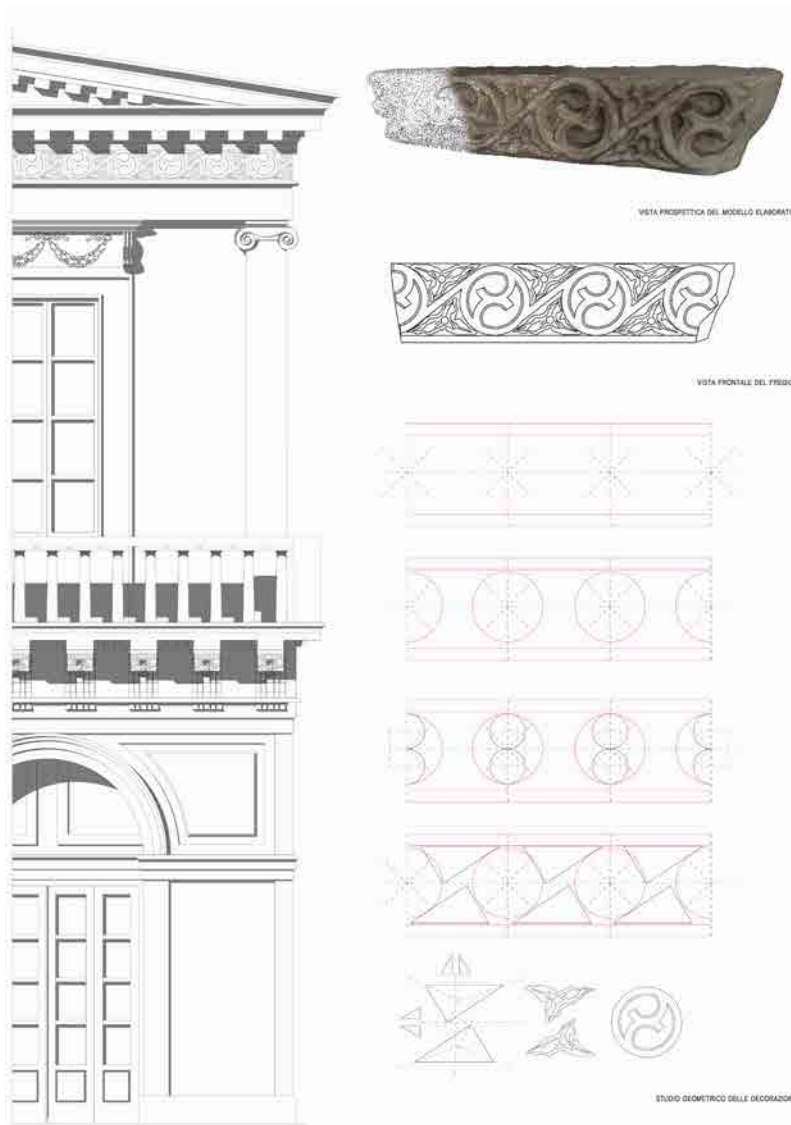
way, a project of safeguard and promotion of artefacts of some historical buildings of the city of Reggio Calabria, looking for a new possible stitching between the two worlds, that of architectural urban pattern, and that linked to destroyed memory.

This fact could it opens to the museum field that includes the entire historical centre, thanks to the deep mutation that in these years the traditional museums have had. The chance to bring together cultural heritage and innovative technologies, allows to create chances of reading and consideration also out of closed and



Fig. 12. Bourbon Municipal Theatre. Application of Augmented Reality and repositioning in the three-dimensional model of the finding number XIX25 Limestone shelf with classical meander decoration.

Fig. 13. Bourbon Municipal Theatre. Augmented reality application and repositioning in the three-dimensional model of the finding number XIX5 Fragment of limestone trabecation decorated with swirl motifs.



supervised paddocks, and to aspires to knowledge and entertainment's patterns which spread themselves on the urban patterns, giving to the city the role of a museum.

This research expects to achieve the opportunity to define in an historical building (Villa Zerbi) the role of a real museum that includes, further the exhibition of artefacts and documents of the old, medieval and modern city, the implementation of a multimedial section to study the before earthquake's city through AR and VR digital systems and prototyping for blind people. The prototyping, by means of 3D-printing, is oriented to a real new proposal in the urban context, and in the educational and didactic field.

The investigation's path, that deploys itself also in a scientific and didactic field with a touristic and p entertainment's vocation, sees in the memory culture of the city, a new way to present and to design again the existent places and its peculiar elements, opening to the whole adjacent context and it spreads itself in programmed paths through the streets of the city.


Digital totem, interactive models, hybrid cultural systems are only some of the solutions through the community can actively interface and open itself to culture, and transforms in cultural prosumer [5].

The Edutainment is the aim of the project of research, and represents its main element, able to innescate a new matching of the traditional models to do the cultural economy. Edutainment, or educative entertainment is the solution for the consumption and the valorisation of culture in the museum field and in Cultural Heritage's contexts.

A new system able to answer to an always more advanced audience and involved to open itself to the city and to the landscape.


1. INSTALLAZIONE APPLICAZIONE

UNA VOLTA INSTALLATA L'APPLICAZIONE SI PUO' INIZIARE UN PERCORSO VIRTUALE CHE SI DIVIDERA' IN DUE SEZIONI:
LA PRIMA PARTE SI SOFFERMA' SUL RACCONTO DEL CATASTRFICO EVENTO GRAZIE AL SUPPORTO DI UNA SERIE DI IMMAGINI.
LA SECONDA PARTE HA COME OBIETTIVO QUELLO DI FAR INTERAGIRE L'UTANTE CON IL BENE ARCHITETTONICO GRAZIE AI MODELLI IN REALTA' AUMENTATA.



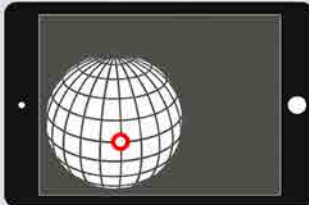
2. MAPPA ANTICA

ENTRATI NELL'APP VERRA' VISUALIZZATA LA MAPPA ANTICA DELLA CITTA'.



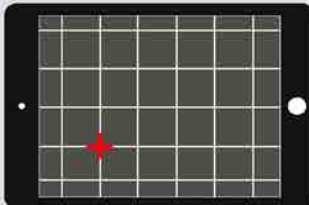
3. LOCALIZZAZIONE

IL SISTEMA IN QUESTA FASE RICONOSCE LA POSIZIONE DELL'UTENTE GRAZIE AI DISPOSITIVI DI LOCALIZZAZIONE E GPS.




4. MONUMENTI DI INTERESSE

IN BASE ALLA POSIZIONE DELL'UTENTE IL SISTEMA INDIVIDUA GLI EDIFICI GEO-REFERENZATI DI INTERESSE STORICO DI CUI E' STATO RICOSTRUITO VIRTUALMENTE L'EDIFICIO PREESISTENTE AD ESSO PRIMA DEL TERREMOTO DEL 1908.



5. INTERAZIONE VIRTUALE

L'UTENTE PUNTANDO LA FOTOCAMERA SULL'EDIFICIO POTRA' VISUALIZZARE I REPERTI STORICI APPARTENENTI ALL'EDIFICIO PREESISTENTE AD ESSO.



6. ATTIVAZIONE DELL'AUDIOGUIDA

VISUALIZZATO L'EDIFICIO SI ATTIVERA' UNA VOCE AUDIOGUIDA. PROGRAMMATA IN DIVERSE LINGUE. CHE DARA' TUTTE LE INFORMAZIONI SUL STESSO E SULL'EDIFICIO CHE ESISTEVA PRIMA DEL TERREMOTO.




Fig. 14. Project for an interactive museum of the city of Reggio Calabria.
Fig. 15. Augmented reality application and visualization of three-dimensional reconstruction project of the Bourbon Municipal Theatre.



Fig.16. Zerbi Villa, place of project for a museum of Reggio Calabria. Main facade.

Fig.17. Zerbi Villa, project for a museum of city. Scheme of organization.





Fig.18. Franz Fischnaller: City Cluster - From the Renaissance to the Megabyte Networking Age (Official Project Opening - Networked Interactive Exhibit) Palazzo Vecchio Florence City Hall, and Electronic Visualization Laboratory, University of Illinois at Chicago.

Fig.19. Franz Fischnaller: LSI application - Visitors View & Immersive Presence (The world in which this story is told is interactive – a simulated environment in which the user can move freely and be part of the story).



NOTES

[1] A brief presentation of the artist: Franz Fischnaller, trans disciplinary researcher, professor, creative designer and new media artist, works in the fields of art, design, technology, science and information technology. He has developed digital media productions, immersive simulations in real time, virtual reality, 3D stereoscopic content, creative interfaces and interactive installations Multi-user. Many of his works are from the ancient world, classical and Renaissance (architecture, urban environments, history, literature and arts), some of them relevant to the cultural heritage of Italian. After 1995, he held research and work in Italy, Germany, Austria, Spain and the US, setting up museum laboratories and collaborating with a number of institutions including the National Museum of Science and Technology Leonardo Da Vinci, Milan; ZKM | Medienmuseum Center for Art and Design, Karlsruhe (Germany); Electronic Visualization Laboratory (EVL), University Illinois at Chicago (UIC); Ars Electronica, AEC Electronic, Museum of the Future, Linz (Austria). In 1995 he created, with the collaboration of the National Museum of Science and Technology Leonardo da Vinci, Milan, the Lautriv Chromagnon Medusa (LCM). As a result of this research, he created the "Full stereo immersive virtual reality application" based on the ideal of the Renaissance City entitled "Multi Mega Book in the CAVE" (Cave Automatic Virtual Environment), an immersive virtual reality environment, whose name it is also a reference to the allegory of the cave in Plato's Republic, in which a philosopher contemplates perception, reality and illusion. From 1997 to 2005 he directed "The Last Supper in Real-Time", virtual immersive and interactive storytelling applied to the Last

Supper by Leonardo for which he has designed and implemented an interactive learning device inspired by the rules of linear perspective by Leon Battista Alberti.

From 2001 to 2006 he lived in the US, where he was Senior Professor at the School of Art & Design, University of Illinois at Chicago (UIC), and Leader of the Electronic Visualization Program at the College of Architecture and the Arts.

He was responsible for creating the "Virtual Reality Lab Facility", specializing in VR and real-time interactive computer graphics at the College of Architecture and the Arts (UIC).

For its activities received in 1995: Award Honorable Mention Interactive Art, Prix Ars Electronica, Austria, for Lautrive Chromagnon Medusa; 1997: Best Foreign Title, Section Theatre and Exhibition, Grand Prix Multimedia Prix'97, Japan, for Multi Mega Book in the Cave; in 1999: Award Honorable Mention Interactive Art, Prix Ars Electronica, Austria, for Robots Avatars "Dreaming with Virtual Illusions".

[2] Silberberg, T. (1995). Cultural tourism and business opportunities for museums and heritage sites. Tourism Management

[3] UNCTAD, Creative Industries and Development. Paper presented at UNCTAD Eleventh Session, Sao Paulo, June 2004 (TD XI) BP / 13

[4] Franz Fischnaller 29/11/2016

[5] Expression coined by Alvin Toffler in his book *The Third Wave* (1980): is a connection of the words producer and consumer indicating a consumer who in turn is the manufacturer or, in the very act of consumption, contributes to the production.

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