SCIRES it
SCIentificRESearch and Information Technology
Ricerca Scientifica e Tecnologie dell'Informazione
Vol7, Issue 2 (2017), 85-102
e-ISSN 2239-4303, DOI 10.2423/i22394303v7n2p85

A PROJECT FOR THE EXPLORATION OF CULTURAL HERITAGE IN A EUROPEAN AREA OF EXCELLENCE: THE BAROQUE CIRCUIT OF VAL DI NOTO.

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Abstract

South-Eastern Sicily offers a high concentration of Cultural Heritage to be promoted with innovative strategies of integration of all the resources present in the territory. Each work of art has its own artistic value, meaningful stories to communicate and material and immaterial engaging thematic itineraries. "Stories" able to reveal the wonder of the places and arouse curiosity about real and virtual journeys with itineraries connecting highly attractive centers to less important ones, as they are generally considered, outside the common tourist flows. The "NEPTIS" project has established a synergy between different scientific competences: from history of architecture to survey, from modeling to information technology in order to create and experiment a system software such as *Conceptouring* able to support the design and construction of immersive interactive experiences for cultural sustainable tourism in an area of excellence of European Baroque.

Keywords

Cultural Heritage, Val di Noto, Survey, 3D models

1. *The uniqueness of territory twixt history and project* *(L. Trigilia)*

Over the years many studies have focused upon the uniqueness of the cultural, architectural and urban context of Val di Noto[1]; much research has analysed the reasons that make Southeast Sicily an area of excellence of European Baroque in its late stage, particularly with regard to the characteristics of the great urban revival followed by the catastrophic earthquake of 1693[2], a result of which about sixty big and small towns and cities were transformed into one immense building site. Hence, it is not only for the consistency of this phenomenon, the amount of cities reconstructed, refurbished or restructured, but also for the outstanding quality of the outcomes achieved which has made this area a unique case internationally, where it is possible to find the application of common criteria and models. This data alone is enough to let us understand how the ancient Noto Valley quickly became the largest construction site in Sicily's history and, for what is known, the largest laboratory for experimenting with international Baroque models.

For the Baroque period, a phenomenon comparable to the post-earthquake Sicilian rebirth is inexistent. In the European context, similar destruction and reconstruction phenomena can be mentioned, which affected different areas in different periods of history.

The strong impact of earthquakes such as in Lisbon in 1755 or Messina in 1783 and later that of 1908, forced the revival of individual urban realities. The same thing occurred for other historical disasters, such as the Great Fire of London in 1666. The massive reconstruction after 1693 of the cities of Val di Noto (however, to which for the sake of analysis must be added that of the Maltese area[3], resulting from the same earthquake), had instead overwhelming proportions that must be considered a unique case. So, if given as a fact that Val di Noto is a site of original specificity, we must, at the same time work to ensure that this patrimonial heritage receives special attention.

[1] Blunt, 1986; Boscarino, 1997; Giuffrè, 2006; Trigilia, 2002 & 2007.
[2] Dufour, 1994.
[3] Trigilia, 1994; Annali del Barocco in Sicilia n. 1 1994 monographic number on the Sicilian reconstruction after 1693; Casamento & Guidoni, 1997; Giuffrè & Piazza, 2012.

What is extraordinary and exceptional is the wealth of national heritage representative of baroque culture concentrated in a single extended area: as the map identifying the cities of South-East Sicily of the baroque circuit here published shows. (Fig.1)

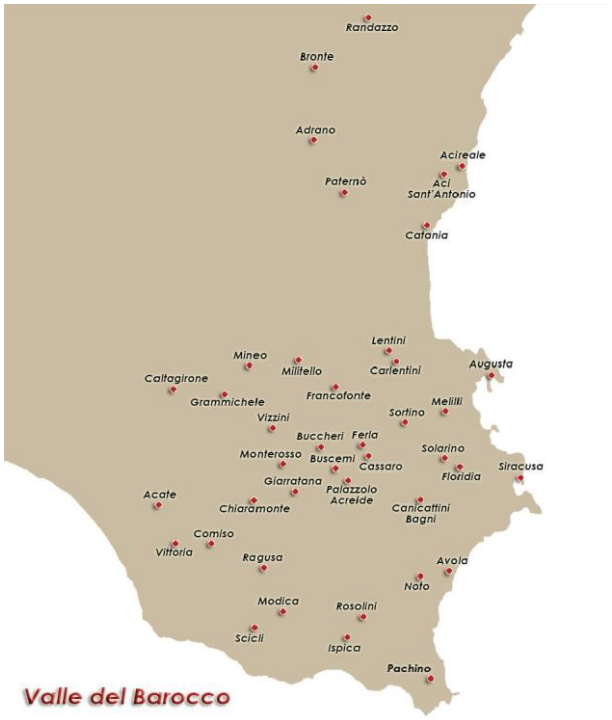

Fig.1: Baroque cities in Val di Noto. Map produced by the International Centre for the Study of the Baroque.

Many efforts have been made to ensure a deeper knowledge and widespread conservation to this "cultural stratum" within the scientific and civil community.

This attention has resulted in the inclusion of the eight Baroque cities of Val di Noto in the UNESCO World Heritage List (2002)[4], to which I contributed, together with others, coordinating for the International Centre for Baroque Studies and writing up the scientific dossiers of the candidate cities on the World Heritage List[5].

For the quality and the remarkable homogeneity of its urban heritage, the ancient Val di Noto constitutes an asset of "exceptional universal value". Despite this important milestone, further actions are still required to ensure an effective valorisation of the city's wealth and treasure troves inside them which are partly still misunderstood. This considered, the need arose from within the National Operational Project for the creation of "NEPTIS ICT solutions for the increased fruition and exploration of cultural heritage"[6], of which I am a scientific coordinator for the University of Catania, focusing on the valorisation of Val di Noto, and in particular the Baroque circuit. The latest frontiers that applied technology to cultural heritage can offer for the increased enjoyment of the heritage are used, given that the advent of personal devices such as smart phones and tablets has led to a radical innovation in the cultural heritage sector.

The NEPTIS concept was created precisely to fill the void in strategic planning, never implemented in Sicily so far, about Cultural Heritage and cultural tourism.

Our analysis is driven by the need to support a new effective conception of the management of Cultural Heritage to the advantage of a transparent and profitable relationship with the public, able to promote cultural interest and enhancement. Today the use of technologically innovative and sustainable solutions involves the development of a system of cooperation between the different partners collecting and managing data.

Various national projects about Cultural Heritage are taking this direction or are in progress: the MIBAC financed project of the "Italian Digital Library" arises from the need to create a support for the "conversation" and "involvement" of users, identifying innovative management models (e.g. Cross-searching, Metadata Harvesting, Reference Linking, Data Syndication, etc.), suggesting guidelines and technological standards

[4] Azzopardi, 1993.

[5] Trigilia, 1999 in Annali del Barocco in Sicilia n. 6. The site of the Unesco site *The late Baroque cities of Val di Noto 'heritage of humanity'* has a total extension of ha. 264,76 and includes the cities of: Noto, Caltagirone and Ragusa with all the historical centres Palazzolo Acreide, Catania, Militello in Val di Catania, Scicli and Modica (with significant parts of urban environments and post-1693 architecture) Trigilia, 2002 where the studies and the scientific dossiers on the cities' heritage of humanity are reported with the reasons list for the candidacy for the UNESCO.

[6] The NEPTIS National Operational Project (PON) is funded by the Italian Ministry of Education, University and Research, also with funds from the European Union; The project was launched in January 2015 and will end in December 2017. The partners of the project are the Universities of Palermo and Catania, the National Research Council (CNR), PiTecnoBio; IDS & Unitelm; beneficiary is Engineering Società Informatica SPA.

supporting and defining the necessary ICT infrastructure for the management of digital libraries. The Italian Culture Portal, as a single integrated access point of reference for digital contents about Italian culture, has highlighted the need to provide appropriate guidelines in order to guarantee the interchange of data at a regional level.

The NEPTIS project starts from the awareness that the representation of Cultural Heritage is not an objective criterion but a form of communication which fulfils historical requirements and which is dynamic as such.

The first surveys on websites and multimedia production had highlighted the lack of capacity of the territory in knowing how to "tell" about, communicate and perceive their wonders and their urban "primacy" from the pre-Hellenic century, exceeding the baroque chronological limits. Therefore, I addressed the interest of the research team of the School of Architecture of the University of Catania in the South-Eastern Sicily area towards organising patterns of fruition of the territory that would make its exceptional nature emerge: from landscape to ancient, from suburban urban to submerged heritage, thus triggering interest in a virtual and emotional type of travel. Progressively, the study of the most attractive urban complexes and of the most characteristic monuments of Baroque Ibleo developed; the analysis was also focused on the so-called minor heritage of cities to be valued, highly representative of the archetypes of Val di Noto, and on the extremely rich yet little-known intangible heritage of the patron saints' holy festivals, which were analysed for purpose, structure and materials.

Cultural heritage, both material and immaterial is significantly integrated and involves the tourist-traveller in a creative emotional tour, capable of combining different cultural interests ranging from architecture to the city, from artistic events to the seasonal fairs and festivals, of which the Sicilian tradition is rich in heritage and patrimonial spirit of the Baroque era[7]. The theatre for the festivals is on the other hand always the city itself with its scenographic spaces and festive embellishments.

The purpose of the project is to study and determine innovative models for the management and use of Cultural Heritage. Activity is implemented in a two-stage, partially overlapping, approach: the analysis of the specific cultural and landscape context (the Sicilian Heritage and the sites/itineraries identified for the experimentation) and the definition of real models acting as guidelines for the other designed activities.

The models studied were:

- the multimedia interactive trip to themes in the Baroque circuit of Val di Noto; - the design of the first Baroque Museum in Italy, understood as a virtual museum, but capable of triggering virtuous strategies for its real institution with innovative multimedia workshops for the emotional and creative involvement of the user.

The first steps for the implementation of the land use patterns were:

- to identify the structural nodes of the most significant and attractive pathways.

- the study of the Baroque Museum project on the basis of innovative communication strategies.

Based on the nodal thematic paths identified, The School of Architecture of Syracuse has elaborated a series of itineraries characterising the uniqueness of the territory, capable of being linked to each other through the interweaving of the most significant themes. As part of the project of the Baroque Virtual Museum, the research group analysed some cognitive themes, the so-called "narratives", which were developed in a textual way and through image paths: post 1693 urban reconstruction, the architectural protagonists, Grand Tour, baroque festival of patron saints, etc.

The study of significant thematic pathways is the basis for the realisation of the Virtual Museum of Baroque Val di Noto. The work team studied an organisational chart, conceived as a flexible structure enabling the implementation of content for the Conceptouring platform experimented by Engineering Ingegneria Informatics SPA, beneficiary of the project partner of the University of Catania.

Conceptouring is an integrated system prototype to create services and applications for mobile devices or accessible through web browsers. These apps will integrate and provide functions for the exploration of Cultural Heritage.

The starting point was the Piazza del Duomo in Syracuse[8] (Fig.2), which is considered to be

[7] Trigilia, 2012.

[8] On the genesis of Piazza Duomo and its urban development and architectural quality: Trigilia, 2000; on excavations carried out in the square area: Voza, 1999.

highly attractive and in which the entire history of the city is encompassed, from the Greek era up until the Baroque age.

A collection of texts on nodal maps and pathways, images of historical iconographies, historical cartographies, photos and drawings (architectural and urban spaces, numerous 3D models) are featured.

Fig.2: Duomo Square in Syracuse. Aerial view.

The study of the nodal system of Piazza del Duomo in Syracuse concerns two interconnected aspects: on the one hand the relationship between space and architecture over the course of the centuries, and on the other, the square as a festival theatre in the baroque period.

The story of the place considered to be the starting point for thematic cultural itineraries, has been deepened by the research group through successive narratives that take inspiration from the verifiable stratifications found and the expression of the system of mutations of space and construction.

Historical narrative was established according to a representative model capable of visualising the diachronic process of site transformation from architectural evidence and observing the stratifications within the scope of the 3D model of the square.

The use of specialist technologies has enabled the placement in relation to the evolutionary dynamics of the identified pathway, starting from excavations carried out underground, together with all the architectural-urban emergences. From the attractive nodal point of Piazza Duomo in Syracuse, the concept of "conceptouring" has allowed for the broadening of the interwoven themes and paths favouring the integration of the most significant aspects of the ancient landscape with urban reality, not only in important cities such as Noto but also of so-called lesser and yet strongly characterised town centres of the baroque circuit, such as Palazzolo Acreide, Buccheri, Buscemi, Avola, Ferla, Sortino, etc.

In this way, a multimedia pathway has been integrated in time and space, in the constructions and the submerged, capable of "narrating" the wonders of this territory which I have meaningfully called "Baroque Valley".

Here remarkable characteristic settlements prior to the arrival of the Greeks in Sicily have been revealed, showing particular integration of the architectural heritage not only from the seventeenth to eighteenth centuries with the ancient, but with urban landscape and the natural environment.

A bond so tight as to be merged into one memory.

Coexisting here are three diverse categories of heritage which at times even coincide on the same site, constituting an inseparable unit between Nature, History and Architecture, between landscape complexes, archaeological areas and urban centres.

From this beauty and complexity of the territory the project here illustrated has embodied itself and is on its way towards completion.

It was started in collaboration with Engineering Informatica SPA and with the scholars and researchers of the School of Architecture of Syracuse, whose contributions are presented below.

2. *Heritage in Val di Noto. Cultural itineraries: new valorization approaches through knowledge and technology* *(S. Gatto)*

The high concentration of cultural and natural heritage in our territory is still linked to a combination of preservation and requalification activities without any contact with urban planning policy, mobility, tourism, digital technologies.

There is a lively debate in Italy and Europe about how to promote these goods assimilating them into the surrounding territory using a broader approach which can further a Sustainable Urban Regeneration of the whole area.

The era we live in, characterized by the use of metalanguage, requires a new conception of the world where nature is the first element to be

invoked. It is fundamental to establish a balance between nature and culture: an attitude relating beauty to city planning.

Lately an increased culture of environmental awareness has been observed and it has started a new form of valorization of the cultural heritage promotion through a series of symbolic elements leading to a new heritage perception.

In this context the itineraries are introduced: they are considered as routes to walk along and to consolidate in order to promote cultural heritage and offering at the same time a guarantee for local tourism leading to what today can be defined as "heritage tourism".

Conceived as a development of cultural tourism, it focuses on those aspects connected with the complex cultural identities of the territory, a legacy not only tangible but also intangible which goes beyond the traditional contents of cultural tourism.

The itineraries, either the old main routes travelled by thousands of pilgrims or the unknown ways to bring to light, are journeys across history, culture, pilgrimages which activate a different "type" of observation from the usual one.

Walking along a cultural itinerary means travelling across a space and at the same time defining it, "marking" its drawing. "Walking" allows visitors to really know landscape and towns and all those elements which constitute the "framework" which supports the places thus becoming familiar with them.

"Europe has been and still is walked (…). The cartography of Europe arises from the capacities, the perceived horizons of human feet. European men and women have walked their maps from hamlet to hamlet, from village to village". (Steiner, 2006)

The concept of "journey" is in constant evolution and reflects the historical period it is inserted in.

Today, on account of a renewed concern about cultural and natural components, further added values are looked for and the journey acquires a new symbolic and experiential value.

The new digital technologies are of great help: websites, social networks, apps for smartphones, virtual reconstructions and augmented reality arouse interest in a type of journey, virtual and real at the same time, through the definition of models which highlight the "exceptionality" of the territory.

The NEPTIS Project focused on an experimentation site known as "the Baroque circuit of Val di Noto".

Val di Noto, site of exceptional significance on the World Heritage UNESCO List, rebuilt after the destructive earthquake of 1693, is characterized by its language uniqueness in the field of urban planning and development, which emphasizes the identifying urban and architectural features of its reconstruction.

Specifically, the project has, among its various aspects, defined itineraries which put together past and present, real routes of identity linking bigger and "smaller" centers which have striking attractive features, inserted into extraordinary settings of natural and archaeological value.

It tries to connect all the itineraries, linking together architecture, archaeology, landscape and experimenting models for the creation of the Virtual Museum of the Baroque.

A network which crosses, joins and connects multiple sites starting from some historical or artistic theme according to its content and meaning.

Itineraries, meant as privileged ways of communication, which represent an occasion for sustainable tourism and an instrument to consolidate the rich and stratified identity heritage which Val di Noto possesses.

The starting point of a series of thematic itineraries is Duomo Square in Syracuse whose study referred on one side to the relation between space and architecture and on the other to the square as a scene-theatre of the court festivity during the Baroque era.

A lot of itineraries start from there referring to unknown sites. For example, the "Tower façades and Mother Churches in Val di Noto" itinerary, taking into consideration the architectural elements which in their complexity characterized and made unique this territory, winds its way through bigger centers such as Syracuse, Noto, Ragusa and smaller centers such as Floridia, Buccheri, Avola, Militello, bringing back the corpus of the religious architecture of Val di Noto deriving from the urban regeneration after the earthquake of 1693 characterized by the adjustment operations to the new Baroque style.

The itinerary is easily connected to the one dedicated to Rosario Gagliardi, the greatest architect not only of Noto and of the Hyblaean reconstruction after the earthquake of 1693, but

also undisputed protagonist of the European architecture.

"Architect Rosario Gagliardi and his masterpieces in Val di Noto" itinerary (Fig. 3) takes into account Gagliardi's most famous works and masterpieces, winding through Noto, Ragusa and Caltagirone where the impressive tower façades he designed emerge as the symbols of the Hyblaean Baroque.

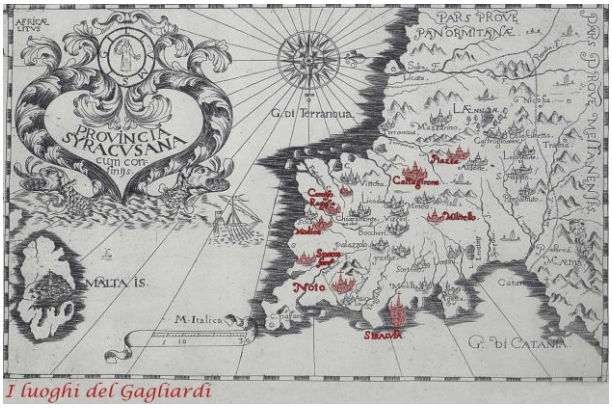

Fig.3: Gagliardi's places and masterpieces in Val di Noto. The itinerary takes into consideration the most famous Gagliardi's works and masterpieces. The list of his attributed works is longer than here considered.

Other interesting itineraries are those which privilege the natural and archaeological routes linking towns whose sites where abandoned after the catastrophic earthquake of 1693 and newly founded towns (Integrated itinerary between archaeology and baroque: Noto - Ancient Noto and Avola - Ancient Avola). Some examples are Avola and Noto whose new centers cannot be fully appreciated without the due consideration of their intrinsic connection with the old center where the last vestiges of an equally glorious era lie hidden beneath the ruins.

This combination, still unknown to the cultural tourism flows, represents the crucial point of an itinerary following the traces of memory, suggesting a reinterpretation of urban history to be realized through its traces and fragments, implementing constantly changing multiple databases.

The itineraries are all perfectly connected with the one called "The baroque festivity of the Patron Saints" because the bond with the Patron Saint and his celebration represents a strong element of continuity between the old and the new town. The festivity of the Patron Saints gives the chance to deepen the same urban values of the place and the inevitable collisions between sacred and profane.

The analysis of the cultural and landscape context and the development of the itineraries (Fig.4) have been inserted into the Conceptouring platform conceived as a flexible and implementable structure. The itineraries, taking into consideration indoor and outdoor environments, represent the framework of the Virtual Baroque Museum of Val di Noto.

Fig.4: Itineraries visualized in NEPTIS. Itinerary around Ortygia; places of St. Lucia in Syracuse.

The creation of the virtual museum through an app will make possible to complete the work of protection, valorization and fruition of the sites embracing the concept of the widespread museum experience: an elaborate measure of valorization with the aim of promoting the complex historical identity, recovering a marginalized or even unknown cultural heritage. It is rather a matter of promoting excellences by using the technological innovations to renew the image and the ability to communicate within the system.

The use of information infrastructure able to cross-reference and keep records of different data will implement a dispersed museum, representing greater explorative wishes and stronger emotional involvement.

3. *Survey and 3D modeling for the virtual visualization of widespread disseminated knowledge* *(R. Valenti)*

Collaborative relationships among operators in the field of cultural heritage can be considered as a necessary practice to develop a shared vision of research and of its application, according to interdisciplinary methodologies able to guarantee scientific rigour during the phase of knowledge dissemination. In particular, drawing and survey, primarily meant as instruments of study and cultural approach to knowledge, are essential for the complete solution of problems regarding cultural production and communication connected with the widespread historical heritage.

Within the NEPTIS Project (ICT-based solutions for augmented fruition and exploration of Cultural Heritage) the role of architectural survey, with all its background of well-known methods based on the use of technologically advanced instruments, is that of transmitting knowledge, in its own way, even when directed to different types of users and not exclusively to experts.

Virtual reality, developed according to scientific approaches, allows the faithful reproduction of historical and cultural heritage; that's why in the present study integrated survey techniques and 2D-3D graphics were used, they aimed at an objective visualization in Conceptouring system software so to arouse a particular interest in the promotion of cultural heritage and of all the remarkable elements present in the areas around Val di Noto.

Through digital survey, the use of visualization software and the construction of models, it was possible to start a process aiming at a better knowledge of cultural heritage projected to a kind of structured thinking able to highlight and establish objective relations between the architectural works in the different areas of Val di Noto, from the well-known and widely visited ones, regular destinations of tourist flows, to the unrenowned ones, but of equal value.

Specific itineraries, where cultural heritage is considered an index of widespread identity, have been planned; an index which is a kind of indicator whose careful knowledge raises awareness and offers opportunity for the economic development of a large but, at the same time, easy to delimit territory.

Cultural heritage is structured as a "continuum of monuments, cities and citizens" according to Salvatore Settis' definition and is meant "as a part of the whole deeply integrated in the territory, of a network rich in identity significance, where the value of any single monument or work of art is the consequence not of its isolation but of its being inserted into a living context" (Settis, 2002, 15).

The use of new technologies and of the previously mentioned app allowed an innovative and multidisciplinary study, in particular, the surveying process and the representation through models demonstrated, in the experimental phase, their potential becoming a perfect information-sharing instrument, able to guarantee a common purpose, indispensable for the study of the geometry and forms of the Baroque in Val di Noto.

Through digital visualization technology it was possible to create itineraries based on collaborative communication which elicited the strong potential of virtual mobility which, actually, operates a network of related elements of the territory made available on the platform so to stimulate through the Information & Communication Technology a real mobility towards unrenowned and consequently less protected sites.

The research implemented modalities of visual information processing of the database related to the investigated historical heritage and of its subsequent entering into the database table providing indications about the design of the platform with regard to the interactive and dynamic cultural itineraries.

The different conceptions of the digital models used proved to be flexible and adaptable to any need deriving from the characteristic of each investigated architectural work.

The conversion of data coming from the investigation into visual objects performed through 3D formalization, made clear the existing relation between real and virtual environments implementing an iconic correspondence between them; 3D representation has also expressed a mimetic visualization, scientific and educational at the same time, necessary for the ICT instrument to provide structured information about the specialized contents of the research.

Hence, surveying was conducted with the purpose of creating a system for the interpretation of the large area, subject of the

present study, so to highlight analogies and uniformity of the architectural features which make the place a fascinating and uncontaminated attraction.

Investigations were carried out with different types of technologies and methodologies in harmony with the information tools for the visual data management and share.

were inserted, collected according to typology or to stylistic details which underlined assonances and declined identities[9]. (Fig. 5)

Photography-based techniques[10] for the construction of 3D models were also experimented (Fig. 6).

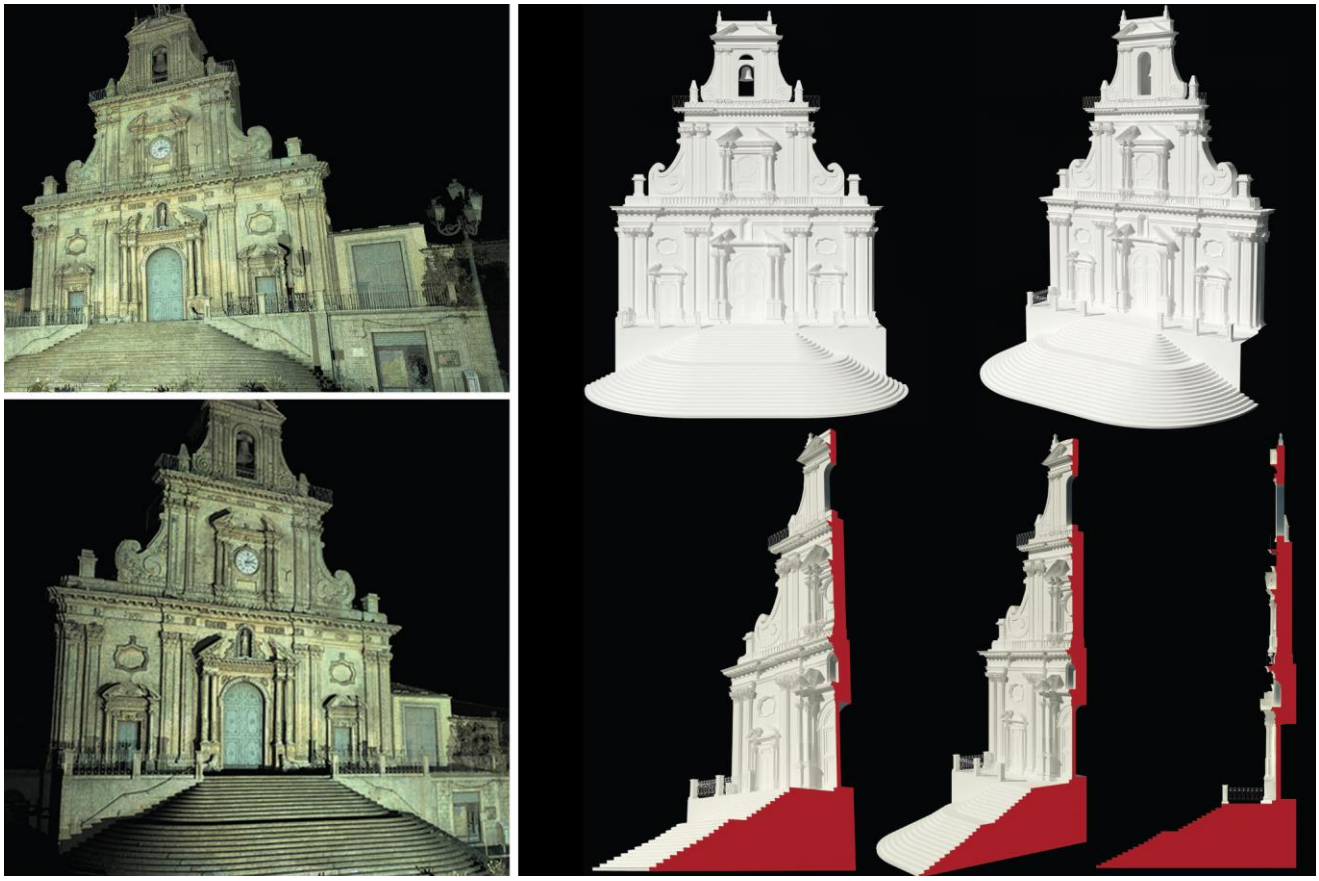

Fig.5: St. Sebastiano Church, Palazzolo Acreide: from the point cloud to the 3D model.

The technologically advanced instruments and the specific software in use at the DICAR Laboratory of Representation of the University of Catania made it possible to develop the acquired data and to construct detailed 3D models which favor an objective knowledge of the architectural works.

The great amount of data deriving from the point clouds was directed to the modeling of any single piece of architecture with two different approaches according to the data post processing software used.

The models realized with a very high precision of quantitative data resulted in a kind of reference grid where randomly selected works

[9] Application, in this phase of the research, refers to a large survey campaign of civil and religious heritage in the previously mentioned areas around Val di Noto.

[10] In this phase of research, interest was focused on the historic centre of Floridia which, though presenting few architectural buildings, has an interesting urban design as a result of the reconstruction after the earthquake of 1693.

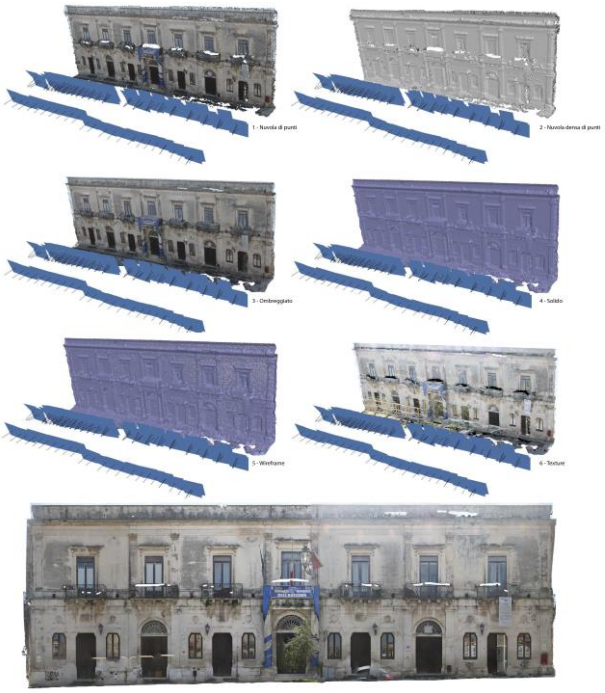

Fig.6: Town Hall, Floridia. Image-based modelling.

They, similarly to the models generated by laser scanner surveying activities, transmit, through objective visual communication, quanti- and qualitative contents of reality. This characteristic attributes the label of scientific validation to digital processing. Models describe architectural reality without adding any discrete subjective feature typical of the traditional graphical restitution of the survey.

The present research focused particularly on the archaeological site of Duomo Square in Ortygia, hidden cultural heritage, neither visible nor enjoyable (Valenti & Paternò, 2016)[11], and was dedicated to the virtual reconstruction of its absence, critically conducted activity starting from the published documents of the ortho-photographic survey excavation areas[12]. (Fig. 7).

A big digital archive of the cultural heritage has been established to facilitate its transmission through the innovative model of acquisition, according to its cultural significance. Thus, it was possible to bring culture into the digital environment aggregating data of the highest quality from the communicative and scientific point of view.

This is extremely important especially when the architecture to be represented has sculpture features and is characterized by sinuous geometric shapes typical of Baroque architecture.

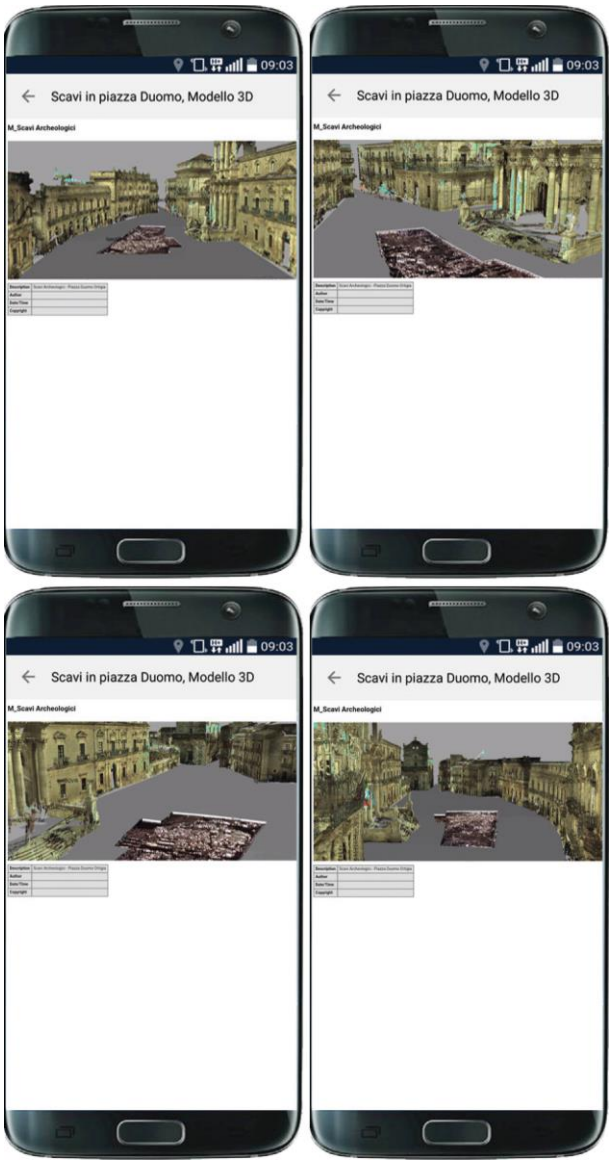

Fig.7: Duomo Square, Syracuse. Virtual reconstruction of the hidden Archaeological Heritage visualized in NEPTIS.

Specifically, the study, through the rich investigation and intensive survey campaigns, examines the potential offered by surveying and 3D modeling used in an integrated and flexible way in relation to the innovative methodologies for documentation, analysis, knowledge and dissemination of historicalheritage in its

[11] Study presented in Naples in October 2016 and published in: F. Capano, M. I. Pascariello & M. Visone (Eds.), (2016). *Old and New Media for the Image of the Landscape*. Napoli, IT: CIRICE.

[12] Surveys and photos of the excavation made between 1996 and 1998 are published inVoza (2007).

components in different representation scales. Thus, the experimented procedures connected to modeling (Valenti & Paternò, 2016) applied to the historical-cultural context of Val di Noto effectively contributed to the research and reconstruction on the territory of the possible connections with architectural works, in order to create on Conceptouring platform evocative itineraries able to capture users' interest.

The applied methodology is undoubtedly in assonance with the modern process of transformation of representation which, thanks to the constant evolution of technology for the investigation of knowledge management process about the formal complexity of historical heritage, has become more and more digitalized (Attenni, Bartolomei, Hess & Ippolito, 2017)[13].

Extremely important is that the methodological process of visualization of survey products through virtual reality must respect the basic principles of objectivity and recognition even during the data processing steps; in such a way it is possible to create a network of information sharing easy to access, consult and disseminate.

4. *Contributions of digital survey research for mobile technology (E. Paternò)*

Considering the importance of the historical and architectural heritage of the areas around Val di Noto, subject of the present study, which is recognized as an attractive and uncontaminated place, its virtual representation appears as one of the most interesting and innovative instrument to preserve and safeguard its historical, architectural and artistic memory together with that of many other endangered sites at risk of disappearing due to phenomena such as deterioration and/or degradation caused by natural events (earthquakes, floods, etc.) and by human actions. Hence it is necessary to protect such goods, favoring their transmissions to future generations.

The presence of such remarkable cultural heritage which also promotes local tourism, stresses the importance of its constant monitoring to be operated with systematic cataloguing actions supported by survey campaigns.

Nowadays knowledge transmission models are constantly redefined, trying to identify ways close to people's interests and easily accessible at the same time. The idea of cultural goods is also changing. Its attributed value is not only artistic, historical, archaeological or natural as it is more and more related to its turnout in the public taste.

The challenge for cultural institutions today is how to share their heritage with new modalities, making it accessible to citizens' and tourists' needs in an "always connected" world.

The use of graphics and of scanning and 3D modeling technologies has become, over the last few years, an important instrument to present and analyze works of art allowing researchers to manage scientific data and visitors a better comprehension of artifacts.

The more frequently used technology for the transmission of cultural heritage is represented today by dynamic sites and portals, social networks, mobile apps, virtual reconstructions, augmented reality.

In the field of web apps, the constant technological advancement has led to the creation of "platforms" able to capture users' interest with 3D data visualization and navigation. More specifically, website visitors can get information through predetermined storytelling formats (texts, videos, audios) or as in the present case through the fruition of digital models allowing a larger number of researchers to study and analyze artifacts from any point of view, anytime and without the risk of damaging the original.

It is even more interesting that users do not have to search for the information connected with a specific place as information is brought to them according to the place or object they are in front of.

Such platforms could be of two types: in the first one, there is the sharing of a virtual open space where different contributions with data sharing purposes converge into; in the second one, data insertion is permitted only to the software's authors and operators.

The latter is the case of the already mentioned Conceptouring Platform which experts and

[13] "Today models are the point of departure for all the activities aimed at a more profound knowledge and protection of the object. Different fields of operations connected with Cultural Heritage – from cataloguing to preservation, from design to restoration and valorization – begin to present the enormous potentials inherent in models obtained through 3D surveys." Attenni, Bartolomei, Hess & Ippolito (2017, p. 61).

researches can implement in order to disseminate knowledge supported by scientific data.

The fundamental aim of the present research is the experimentation in the field of technological potential from survey to the tangible and intangible representation in order to provide a support for the visualization, management and dissemination of cultural heritage.

Through the investigation, knowledge and dissemination of culture it would be possible to regain control of the cultural heritage which deserves to be promoted and disseminated.

These are the set up guidelines to implement mobile applications.

With the help of specific software, procedures for 3D modeling and its enjoyment have also been developed.

Similar to real objects, 3D models are measurable and they can express physical and chromatic data, they are indefinitely replicable and can be transformed in "tangible" objects through prototyping techniques. What's more, they represent a database for the development of navigation platforms which allow the remote fruition of goods which, very often, remain inaccessible or even unknown.

The applied methodology is based on the use of technologically advanced instruments (laser scanner, total stations) for data acquisition and on the use of specific software for data processing and 3D modeling.

The first step was that of architecture surveying, specifically, a powerful surveying campaign was carried out in the Val di Noto area. The adopted resolution for each survey was defined according to the plastic complexity of any single architectural object.

The point clouds, outputs of the on-site surveying activities were processed through Cyclone and then exported in .pts files to be later on imported in Rhinoceros which efficiently manages all the acquired geometric information and texture data. (Fig. 8)

The main difficulties of the conducted research regarded the 3D model conversion into smaller files which could be uploaded and attached to the app.

It was finally decided to choose simple .jpg files appropriately uploaded to allow users 3D navigation with no particular device functions. Images are uploaded and set in the right sequence thanks to an appropriate code developed within a small HTML file, compatible with any device.

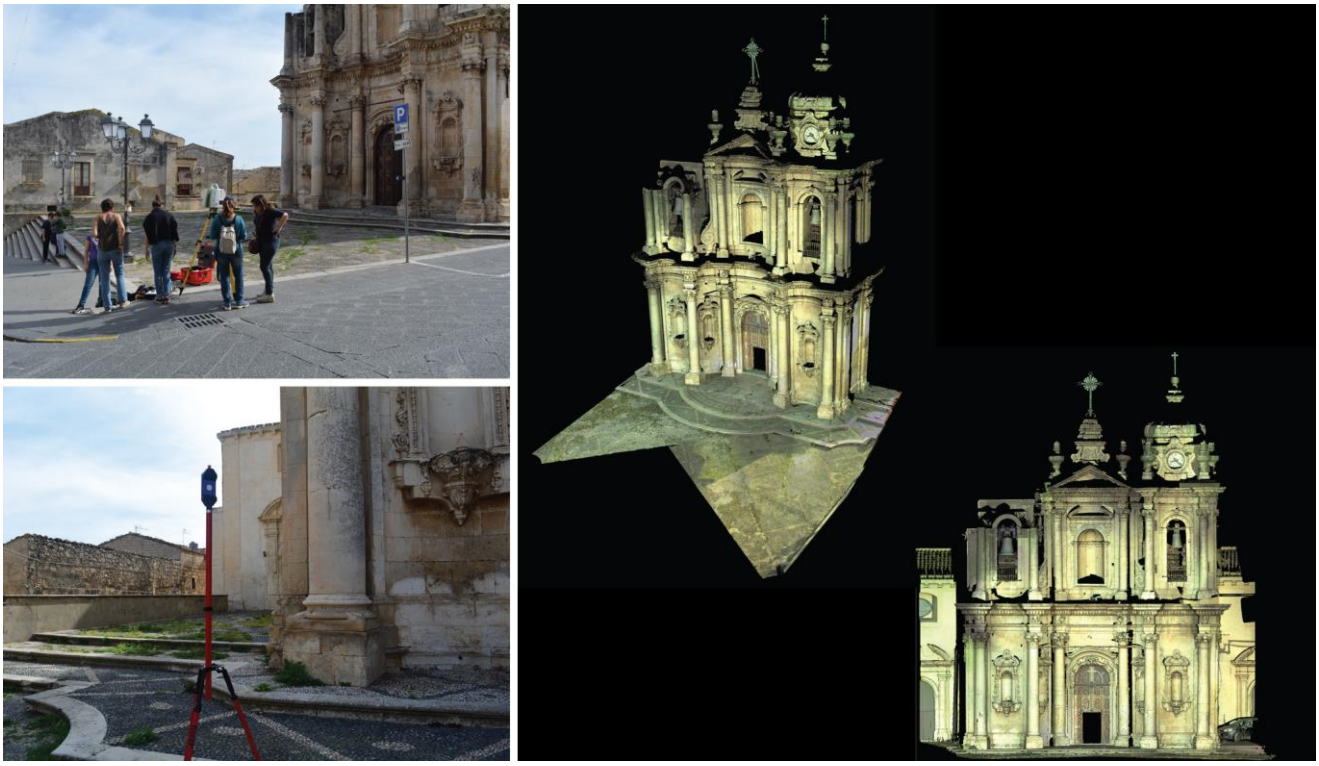

Fig.8: St. Antonio Church, Ferla: laser scanner surveying and digital data post processing.

All this was made possible thanks to the use of Rhinoceros and Object2VR.

It was possible to produce 3D renderings of the 3D models through a tool present in Rhinoceros which generates a rendering sequence in .jpg format choosing the focal point and the most appropriate path for each "shot".

In order to obtain a responsive navigation of the model, with a convenient number of images and an appropriate file size of the model in the app, five horizontal paths were used. Eighteen shots were taken for a total number of ninety model images. Each path was detected imagining any single model within a sphere and extracting each path from its surface.

The ends of each path coincide with the intersection between the sphere and the 90° cone of vision whose station point corresponds with the focus of the shot. In particular, the 18 shots of every single path were taken moving the camera of 5° along the path between each shot.

The renderings were imported in Object2VR (able to support source JPG, PNG, TIFF, PSD and QuickTime VR files) which was configured so as to identify and store images in the virtual space formatting the file names Rhinoceros generated. Zooming was also implemented in order to visualize any architectural detail.

The software generated an HTML file containing the code which allows the virtual restitution of the model and its navigation from personal mobile devices. (Fig. 9)

However, the use of modern technologies of virtual analysis and representation of architectural goods doesn't mean that traditional approaches are totally overcome, rather new collaborative environments are looked for which are often useful to save money and time and which allow human eye to see what it cannot perceive on its own.

Thanks to digital models and to the above mentioned technology, "passive" consumers turn into "active" users able to decide what to see, where to go and which thematic itinerary to follow.

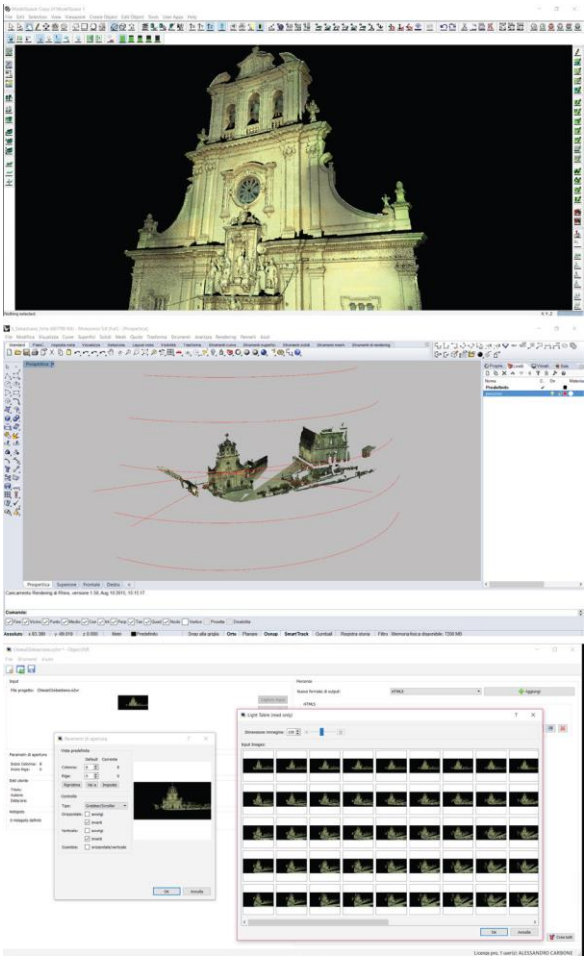

Fig.9: St. Sebastiano Church, Ferla: from survey to virtual representation.

5. *Techical note on Conceptouring system in NEPTIS project* *(N. Mariniello)*

The technological aspect of NEPTIS is projected to supporting production, management and enjoyment of a territory cultural content, for this scope a software system called Conceptouring has been developed that allows the creation of various content through a web interface and also manages its editing and publishing.

The web interface Conceptouring is accessible to two types of users: content producer users and handler users who oversee their cultural value and contextual adequacy.

When a controlled content is published it becomes accessible through the NEPTIS mobile app that offers users the ability to view it.

5.1 The Conceptouring content curation model

Final users of Conceptouring can be granted the permission to write their own stories, if this option is followed Conceptouring becomes a simple, content oriented social network for Cultural Heritage enthusiasts.

In addition to this feature, it is worth noticing that all stories, be they written by final users or by a specialized editorial committee, can be enriched by specific elements (pictures, videos, comments) selected from all major Social Networks.

This set of features is available for all NEPTIS stories, not only for the stories written by professionals but also stories written by end users.

This full, by-design, integration with external Social Networks is probably the main Conceptouring differential with most existing Cultural Heritage promotion systems.

It allows any writer (end users of professional site curators) to create and publish dynamic, social enhanced stories that tell a territory or a site in a dynamic and fresh way, by using a modern and effective communication style.

The extensive possibility of reuse and repurposing of media shared on major Social Networks[14] substantially reduces the cost of producing descriptive content for our customers. The following picture provides a graphic representation of the main conceptual phases of this process of repurposing existing content (Fig. 10)

In short, writing a Conceptouring story is conceptually a 3-phases process:

- FIND: the initial phase, where the writer is granted the possibility to search all major social networks for appealing and interesting social material; he just needs to enter one or more keywords (about the topic/area/site he wants to write about); he may also optionally specify more advanced search criteria (such as selecting only post with active geotags or posts with associated multimedia content).
- AGGREGATE: the intermediate, creative, phase where the writer selects (among search results) the social content (pictures, videos, comments) he likes the most and blends them into his own story, by adding intertwined sections of descriptive text.
- PUBLISH: the final phase when the author decides, with just a few clicks, to make a specific story (that he considers complete) available online.

Fig.10: Content curation steps.

The Publish phase deserves some more description. Conceptouring supports several publishing options. Conceptouring powered stories can be easily published:

- in any organization's existing portal (regardless of the content management technology of their specific portal);
- in the existing social profiles of the customer in the main social networks (e.g. facebook page or twitter stream);
- in a Conceptouring powered site specific website.

However, the most important option is to offer such stories in Conceptouring powered mobile apps dedicated to the areas or the sites being managed (more on this later).

To promote an area or even a single site our customers need many high quality descriptive (Content Curation) and need to be able to link them effectively to the places or items each story describes (Content Management).

In NEPTIS all stories, no matter how long or complicated is their writing process, can be linked to Points of Interest (relevant places), or EOIs or POIs.

We will hence use the first term (Content Curation) to refer to the process of writing of stories enriched by using external sourced multimedia content.

We will use the term Content Management to refer to the management of all content managed by NEPTIS along their lifecycle.

[14] And in many other sources of open data cultural heritage content, such as wikipedia.

Content Management is then related to simple functions such as story updates, the linking of a story to a specific site or item, or to more articulated ones such as the evaluation and rating (by a redational committee to manage their priority) about the quality of end user produced stories.

The Conceptouring conceptual design emerged as a logical consequence of the just describes value proposition. At the end of this process, Conceptouring finally came up as the sum of three main software components:

A graphical representation of the Conceptouring concept is the following. (Fig. 11).

Fig.11: The Conceptouring concept.

In short, the Conceptouring software system is not an app, instead it makes it possible for Engineering, or Engineering business partners or even customers (if they so desire) to build their own apps with little effort and no coding.

In this sense, Conceptouring is a very easy to use system to setup and publish apps environment. In fact, Conceptouring apps are almost ready. Just a few configuration choices are needed to build the native apps and submit it for approval to the Apple Store and to the Google Play Store.

The whole system is synthesized in two main technological objects: a WEB INTERFACE for contents and a MOBILE APP for content fruition.

Graphically the various components of the CONCEPTOURING content management system can be shown as follow: (Fig. 12).

The system consists of a set of modules composed of a web interface that allows the management of contents in the phases of insertion, modification, validation and final publication.

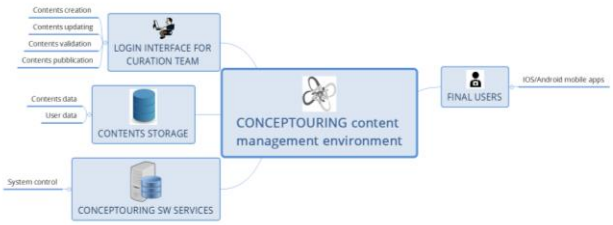

Fig.12: Conceptouring concept management environment.

A database that stores the contents and data of the users of the system.

A set of software services to support the various functionalities.

Finally, some mobile apps that are generated in order to show content for final users and offer support services for tourist visits.

Let's see more in detail the two fundamental components of the system that are the web content interface and mobile apps.

5.2 Web interface for POIs and Stories description and Mobile App description

Stories in the Conceptouring are narrative descriptions about places, cultural heritage sites, monuments or specific items of artistic or historic relevance.

NEPTIS stories are also the main narrative instrument used to describe paths (sets of different, connected, Points or Items of Interest)[15]. (Fig. 13)

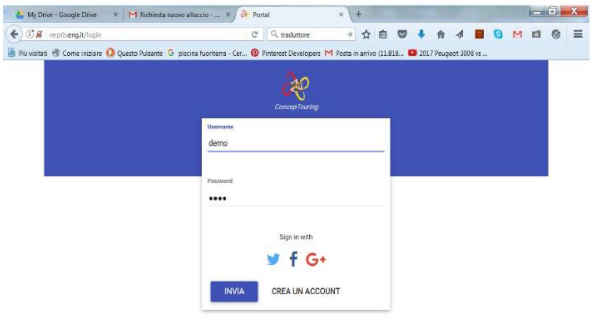

Fig.13: Conceptouring access page.

[15] Paths do have another major options available for their descriptions and promotion: this option is virtual tours: however virtual tours are deeply interconnected with NEPTIS stories and can be seen as just another specific format of the general concept of a NEPTIS story.

The core of the Conceptouring then is an easy to use web interface that allows anyone to write stories and share them.

In most cases, a responsible for a cultural site or a museum will appoint a team of editors in charge of writing reliable high quality stories that describe the site or the area they want to promote.

These approved, high quality stories form the core of the descriptions provided by NEPTIS.

However, the final users visiting the customer site (a museum, an archaeological site, even an entire town or region) can write their own stories about it: what they felt during the visit, their emotions, their memories.

In a hypothetical commercial version of Conceptouring, the customer appointed professional redational committee, can examine the user produced stories and decide to what extent each story can be approved or promoted.

This allows engaging high quality social stories to be shown together with reliable approved content made available by the institution managing the site, with reduced fears of misuse.

In the project vision user stories can be used as a powerful marketing tool to promote a territory or a site by documenting and describing in terms of rich and reliable descriptions the sites and the items that may attract visitors and tourists.

In fact, from a purely technical point of view, any story (no matter who the author is) can be localized and linked to a specific territorial area or cultural heritage site (POI) or artistic item (IOI).

The web interface then is basically a content management tool for managing cultural content (photos, videos) linked to a set of points of interest in a given territory.

The web system is also able to handle the creation of mobile applications for the presentation of the various territory contents. The managing interface is shown as follow: (Fig. 14).

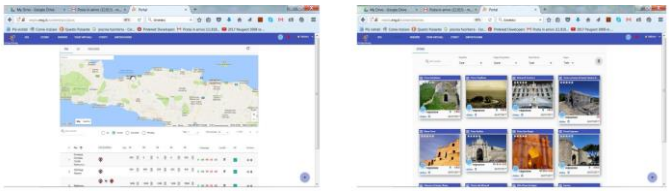

Fig.14: Conceptouring main control panel.

In these images are displayed the different contents over a territory, and all these contents (such as video and video etc) are associated with POIs and EOIs, both can be built and configured by the interface as shown below.

The last step in this cultural object building process is the publication by a curator user and finally the cultural content is visible and accessible through the mobile app.

The application has the following main features:

- Sections: Culture, Nature, Folklore and Enogastronomy, Routes, Historical Maps, 3D Models.
- Stories and integration with Conceptouring web interface
- Automatic localization: Italian, English, French, Spanish, German.
- TTS Descriptions and Voice Input STT
- Local feelings (social searches around you)
- Proximity notifications, even on watch; QR Code
- Maps, native GPS navigator.

All Conceptouring powered apps propose to the user the optional choice of logging by using his social login identity. Once personal or anonymous login is achieved, the user will be offered position aware information to discover the touristic and cultural offer of the territory around him.

When the user logs in, he is given the opportunity to use the set of services we talked about before (Text to Speach, Notifications,

Queries, etc.) or he can choose to view thematic sections of Points of interest, paths or 3D models, Maps and so on (Fig. 15).

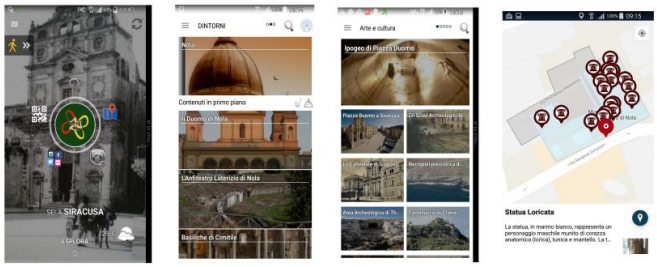

Fig.15: Main sections of NEPTIS mobile app.

All to inform, facilitate and support his / her visiting experience.

REFERENCES

Annali del Barocco in Sicilia, 1 (1994). *Studi sulla ricostruzione del Val di Noto dopo il terremoto del 1693*. Roma, IT*:* Gangemi Editore.

Atteni, M., Bartolomei, C., Hess, M.& Ippolito, A. (2017). Survey and modeling: from the process to a methodology. *SCIentificRESearch and Information Technology,* 7(1), 57-72. Retrieved fromhttp://caspur-ciberpublishing.it

Azzopardi, J. (1993). *Mdina and the earthquake of 1693*. Malta: Heritage Books.

Bertocci, S. & Bini, M. (edited by) (2017). *The survey for the restoration of historical heritage. DISEGNARECON*, 10(18). Retrieved from https://disegnarecon.univaq.it

Blunt, A. (1968). *Barocco siciliano*. Milano, IT: Il Polifilo.

Boscarino, S. (1997). *Sicilia Barocca. Architettura e città 1610-1760*. Roma, IT: Officina Edizioni.

Boscarino, S. (1992). Introduzione al Barocco siciliano. In Madonna, M. L., & Trigilia, L. (Eds), *Barocco Mediterraneo: Sicilia, Lecce, Sardegna, Spagna* (pp. 3-21). Roma, IT: Istituto Poligrafico e Zecca dello Stato.

Brusaporci, S. (edited by) (2013). *Modelli complessi per il patrimonio architettonico-urbano.*Roma, IT: Gangemi Editore.

Casamento, A., & Guidoni, E. (1997)*. Le città ricostruite dopo il terremoto siciliano del 1693. Tecniche e significati delle progettazioni urbane*, in '*Storia dell'Urbanistica/Sicilia* II'. Roma, IT: Kappa edizioni.

Chiavoni, E. (edited by) (2009). *Metodi e tecniche integrate di rilevamento per la costruzione e fruizione di modelli virtuali 3D dell'architettura e della città.* Roma, IT: Gangemi.

Dufour L., (1985). Dopo il terremoto del 1693: la ricostruzione della Val di Noto, in "Storia d'Italia- Annali n. 8 – Insediamenti e terremoti". Torino., 476-492.

Dufour, L., & Raymond, H. (1994). *Val di Noto. La rinascita dopo il disastro.* Catania, IT: Sanfilippo*.*

Giuffre', M. (2006). *Barocco in Sicilia.* Verona, IT: Arsenale Editrice.

Giuffre', M., & Piazza, S., (2008). *Terremoti e ricostruzioni tra XVII e XVIII secolo.* Atti dei Seminari Internazionali. Lisbona 10 ottobre 2008- Noto 24 ottobre 2008. Palermo, IT: Edibook Giada.

Meschini, A. (2011). Digital technology in the communication of Cultural Heritage. State of the art and potential development. *DISEGNARECON*, 4(8), 14-24. Retrieved from https://disegnarecon.unibo.it

Settis, S. (2002). *Italia S.p.A. L'assalto al patrimonio culturale*. Torino, IT: Einaudi.

Steiner, G. (1994). *Una certa idea di Europa*. Milano, IT: GarzantiEdizioni.

Taibi, G., Valenti, R., Liuzzo, M., & D'Aiello, M. (2013). Crabnebula Digital Suite, an Algorithm of Survey and 3d Modelling for the Preservation and Management of Urban Heritage. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XL-5/W1, 227-234.

Trigilia, L. (1994)*. 1693 Iliade Funesta. La ricostruzione delle città del Val di Noto.* Palermo, IT: LombardiEditore.

Trigilia, L. (2000). *Siracusa. La Piazza e la città.* Catania, IT: Domenico Sanfilippo Editore.

Trigilia, L.(2002). *La Valle del Barocco*. Catania, IT: Domenico Sanfilippo Editore.

Trigilia, L. (2007). *Un viaggio nella Valle del Barocco*. *Pantalica, Siracusa e le città del Val di Noto patrimonio dell'umanità.* Palermo, IT: Domenico Sanfilippo Editore.

Trigilia, L. (2013). *Le immagini raccontano la città. Artificio e Devozione nel Siracusano*. Palermo, IT: Lombardi Editore.

Valenti, R., & Paternò, E. (2016). Image and memory: the representation of a fragment of submerged urban landscape. In F. Capano, M. I.Pascariello & M. Visone (Eds.), *Old and New Media for the Image of the Landscape*: *Representation, Memory, Preservation* tomoII (pp. 137-146). Napoli, IT: CIRICE - Centro Interdipartimentale di Ricerca sull'Iconografia della Città Europea.

Valenti R., & Paternò E. (2016). *La rappresentazione degli elementi scultorei in architettura. Dal modello 3D alle geometrie sottese*. In XIII Congreso Internacional de Expresión Gráfica aplicada a la Edificación *"DIBUJAR, CONSTRUIR, SONAR", APEGA 2016* (pp. 1067-1079). Valencia, ES: Tirant Lo Blanch.

Voza, G. (edited by) (1999). *Siracusa 1999. Lo scavo archeologico di Piazza Duomo*. Palermo, IT: Lombardi Editore.