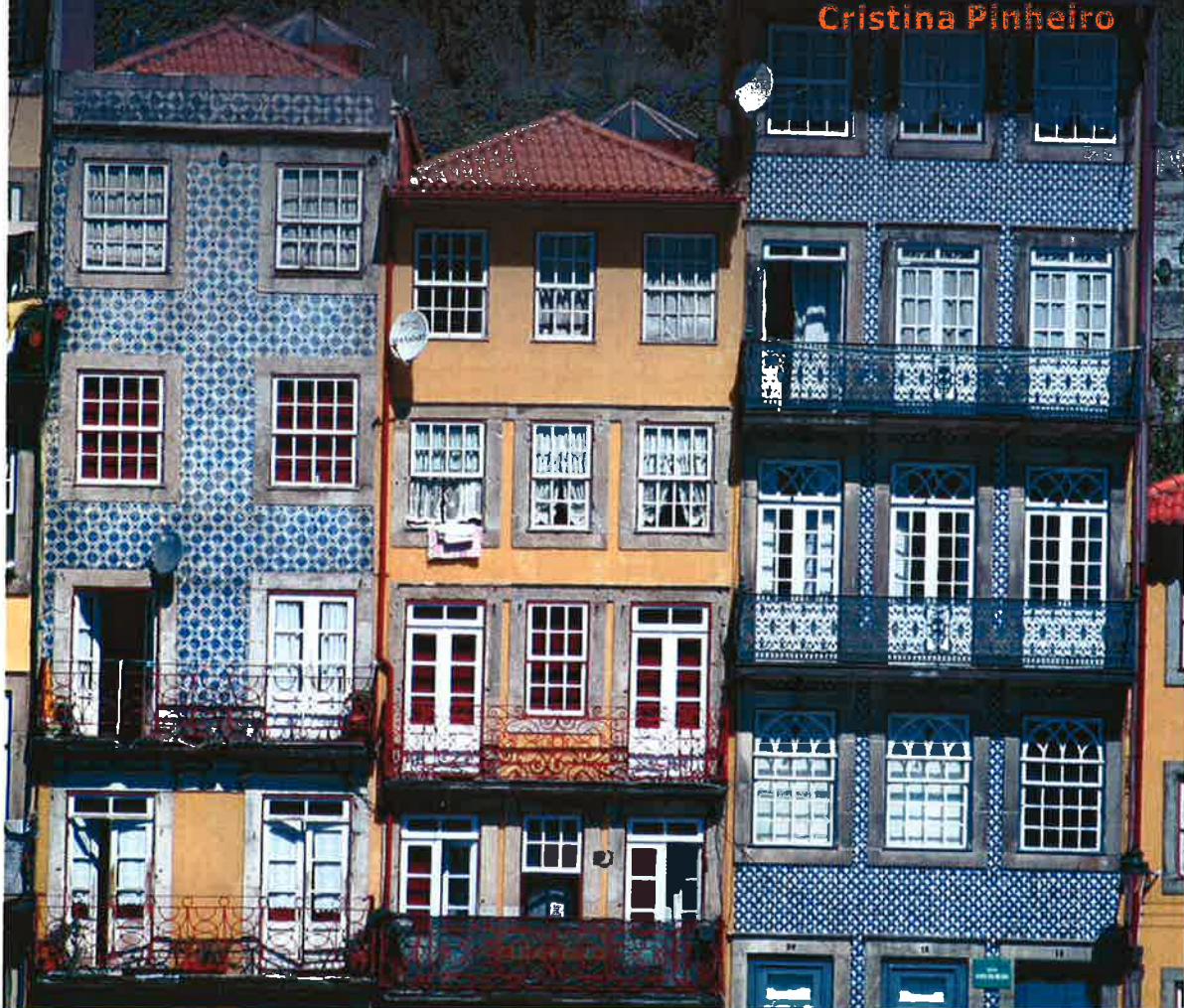# HERITAGE 2012

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Edited by

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Knowledge, science and enhancement of historical decaying buildings in Tuscany. The "ArTeSalVa project"

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ABSTRACT: The "ArTeSalVa" project starts from the observation of the neglect and disuse of the historical public buildings in Italy, which have important architectural value. The project aims at studying the less known historical events regarding some decaying buildings in Tuscany and using 2D and 3D digitization modalities in order to map the current status, to track decay processes and to create effective tools for scientific and tourism visual communication. A significant case study is represented by the medieval Carthusia, in Calci near Pisa. The historical research is investigating the different ways in which the monastery was used and thus the most important changes introduced in it. The related digitized data are used to record the decay, highlight transformations and support planning of possible new uses of the areas that are not currently accessible to the public. The digital models are the instruments to document and present visually the scientific results.

1 INTRODUCTION

1.1 *Historical background*

After Italian unification (1861), the newborn state acquired many ecclesiastical properties; they were often very prestigious buildings used for various functions, different from the original (Gioli 1997). The laws that permitted the sale of these buildings - n. 3036/1866 e n. 3848/1867 – slowed down preservation of these by the competent authorities. In particular, the Ministry of Public Education, which founded the High Council of Fine Arts in order to preserve cultural heritage, tried on many occasions to reach an agreement with the General Direction of State Properties of the Ministry of Finance, in order to better respect the existing cultural heritage restoration guidelines. These guidelines, however, were almost never respected.

Some state properties were used by the central government, while others were allocated to local authorities or sold to private parties.

Monasteries and convents taken over by the state became public areas used for the well being of citizens. They were transformed into prisons, conservatories, asylums, military arsenals, offices, etc. These complexes suffered as their restoration and use did not respect their original character, thus becoming 'simple containers' for public functions.

The local authorities could ask for the free assignment of state properties to be used as schools, kindergartens, poorhouses, hospitals, etc. This opportunity seemed to offer new build-

ings free of charge; but this strategy failed due to the bureaucratic red tape and the expenses needed to adapt the historical buildings to their new functions. The maintenance and preservation of these complexes - a duty of the delegated local authorities - were rarely carried out because of the unclear attribution of economic responsibility.

The state buildings that could not be converted (in order to be used for public functions) or that were not recognized as national monuments, were sold to private parties in order to increase state revenue. The rules for the sale and preservation of historical buildings were not defined. Monuments and works of arts underwent heavy restoration, which sometimes brought about their destruction.

1.2 *Current cultural context of the ArTeSalVa project*

In the last few years the question of the sale of the state properties in Italy has once again been proposed and it has often been the topic of heated political debates which have had an impact on the legislative measures taken (La Monica 2010). The sale - according to article 3 of law n. 85/2010 - has been proposed as a partial solution to national budget problems. Three actions have been taken:

— an inventory of state assets;
— the establishment of a management agency, State Properties Agency;
— the reactivation of state properties through their sale to private parties or the transfer of ownership to local bodies.

Federalism is being introduced with regard to state properties; in other words, the ownership of State properties is been transferred to local authorities and two lists of transferable and non-transferable assets have been made up.

These strategies described above are the same as those used 150 years ago. Now, it is the State itself that is transferring ownership of its properties whereas, in the past, ecclesiastical buildings became State properties or were sold to private parties.

At the moment the laws regulating the ownership and management of State properties of historical interest are changing, so new cultural heritage values must be defined for every single historical building. This must be done in order to identify the constraints to be respected and the resources needed to enhance this heritage that is so much a part of our historical identity.

2 THE ARTESALVA PROJECT

Re-use is the natural form of survival for historical public and private buildings. It is necessary to find innovative solutions that ensure a longer useful life cycle and maintain cultural, social and economic values (active safeguarding).

Re-use can also enhance interactions with the context. Through an increase and spreading of knowledge, the historic buildings once again become the vehicle of intangible values - which are identity and memory - and potentially become a determining factor in the development of local economies. These values determine a combined process of restoration, preservation, management and sustainable tourism for cultural heritage buildings.

This is the past and present cultural context in which the ArTeSalVa project (Architecture, Technologies, Safeguarding and Enhancement of Historical Public Decaying Buildings in Tuscany) was promoted by the Scuola Normale Superiore and National Research Council CNR-ISTI VC Lab in Pisa and financed by the Region of Tuscany with European POR-FSE funds.

The project starts from the observation of the neglect and disuse of historical public buildings in Italy having substantial architectural value. The goals of the project are:

— to increase awareness of the different communities on the value of these buildings, through focused historical and scientific research and the use of new technologies in order to obtain some documentation of the current conservation status;
— to communicate the histories of these buildings and their past uses through innovative digital presentation channels. These steps are fundamental in order to activate the enhancement process and offer more opportunities for the restoration and active re-use of this heritage.

The project aims at studying the less known historical events regarding these buildings and their different functional and structural changes. The buildings involved in the project are:

1 Medici Villa located in Montelupo Fiorentino (near Florence);
2 Carthusian monastery located in Calci (near Pisa);
3 Badia Camaldolese located in Volterra (near Pisa);
4 Fortress of Verrucole located in Garfagnana (near Lucca).

The core idea of the project is the creation of an integrated information base to help understand, promote and restore the buildings. To this aim, the project will employ a combination of traditional archive research and modern digital technologies in order to build up the desired knowledge corpus.

Modern 2D and 3D digitization, manipulation and visualization technologies are effective instruments for the documentation, promotion and restoration of cultural heritage artefacts used nowadays in most of the relevant cultural heritage projects (Scopigno et al. 2011).

However, useful as they may be, these technologies can only give an account of the current state of the buildings; their history and original conditions can not be determined through the use of such technologies. In order to fully restore these monuments, knowledge of their past identity is as important as their current state. To this end, the analysis of the archival documentation can help to reconstruct the architectural history of a complex through the centuries and to recognize structural and formal changes which the buildings have undergone; these buildings in fact have been used in different ways over the centuries. This process of historical detailed reconstruction can be useful in order to understand the elements to safeguard or strengthen in a restoration and enhancement project.

In addition to the data collected, one serious concern of the project is making all of this data accessible for future usage. Building a substantial information dataset, and then turning it into another non-accessible publication is an error that should be avoided at all costs. To this aim, the project will follow a complete strategy in order to preserve data and facilitate re-use:

— *web accessibility*: all the data gathered in the project will be made accessible through a web interface. Through the use of multi-level access strategy it will be possible to provide different levels of access to different user profiles, such as simple users, art historians or curators;

— *open data formats*: in order to favour data interexchange, increase data longevity, and make the information as accessible as possible, the project will stick to the use of open data formats. The project will also strive to store all the raw data together in order to set up a database for future needs;

— *data classification*: all the different information has been classified using national and international archival and information standards in order to make the data more easily accessible for future users and create interoperability with other systems.

The data gathered in this phase of the project will be used in three different ways, which, however, are strictly correlated:

1 *Documentation of the current state*: the lack of funding generally associated to the state of inadequate conservation of these buildings has also, over of the years, produced a lack of reliable information regarding the current state of the buildings. The available maps, photos and written reports are generally years old and quite outdated, thus making it difficult even for the authority that is managing the building to know the exact state of many parts of the complex.

2 *Communication to the general public*: most of these endangered buildings are in a situation of dismay; one of the reasons is that they are not very well known by the general public. Providing detailed information on their history, virtual tours, and high quality photographic surveys may help raise touristic interest, promote their re-use and stimulate local awareness towards these buildings.

3 *Support to restoration/conservation actions*: since the data produced in the project strictly follows scientific and technical guidelines, and has been catalogued to be easily accessible, it will be a valuable asset for the authorities involved in any future attempt to restore the buildings. Historical information and photos will guide the restorers when deciding the objectives of the restoration process, while the actual mapping of decay, 3D surveys and photographic campaigns will help plan the more practical aspects of the restoration.

Figure 1: A view of the Carthusian Monastery

3 THE CARTHUSIAN MONASTERY IN CALCI

3.1 *History*

A significant case study in the project is the Carthusian monastery, located in Calci (near Pisa). The monastery was built in the 14th century and enlarged for the first time in the 17th century. Between 1764 and 1797 the prior Alfonso Maggi began a very important campaign of restoration, enlargement and decoration. He hired architects, painters and skilled workers from different parts of Italy. Today the Carthusia maintains this 18th century style (see Fig. 1).

There have been several attempts to change the original destination of the Carthusia in Calci in order to re-use the same spaces with new, different and often incongruous functions.

In 1866 the Italian state closed the Carthusia in Calci and in 1869 declared it a 'national monument', also if the charterhouses were huge complexes difficult to convert, manage and maintain (Gioli 2010). Some friars remained in order to officiate the church, preserve the buildings and compile the artistic and archival inventories.

The distinction between 'monumental' parts and 'non-monumental' parts allowed for a casual re-use of the historical buildings; this distinction encouraged improper uses of the areas considered to be non-artistic, on which unregulated restorations were carried out. The Carthusia in Calci was also divided into two parts: monumental and non-monumental. There was an attempt to transform it into an insane asylum.

The idea was not unusual. In 1855 the Carthusia in Collegno in Piemonte was abolished and became state property, a year later it was bought by the Royal Insane Asylum of Torino and transformed in a new section.

In 1868 Pisa needed an insane asylum. The Carthusia in Calci represented an ideal place: it was a beautiful complex inserted in a healthy natural environment, far from the city of Pisa but near the town of Calci, well served by public transport. This first attempt failed.

In 1870 Augusto Sbertoli - a famous professor - needed more areas for his patients; he asked permission to occupy the part of the Carthusia in Calci which could be used without damaging the architecture and the works of art. He was aware of the limits imposed by the 1869 law regarding the safeguarding of national monuments, but he wanted to create one of the best national healthcare centers in Europe. In order to obtain the concession, Professor Sbertoli focused on the most important critical elements linked to state management: the economic maintenance of the complex. He promised only to sustain daily maintenance costs. The constant use of the buildings would also ensure better preservation. In fact many State properties were underused or not used at all and were already decaying. The more a building is in decay, the fewer are its restoration prospects.

Also if he wanted to change his original function, Professor Sbertoli had respect of duties of preservation and ensured free entrance for that people who wanted to visit the Carthusia. Despite all, the purpose was refused.

In 1888 there was a new attempt to change the destination of the Carthusia in Calci. The Province of Pisa made a new inquiry in order to obtain the whole complex to use as asylum because it didn't have sufficient financial resources to build a new one. The project involved the preservation of the monumental areas and the re-use of the non-monumental buildings as asylum. This transformation has not caused important changes.

The permission of use of the State properties, especially those with an artistic character, belonged to the relevant Ministries, which usually turned the issues to local authorities and Art Commissions. The Ministry of Public Education, which managed the Carthusia in Calci, in fact turned the question to the local Monuments Preservation Commission in Pisa.

In 1892, the Commission expressed his opinion about the transformation. It considered that the Carthusia was not an intangible monument because it lost the medieval shapes. The 17th century artistic character of the complex was not appreciated, so the buildings could be modified. However the project could not be approved because it hadn't all the elements necessary to economic evaluation and it was impossible to understand the true impact of the adaptation on the complex. Doubts concerned substantially the way of the transformation. The Art Commission asked more details and a precise project. Meanwhile the Carthusia was used as storage for artillery.

In 1894 the Province of Pisa submitted to a new project of tranformation signed by the architect Luigi Bellincioni (Bellincioni 1895), who explained the project on the spot. The idea was to convert the existing areas with a little cost, making the minimum of work and excluding any monumental part. The Art Commission appreciated minimal intervention criteria used by the architect, but it considered that it was not possible to adapt the Carthusia without disturbing its artistic character. The transformation into an insane asylum would have also kept out tourists. The Art Commission decided against the concession. Official cards were passed to the High Council of Fine Arts in Rome in order to have a final evaluation on the feasibility of the project. In 1895 the topic was archived permanently with its opposition to permission.

In 1915 the Carthusia was transformed into a military hospital for war prisoners. Inside the Carthusia there were big unused and non-monumental areas that could be converted into a hospital. Cohabitation was not positive for the national monument. There were also incredible attempts to transform the painted refectory into an operating room and the whole complex into a tuberculosis hospital for foreign war prisoners. This period was the worst for the Carthusia, the transformation into a military hospital produced heavy damages to buildings and works of arts. The state of neglect in which it was maintained for years put at risk the whole complex. Minimum restoration works were carried out and they were realized in an arbitrary way. When the hospital was closed in 1919, the Carthusia needed urgent and important repairs in order to restore the previous situation and demolish the additions. In 1921 the necessary works amounted to the considerable sums, at that time the Carthusia was an historical decaying 'box' and it was emptied of works of art.

In 1923 the Ministry of Public Education intended to adapt the monumental parties of the Carthusia as National Museum, but this purpose should be fulfilled only in 1972, when it was officially opened. In 1962 the non-monumental part was granted to the University of Pisa with a free perpetual license to use it. In 1986 the University opened there a Museum of Natural History that houses its most important scientific historical collections.

3.2 *Current State*

The current situation involves a huge complex divided into two different parts having two separate managements:

1 the Museum of Natural History owned by the Ministry of Public Education and Research and entrusted to the University of Pisa;

2 the National Museum owned by the Ministry of Cultural Heritage and entrusted to the Superintendence of Fine Arts in Pisa.

Thanks to European projects, the Museum of Natural History can create new installations and develop new educational paths. The collection is continuously expanded. The university uses some parts of the buildings as offices and laboratories, so every area is occupied by activities, thus helping the complex to remain in a good state of preservation and guaranteeing the possibility of future restoration and re-use.

Today the National Museum is the part of the complex that is undergoing serious decay. The lack of sufficient public and private funds has contributed to the decay of the buildings and works of art. The security staff has an insufficient number of employes, so it is not possible to visit the whole area unaccompanied. Many rooms are closed and unused, the other areas are accessible only by means of a guided tour. The museum does not have tools which allow it to communicate with the public, informational brochures, maps, its own website, etc. Around the Carthusia there are beautiful gardens which are not open to the public, in addition to many other areas which could come accessible.

Since last year, the new direction is trying to change the situation and increase opportunities to restore and enhance the Museum, which has many potentialities to develop. This emerging opportunities, beside the historical and artistic importance of the building, are the reason for having chosen this complex for the purpose of the ArTeSalVa project.

The ArTeSalVa project is collaborating to give new educational paths and new traditional and digital communication tools to offer tourists a better visit and enjoy the Museum experience. The project aims also at creating useful tools for its documentation, preservation and restoration.

3.3 *The work in the ArTeSalVa project*

As described before, the project is building up for this test case an articulated knowledge base: half coming from a more "classical" documentation method, and some that exploits new digital technologies:

— a collection of the archival, iconographic, photographic sources related to the buildings and their works of art;

— a database of the available archival sources, with information on their content, already accessible the website of the project (http://artesalva.isti.cnr.it);

— a high quality, divulgation-oriented photographic campaign produced by the team of Oliviero Toscani, a photographer of international fame, in order to raise public awareness and potential private and public sponsors;

— a "virtual tour" of the main building of the complex, soon available on the web, to let visitors explore the Carthusian monastery in a very simple way;

— a 3D reconstruction of some of the more interesting areas, in order to map the current state of decay and to create a useful tool for the future restoration.

The archival research was mainly conducted in Italian archives and permitted the collection of many important data for the reconstruction of architectural and artistic history. Documentary, iconographic and photographic data are used to reconstruct the evolution and transformation of the complex across the centuries. The attention has focused on different destinations of the Carthusia between the second half of the 19th century and 20th century. The analysis of these changes can be useful to evaluate the elements that must be preserved or enhanced at the planning stage. All data will be entered in an opensource database freely avaliable on the project website.
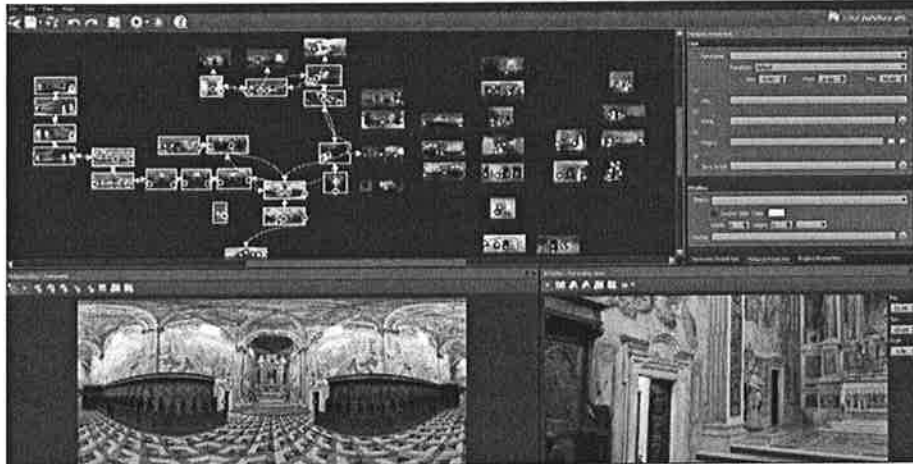
Figure 2: The tool used to create the Carthusia virtual tour

Figure 3: A different ways to see a virtual tour of Carthusian Monastery

The database respects international archival and information standards in order to be interoperable with other existing and future systems.

Using digital 3D technologies: 3D scanners, processing software and visualization tools it is easy to generate accurate 3D models of a building (interior and exterior) and show them. However, in the scope of this test case, this option was somehow overkill. The geometry of the rooms of this building is quite simple, and a 3D digitization would not give to the user much additional value. On the other hand, the decoration of the rooms in the main building is mostly made by frescoes: to fully document this situation, a 2D-based sampling was then a much better choice than a 3D sampling.

The "virtual tour" has then been implemented using panoramas, a simple but effective mean to convey the richness of the decoration of the building and to show inaccessible areas. This choice, simple as it may seem, has the advantage of being easily accessible through a website, is simple to use also to users non-experienced in 3D, and still provides a complete, immersive view of the buildings and its decorations. At the moment there are about 50 panoramas, which show the most important and not visible areas of the Carthusia (see Fig. 2). The panoramas have

been organized in a virtual tour to allow the user the possibility to freely move in the building, choose a point of view using the map or directly the photo index displayed in the virtual tour interface (see Fig. 3)

Beside the medium resolution panoramas (10–15 MPixels), used to build the virtual tour, some very high resolution panoramas (70-120 MPixels) has been captured in the rooms with the more important frescos, to provide an effective documentation for art historians and restorers. These higher resolution panoramas have been captured with specific equipment, able to generate incredibly detailed images made by billions of pixels.

Not all the areas of the building have a simple geometry; on the contrary, some does present a quite peculiar shape. An example of this is the double-level cloister in the proximity of the Medici's Residence. The cloister, visible in Figure 4, has a higher level with lots of decoration and rich frescos, and a central well in the middle of a bridge, which is actually only a hole that is aligned with a proper well, placed on the lower, less decorated level.

Figure 4: The 3D model of Medici's court

The 3D scanning has been carried out using a time-of-flight interference scanner, a FARO Photon 120. This is a very fast (1 million points per second) and precise (2-3mm accuracy) scanner for buildings: the two levels of the cloister has been covered taking 20 circular scans, in more or less 4 hours. The data has been processed using free software developed by Visual Computing Lab ISTI-CNR (Callieri et al. 2011; Cignoni et al. 2008), and produced a model with the resolution of 5mm of the entire area (20x20 meters, two stories high). This model is extremely detailed and can be used with both the aim of showing to the large public such a peculiar architecture and of serving as a precise documentation during restoration (see Fig. 5).

We hope to be able to scan additional areas of the building soon: out list of interesting spots is made by areas not open to the public (but interesting because of specific architectural features, like the basements vaults) and areas with a strong level of dismay (like the bell tower, currently inaccessible to everyone, due to the instability of some internal structures).

Figure 5: A particular of the decay of the Medici's court in 3D model

4 CONCLUSIONS

Many restoration projects neglect the architectural and past uses history of buildings because there is not often time to study and document it. Archival research takes much time and it is impossible to wait its end. For this reason superficial and not updated historical reports are quickly prepared and attached to restoration projects. In this way several historical elements are forever deleted because there is no knowledge of their cultural values. Histories especially related to the recent destinations of the monuments are often unknown or considered irrelevant.

The project ArTeSalVa aims at providing this documentation and reports to everybody who has interest (local authorities, architects, restorers, etc.) in order to prepare sustainable projects of restoration and enhancement.

Morever, ArTeSalVa goes beyond the historical study and documentation, by using new digital technologies to document the state of buildings, disseminate and improve the results, building a knowledge base useful now and in the future.

The project is in progress. The archival researches are almost completed, so it is already possible to use historical information to integrate the virtual reconstructions and 3D models. We have tested availiable information technologies in order to record the state of preservation and communicate data, with a main focus on effective usability by experts and tourists. All the results of the project will be published on web using standard and free tools (planned opening on May 2012 at http://artesalva.isti.cnr.it).

Cultural Heritage is not a commercial product, nevertheless some advertising strategies are used in the project ArTeSalVa, in order to bring more attention and financial resources to it. A photographic campaign produced by Oliviero Toscani staff will be available on 2013 on the website of the project.

To conclude, we are convinced that cultural heritage represents our identity and it is important to think about every way to preserve and enhance it.

ACKNOWLEDGEMENTS

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HERITAGE 2012
3rd International Conference on Heritage and Sustainable Development

Heritage 2012, 3 International Conference on Heritage and Sustainable Development followed the path established by previous editions of this event and aimed at establishing a state of the art event regarding the relationships between forms and kinds of heritage and the framework of sustainable development concepts. The number, variety and quality of papers presented and published allow a final and positive balance. In fact, for this edition of *Heritage* double-blind peer-review of papers applied and the number of definitive rejections was relatively low, confirming the over-all high quality of submitted material.

Heritage 2012, 3 International Conference on Heritage and Sustainable Development was proposed to be a global view on how heritage is being contextualized in relation with the four dimensions of sustainable development (environment, economics, society and culture) that were the core topics of the Conference. These topics brought to discussion the definition of a singular approach on how to deal and go beyond the traditional aspects of heritage preservation and safeguarding. As presently heritage is no longer just a memory or a cultural reference, or even a place or an object, further analysis and other perspectives are in order: heritage is moving towards broader and wider scenarios, where it becomes often the driven forces for commerce, business, leisure and politics. For those reasons the topics of "governance for sustainability" and "education for the future" were also included in the programme as key factors for enlightenment of future global strategies for heritage preservation and safeguarding.

A new chapter was included in this edition of *Heritage* conferences: one on Preservation of Historical Buildings and another dedicated to Early Stage Researchers. This chapter dealt with the specific tasks of preservation, rehabilitation and maintenance of historical buildings and sites and the number and importance of contributions to this topic made it one of the major areas of the Conference. Key issues were preservation and rehabilitation techniques of structures and materials, adaptive reuse of historical buildings, sustainability goals, and assessment tools, among others.

This edition of *Heritage* also gave stage to early stage researchers and students willing to share the results of their research projects, namely post-graduation projects and doctoral projects. *Heritage* received a significant number of such proposals the quality of which was confirmed during double-blind review (by at least two members of the Scientific Committee). This high quality level led to the granting of a significant number of reduced fee packs whose aim was to support and encourage young researchers.

The Editors

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