UMAC
University Museums and Collections

ICOM
INTERNATIONAL COUNCIL OF MUSEUMS
CONSEIL INTERNATIONAL DES MUSEES

VOLUME 7 2014

UNIVERSITY MUSEUMS AND COLLECTIONS **JOURNAL**

VOLUME 7 2014

UNIVERSITY MUSEUMS AND COLLECTIONS **JOURNAL**

The University Museums and Collections Journal (UMACJ) is a peer-reviewed, on-line journal for the proceedings of the International Committee for University Museums and Collections (UMAC), a Committee of the International Council of Museums (ICOM).

The journal appears at least once a year at:
http://edoc.hu-berlin.de/umacj

ISSN 2071-7229

Basket porcelain with truss imitating natural fibers, belonged to a family in São Paulo, c. 1960 - Photograph José Rosael – Collection of the Museu Paulista da Universidade de São Paulo/Brazil

Napkin holder in the shape of typical women from Bahia, painted wood, 1950 – Photograph José Rosael Collection of the Museu Paulista da Universidade de São Paulo/Brazil

Since 1990, the Paulista Museum of the University of São Paulo has strived to form collections from the research lines derived from the history of material culture of the Brazilian society. This focus seeks to understand the material dimension of social life to define the particularities of objects in the viability of social and symbolic practices.

The objective of one of the fronts in the research line "Quotidian and Society" is to develop historical issues related to domestic space. One of the guiding questions in the collections formation concerns the constitution of feminine identity associated with the simultaneous production in the domestic space. For the past five years, hundreds of objects have been collected in the light of these questions, among them are the two items on the cover of UMAC Journal volume 7.

The painted wood napkin holder used in 20th century has the shape of a woman peddler, a constant character in many Brazilian regions, but one that across time has been typified as a baiana – a feminine character from the northeastern state of Bahia, Brazil. The baiana is associated with the traditional chore of selling fresh and prepared foods by Afro-descendants, both slaves and free citizens, throughout 18th and 19th centuries. In 1998, this practice became a registered profession and, in 2012, intangible heritage. The baiana's typical dress is completed when the white paper napkins are placed in the holder.

The porcelain bowl that imitates the weaving of organic fibers is a constant decoration piece in 19th century interior design until the end of the 20th century. The technique was developed to foster the nostalgia for a pre-industrial era, which the bourgeois home constantly references in trying to place itself as a refuge against the anonymous crowds, mechanical work and buzz of urban societies.

Vânia Carneiro de Carvalho
Curator
Interior design objects collection at the Paulista Museum of the University of São Paulo, Brazil

Evaluating change

The University Museum Proceedings of the 13th Conference of the International Committee of ICOM for University Museums and Collections (UMAC) Rio de Janeiro, 10–17th August 2013

Table of Contents

2. Positioning academic heritage. Challenges for universities, museums and society in the 21st Century - Ghent, 17-20th November 2013

A national project for the Italian University Museums network

Elena Corradini & Luigi Campanella

Abstract

Twelve historical Italian Universities, with their museum centers and systems, museums and collections, through the creation of a first network of Italian University Museums, take part to a national project aiming for contributing to the creation of a national museum system to enhance cultural, historical-scientific and naturalistic heritage. The first goal of the project is monitoring the heritage of University museum network, in order to create a national database, using the national catalogue standards, of the most significant collections.

The tool of the network is a bilingual web portal to rationalize the presence of the Italian University Museums on the web, for strengthening and standardizing the presentation of their quality contents on the web with common thematic and multidisciplinary itineraries through their most relevant collections.

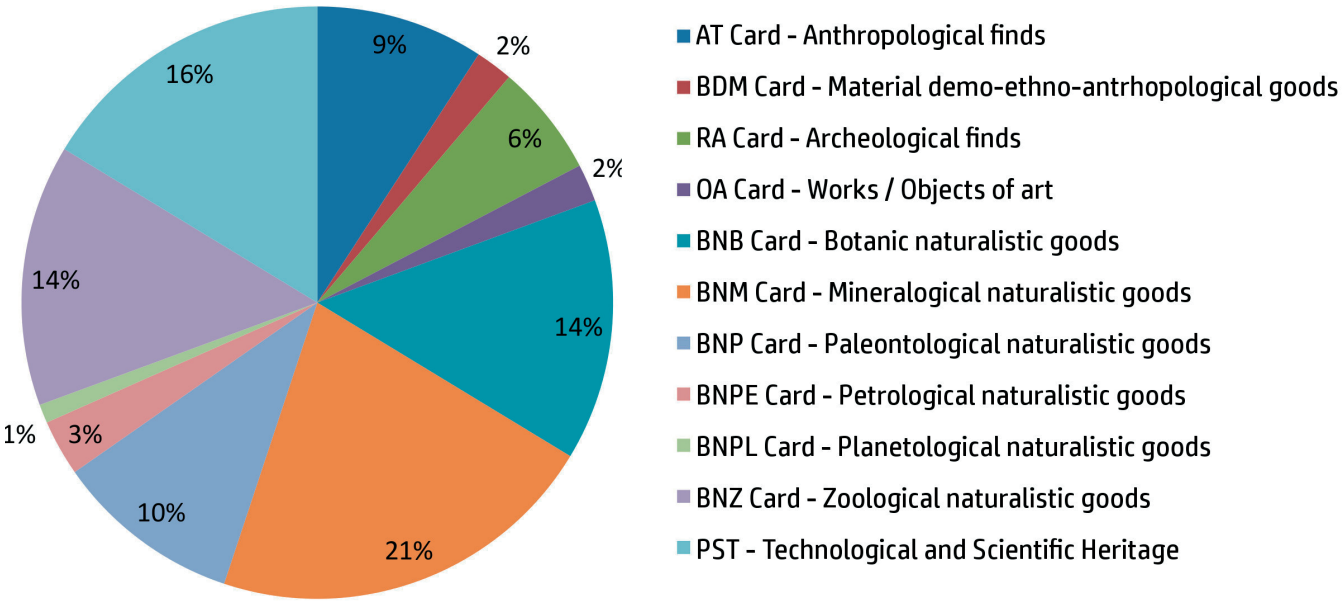


Fig. 1
The activity of cataloguing of the Network of the Italian University Museums

Introduction

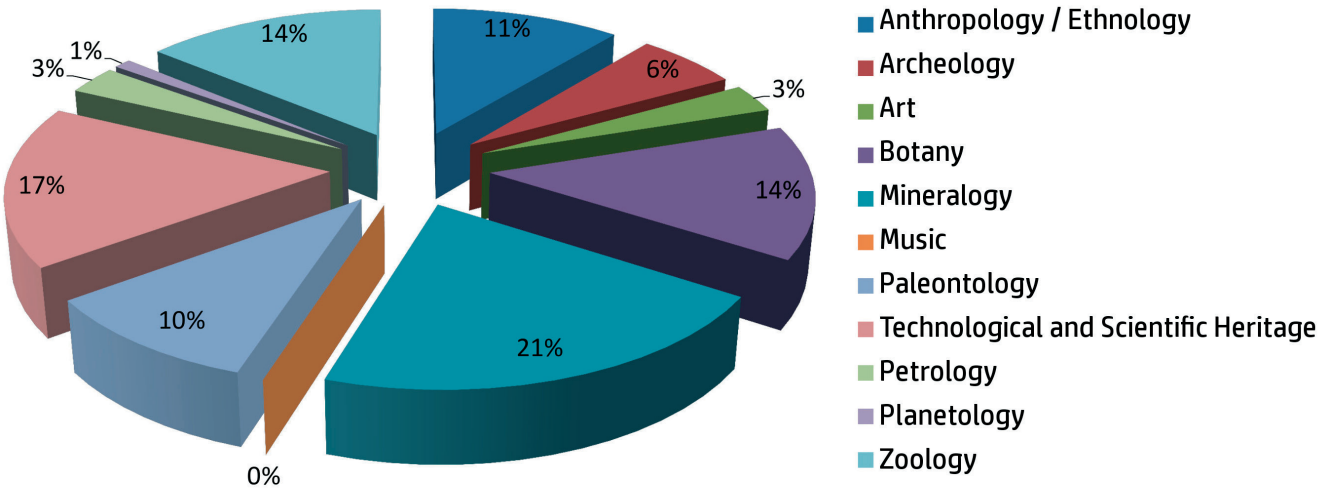
The museums, museum centers and systems of the twelve historical Italian Universities (Bari , Cagliari, Chieti-Pescara, Ferrara, Florence, Modena and Reggio Emilia, Parma, Perugia, Rome "La Sapienza", Salento, Siena, Tuscia), through a specific program agreement approved and financed by the Ministry of the University and Research, take part in a national project aiming at contributing in the creation of a national system of 64 University Museums, 38 collections, 9 Botanical Gardens and for enhancing cultural historical-scientific and naturalistic heritage of their Universities.
The agreement represents for the Universities a fundamental opportunity to contribute to the creation of a first real and virtual network of Italian University Museums. The project, approved and financed in the year 2013 by the Ministry of the University and Research within the law 6/2000 for the diffusion of the scientific culture, is coordinated by the University of Modena and Reggio Emilia (www.pomui.unimore.it).

The creation of this first national network of museums, museum centers and systems of twelve Italian Universities is a fundamental tool to create multiscale management models and integrated plannings both at a national and international level. These concern not only scientific research but also multidisciplinary museum education and integrated museum communication, so that the public value of cultural historical scientific and naturalistic heritage preserved in museums can be perceived.

The mission of the Italian University Museum network (that we aim to activate within the project), consists in offering the necessary tools to increase the interest for science through the knowledge of its collections as well as to create amusing, exciting and multiform contents in order to stimulate curiosity, interest and a more and more active participation. To respond to this need, scientific museology is in constant evolution, being aware that if audience lose interest in science it will not understand its importance.

The project aims at offering a relevant contribution to the scientific education on different levels using innovative tools that do not need huge structural investments, and that directly involves University Museums located throughout national territory by connecting them. Science related issues must become an integrating part of education for young researchers and part of the heritage for scientists because scientific museums places are relevant to promote a correct and innovative scientific information concerning science and its ongoing progresses. It means an evolution of the educational and informative role of museums in which the historical aspects are functional to a social and educational vision, through a close relationship between school and local area. Such evolution will allow to create new contents for the communication of museum objects as educational tools, providing an interesting method to transfer scientific culture since the first stages of school education.

Fig. 2
The variety of disciplines of the Italian Network



The tool of the Italian University Museums network will be a bilingual web portal realized on purpose for the project, in order to rationalize their presence on the web, for strengthening and standardizing the presentation of their quality contents on the web, as suggested by the guidelines of European project Minerva (www.minervaeurope.org), in an innovative perspective that takes into consideration the peculiar features of the collections and the experiences of each single University Museum, their interdisciplinarity and the possible uses in a contemporary historical, social and cultural context (Fig.2). That will allow to design a new image of the museums and their ability to activate national and international synergies to plan lifelong learning activities addressed to different audiences, from research structures to schools of any kind and level, to a wide audience.

The catalog of the collections

The first objective of the project is monitoring the scientific cultural heritage of the University Museums network, in order to create databases of more than 25.000 objects of their most significant collections. This first phase of the work can proceed through different steps: choice from each participating University of a defined number of objects of his heritage able at the same time to well representing cultural vocation and to give a meaningful contribution to the national project; inventory and classification of the chosen objects, cataloguing of the chosen objects using the national standards of the catalogue cards within the General Informative System for Cataloguing on the web, SIGECweb**,** released in collaboration with the Central Institute for Cataloguing and Documentation of the Ministry of the Culture and Tourism (Fig. 1).

The selection of the objects / specimens for the activity of cataloguing has been fulfilled, in order to choose the most significant and to insert them in a coherent relation, for their the symbolic value, with four thematic paths: environments, landscapes, stories, history of scientific instruments.

The standard are constituted by a set of rules, guidelines of method and specific terminology tools to follow for the acquisition of knowledge on the goods and for the production of their documentation. The rules for cataloguing cultural heritage include also rules for digital acquisition of the photographic images, for data transfer and also authority files cards which relate to entities (as the authors, the bibliography) in relation with the cultural heritage.

The catalogue cards are descriptive models that collect in an organized manner information on heritage, according to a cognitive path that guides the person who catalogs and at the same time controls and encodes the data acquisition according to specific criteria. The Central Institute for Cataloguing and Documentation of the Ministry of the Culture and Tourism has issued different cataloguing models in relation to different types of cultural goods, organized on the basis of the various disciplines.
Every rule is made up from of the layout (the structure of the data) and the related rules of compilation, in which is indicated in detail how the individual entries must be drawn up.
The observance of common rules allows, by the application of specific procedures, the interchange of information among the different players in the field of cultural heritage.

The Italian University Museums network web portal

The catalogued objects for the specific relevance of the represented disciplines, like Physics, Anatomy, Archeology, Botany, Chemistry, Mineralogy, Paleontology. Physics and Zoology (Fig. 2), can contribute to the creation of four thematic paths, stories, history of scientific instruments, landscapes, environments, by which the project want to activate the interest and the participation of a even more large and different audiences. The web-portal realized by the Network (online by July 2016) is the virtual place where the ICCD catalogue cards, realized for each object/specimen with an highly qualified scientific information, are accessible to the visitors to illustrate the various itineraries realized by the museums.
The designing project for the web portal of the Italian University Museums is based on the fact that the web does not have to be a mirror of what already exists within a museum: the web is an appropriate tool to create a digital space that through the interaction with users and the production of new contents aims at spreading the knowledge and improving the services that University Museums as public bodies are supposed to provide.

The itineraries realized by each University Museum can create multiples contexts, by working with both historical and territorial frameworks. The museums, developing a narrative approach to the information, can describe the way an object deals with other objects, with places, persons, scientific theories. This activity of story-telling implies consequently to amplify and diversify the cultural communication, involving both emotional and sensorial sphere.

The bilingual web portal is characterized by an architecture of contents developed according to a strategic marketing and usability vision, with a functional graphic interface, easy-access to contents and customizable contents, symbolically representing a strong inclination towards innovation (Fig. 3).

The information management system of the bilingual web portal will represent the engine of a network of available resources; it will aim at managing the information richness and the needs of the different subjects, giving back an integrated vision in a suitable way to spread the knowledge of cultural historical scientific and naturalistic heritage to a wide audience, as well as stimulating interest and curiosity (Fig. 3).

The creation of the web portal to spread culture and collections fruition, connecting schools and University cultural heritage, will enhance open institutions to get in contact with surrounding social, economic and cultural realities, in order to improve the quality of education as well as future social and cultural life.

Fig. 3
The bilingual web portal of the Italian Network

The bilingual web portal will promote a connection between schools and cultural historical scientific naturalistic heritage preserved within University Museums, offering the teachers an educational tool to young students the big topics of science, becoming therefore a means of knowledge, communication and scientific divulgation. An updating of contents according to the topics that daily animate the scientific debate at national and international level will allow to start educational project on cultural historical scientific naturalistic heritage for students of different school kind and level in collaboration with regional and provincial School Offices, with headmasters, teachers and associations of teachers in order to design different e-learning educational paths for students and teachers of any school kind and level. In particular, educational offers addressed to students of the two last year of higher school represent an excellent offer for University career guidance.

In particular, the creation within the portal of an informative service for young post-graduates in the sector of museology and cultural historical scientific and naturalistic heritage will allow to:
- improve the visibility and the image of Universities through innovative communication plans;
- create an useful support to educational activities and to cultural exchanges with other realities, without any territorial border;
- have an effective and efficient tool for a qualified occupational system through personalized paths for young post-graduates;
- promote the on-line diffusion and fruition of available resources for labour market;
- create a real-time dialogue between suppliers and demanders of professional resources;
- support the participation of young people to project design activities of University Museums and to integrate them within the financial circuits that support fellowships and grants for young post-graduates;
- introduce guidance models for post-graduates.

Digital technologies for the Italian University Museums web portal

The network and the creation of a dedicated bilingual web portal allow to activate synergies, to share the mission and multidisciplinary contents, in order to stop the disjointedness and the variety of their current presence on the web in various forms: dedicated portals, complex websites, websites and pages within the web site of the University and to promote more services for the knowledge, the learning, for the users and for sharing of resources with other sites.
It is therefore fundamental to create an interactive environment, specialized in conveying information, knowledge and culture, with a clear communication of the institution identity that can promote it, its mission and vowed to quality.

New digital technologies, characterized by a good usability and accessibility level, will be applied (with reference to D. lgs. 4/2004- Code of cultural heritage and landscape and to the Recommendations of the WCAG 2.0). They can be used, both within exhibition paths on-site and online through mobile devices and for editorial initiatives. These technologies will allow to create cultural communication programs that involve the emotional and sensorial spheres, by adopting different educational strategies, for general audience as well as for the students of different school kinds and levels.

The structured digital information used by means of software with rendering devices, to offer to the visitors experiences on site using the augmented reality through the field of computer graphics and the studies of the possibilities to superimpose the digital processing to the perceived reality (Buxton 1997; Wang 2009; Butchart 2011; Huang & Alem 2011; Damala, Marchal & Houllier 2007).

Such devices will be oriented to different information plans, from the local interest of the exact museum site and its surrounding area, to a regional, national, continental and worldwide interest that can strengthen the tight links of each individual earthly dimension to the rest of the planet and of the biosphere, as well as to the universe.
At present, the most part of web portals and websites of the Italian University Museums has a reduced level of interaction with users, despite the considerable amount of contents in front of which visitors tend to have a passive attitude.

The functionality of the World Wide Web continues to expand alongside the computing infrastructure: web pages can now host many forms of interactive multimedia components. There is an emerging expectation that the Web will further expand to incorporate immersive 3D environments.

The 3D immersive multi-user virtual worlds become increasingly accessible while it offers an improved and engaging quality of experience. 3D digitization models of the objects are a relevant step of the overall process of the complete reading of the objects, in accordance with specific application requirements due to complexity of the digitization needs. The main factors that influence the suitability and applicability of a method are the complexity in size and shape, the morphological complexity, the variety of materials (Pavlidis, Koutsoudis, Arnaotoglou, Tsioukas & Christodoulos 2007).

3D digitization models that may be linked to various kinds of multimedia information also with interactive models, contribute to provide more comprehensive descriptions concerning finds that can usefully be included in databases also to set catalog cards. The interactive visualization granted by 3D models is the representation tool closest to direct inspection. The following steps of storing, managing, searching and displaying 3D objects are still uneasy processes. Digital 3D models make objects accessible on a much wider scale than in real life, since everybody could have virtual access to objects located far away, without the limitations of museum operating hours or access rights.

A digital archive of high quality three-dimensional models would constitute a great improvement because it remains durable and unalterable: high resolution models could be realized for the study of the detailed formal properties; digital models of lower resolution can document a great number of pieces. The technologies that enable presentation of interactive 3D content on the web are fundamental for building virtual exhibitions, as they permit to build both internal exhibitions accessible within the museums and remote on-line exhibitions accessible over the web. Remote access to 3D content allows users to experience distant virtual exhibitions in the same way as they can experience local 3D applications (Flotynski, Dalkowski & Walczak 2012; Pieraccini, Guidi & Atzeni 2001).

The visual impact has a big relevance: virtual reality opens various opportunities for research, representation, teaching, valorization, dissemination, protection, fruition of the cultural heritage of the University Museums. Virtual exhibitions enable the presentation of countless artifacts that cannot be directly exhibited to the public due to their fragility, limited space, or the prohibitive cost of creating and managing appropriate displays.

Visual data analysis blends highly advanced computational methods with sophisticated graphics engines to tap the extraordinary ability of humans to see patterns and structure in even the most complex visual presentations (Goilekas 2001).

The use of new advanced and sophisticated techniques (currently applied to massive, heterogeneous, and dynamic datasets, such as those generated in studies of astrophysical, biological, and other complex processes) made possible the interactive manipulation of large visual data sets using visual presentations. Advanced computational methods with sophisticated graphics engines can take advantage of the extraordinary ability of humans to see patterns and structure in even the most complex visual presentations and ultra high-resolution displays allow to zoom in to examine specific aspects of the renderings, or to navigate along interesting visual pathways (Goilekas 2001).

A virtual environment tries to evoke a strong sense of reality in the user. This is achieved by the generation of artificial inputs to the users' visual, acoustic and haptic senses. By interfacing some of the user's articulations in the real world back into the virtual environment, the user can consciously interact with the environment. Typically, interfaces to direct-manipulation devices are used, but nowadays more advanced interaction techniques like speech and gesture recognition have become a major research interest (Loscos, Tecchia, Frisoli, Carrozzino, Ritter Widenfeld, Swapp & Bergamasco 2004).

The generation of high-quality visual feedback from the virtual environment is often considered the most important aspect in generating a high degree of immersion. The desire to increase the degree of immersion led to the development of sophisticated image generators and display devices (Carrozzino & Bergamoso 2010; Lorenzo, Sicilia & Sanchez 2012).

The possibility to immerse a single user into a virtual environment also creates the desire to simultaneously share the environment with multiple users, and allows them to interact not only with the environment but also each other (Moustakas & Tzovaras 2010).

The use of multimodal systems that respond to inputs in more ways or more communication channels and support a user who communicates with an application using different modes as the voice (in a human language), gestures, handwriting, typing, audiovisual speeches can be very interesting.

The educational potential

Digital technologies facilitate many kinds of collaboration – between museum and learner, between different institutions and among learners themselves- and also facilitate personalisation: the learning potential of a versatile and mobile information source that is under the control of the learner is very big. The four thematic itineraries of the University Museums network web portal (stories, history of scientific instruments, landscapes, environments) with their underlying philosophies and their different approaches to learning, can reflect the views of the University Museums and can include for example different types of activity with learned-created outcomes: creative play, guided tour, interactive reference, puzzle/mystery, role-play/stories, simulation.

Making attention to the intergeneration of learning experiences, that is to say to wonder how educational ways are conceived and designed for different age classes, the web portal of the Italian University Museums network can became a place where users of all ages and backgrounds can engage themselves in a more in-depth analysis. Through different learning styles and levels of

knowledge the web portal can develop interest and motivation to learn more that can be transferred to formal learning environments building capacity and providing continuity. And while the portal has a role to play in capacity and continuity, it perhaps can have greatest role to play in engagement.

Another important aspect to analyze consists on multimodal learning that means what different learning styles and levels of knowledge the educational activities appealed to and how educational ways are conceived and designed for multiple users. Analyzing the contents is important to take into account at first if the multimedia devices used for the four thematic itineraries of the Italian University network allow different degree of knowledge, inspired to the concept of lifelong learning, if visitors can achieve a deep understanding of new themes and contents of the museum. At second it's necessary take into account the principles of the accessibility in the structuring the contents of the thematic itineraries for the web portal multimedia project.

The University Museum portal can have a big value also with non formal and informal learning environments in supporting young people's science learning needs. The engagement matter is essential for learning. In approching to science there must be positive engagement in particular at young ages and it is vital that we invest in young people and in the activities that will encourage their interest in science – not simply replicating the classroom experience. We must also support the adults who visit museums with them by understanding and designing intergenerational learning experiences to make a museum a truly valuable learning experience.

The Optics of Sapienza

The Optics of Sapienza is the name of an itinerary organized by the Museums of the University of Rome "La Sapienza". It can be red according to two different ways, the first referring to the content of the exposed collections, the second one to the specific perspective of Sapienza in the worldwide research framework.

The lens has been always a base component of scientific instrument. This component is relevant part of several instruments stored within the Museums of Sapienza.

The Optics instruments are largely used for the research in different areas such as medical clinical, cellular biology, chemistry, physics, environmental sciences, merceology.

Eight museums are included within the itinerary: Zoology Museum (electronic microscopy), Merceology Museum (microscopes, megascope, lanameter), Physics Museum (spectropolarimeter, projection lamp, heliostat), Chemistry Museum (reflection and fluorescence microscopes), Hygiene Museum (ultramiscoscope, old microscopes), Mineralogy Museum (gonimeters, polarizing microscope, refractometers), Medicine History Museum (photomicroscope, ancient microscopes), Anatomy Museum (electronic microscope).

From on glass observation to industrial products the cycle University - research - industry is completed. So the scientific itinerary becomes a cultural and educational incubator. The itinerary is supported by virtual and augmented reality, by both hard and digital and multi mediapress, by photos, videos, historical cartographies.

Conclusions

In order to create virtual places without space and time limits (places where anybody who is interested in a topic of the different disciplines involved in the collections of the University Museums can discuss and share experiences with other people), the web portal envisages to use social tools and content design interfaces typical of Web 2.0: they represent not only a new set of standards and services, but also an important change in relationship with our way of using internet. The emerging multichannel model, in which the web works as conductor: through distributed networks, and in particular social networks that will be adopted, connects not only cultural institutes to their users but also persons among them. This model is completely innovative for the University Museums involved in the project, which use mostly an information distribution model typical of web 1.0, that is to say the *broadcast* model in which contents are created by the cultural institutions themselves and then distributed to users through the web.

The use of social networks will be particularly relevant since it will allow to collect an audience interested in the specifically treated topics, contributing in creating a strong basis of users and/or followers that take part to the cultural life of museums. Thanks to the diffusion of the system, it will

be possible to spread the catchment area towards domains and social and cultural spheres not in direct connections with University Museums' specific activities, in order to spread broad reach and varied messages, communication, intellectual motivations.

Thanks to the collaboration of cultural associations of voluntary organizations, through the web portal it will be possible to realize common activities related to the collections of the University Museums aimed at social inclusion, with specific attention to migrants and all new citizens that bear cultural values and knowledge of various origin.
In particular a section of the portal specifically dedicated to young people is definitely innovative. This new section aims to create connections between the professional resources produced by the University within the field of knowledge, musealization and valorization of cultural historical scientific or naturalistic heritage and the world of work and research: such a service is still not present in the panorama of the organization of the University Museums. Into the web portal an informative service will be created with two main goals: to guide students in the choice of educational paths linked to scientific domain, and to guide young post-graduate through an innovative system for connections and diffusion/fruition of museum professional resources: the teleport of young museologists.

About the authors

The chapters about the catalog of collections, The Italian University Museums network web portal, Digital technologies for Italian University Museums web portal have to be assigned to Elena Corradini; The Optics of Sapienza to Luigi Campanella.

Aknowledgments

I thank Claudio Cadei for his useful and attentive collaboration.

Literature cited

Abate, D., R. Ciavarella, G. Furini, G. Guarnieri, S. Migliori & S. Pierattini 2011. 3D modeling and remote rendering technique of a high definition cultural heritage artifact. *Procedia Computer Science* 3: 848–852.

Amato, F., A. Mazzeo, V. Moscato & A. Picariello 2012. Building and retrieval of 3D objects in cultural heritage domain. In: *6th International Conference on Complex, Intelligent, and Software Intensive Systems*, ed. CISIS (Washington: IEEE Computer Society), 816-821.

Bouras, C. & T. Tsiatos 2004. Distributed virtual reality: building a multi-user layer for the EVE Platform. *Journal of Network and Computer Application*, 27, 2: 91-111.

Butchart, B. 2011. *Augmented reality for smartphones. A Guide for developers and content publishers*, Bristol (UK), JISC Observatory.

Buxton, W. 1997. Living in augmented reality: Ubiquitous media and reactive environments. In: *Video Mediated Communication*, eds. K. Finn, A. Sellen & S. Wilber (Hillsdale (NJ), Erlbaum), 363-384.

Carrozzino, M. & M. Bergamasco 2010. Beyond virtual museums: Experiencing immersive virtual reality in real museums. *Journal of Cultural Heritage* 11, 4: 452–458.

Chane, C.S., A. Mansouri, F.S. Marzani & F. Boochs 2013. Integration of 3D and multispectral data for cultural heritage applications: Survey and perspectives. *Original Research Article Image and Vision Computing* 31, 1: 91-102.

Flotynsky, J., J. Dalkowski & K. Walczack 2012. Building multi-platform 3D virtual museum exhibitions with Flex-VR. In: *18th International Conference on Virtual Systems and Multimedias* (Milano: Institute of Electrical and Electronics Engineers, Inc.), 391-398.

Goilekas, K. E 2001. *Visual effects in a digital world*. Morgan Kaufmann.

Gu, Y.X., N. Li, L. Chang & H.B. Duh 2011. A collaborative augmented reality networked platform for edutainment. In: *Mobile collaborative augmented reality system: Recent trends*, eds. T. Huang & L. Alem (New York: Springer), 1-9.

Koller, D., M. Turitzin, M. Levoy, M. Tarini, G. Croccia, P. Cignoni & R. Scopigno 2004. Protected interactive 3D graphics via remote rendering. In: *Proceedings of ACM SIGGRAPH 2004*, 695-703.

Lorenzo, C.M, M.A. Sicilia & S. Sánchez 2012. Studying the effectiveness of multi-user immersive environments for collaborative evaluation tasks. *Computers & Education* 59, 4: 1361–1376.

Loscos, C., F. Tecchia, A. Frisoli, M. Carrozzino, H. Ritter Widenfeld, D. Swapp & M. Bergamasco 2004. The museum of pure form: Touching real statues in an immersive virtual museum. In: *Proceedings of VAST 2004, The Eurographics Association. The 5th International Symposium on Virtual Reality, Archeology and Culture*: 271-279.

Moustakas, K. & D. Tzovaras 2010. Virtual simulation of cultural heritage works using haptic interaction. In: *Artificial Intelligence: Theories, models and applications* (New York: Springer), 389-394.

Pavlidis, G., A. Koutsoudis, F. Arnaotoglou, V. Tsioukas & C. Christodoulos 2007. Methods for 3D digitization of cultural heritage. *Journal of Cultural Heritage* 8, 1: 93-98.
Pieraccini M., G. Guidi & C. Atzeni 2001. 3D digitizing of cultural heritage. *Journal of Cultural Heritage* 2, 1: 63-70.
Rogers, D. & R. Earnshaw 1990. *Computer graphics techniques: Theory and practice*. New York: Springer.
Thomas, B. H. 2009. AR Visualization facilitating the architectural process: Using outdoor AR in Architectural Designing. In: *Mixed reality in architecture, design and construction*, ed. X. Wang (New York: Springer), 105-110.

Contacts

Elena Corradini, Professor of Museology and Chancellor Delegate of the University Museums
Address: University of Modena and Reggio Emilia, Department of Engineering "Enzo Ferrari", Vignolese street 905, 41125 Modena, Italy
E-mail: elena.corradini@unimore.it

Luigi Campanella, Professor of Chemistry, President of Polo Museale la Sapienza, University of Roma La Sapienza, Piazza Aldo Moro 5, Roma, 00185, Italy
luigi.campanella@uniroma1.it

Keywords

Digital technologies - Network - Catalogue