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IRAQ PROJECT: THE VIRTUAL MUSEUM OF BAGHDAD

1. Introductory remarks

A few days after the entry of the US army into Baghdad, the looting and partial destruction of the exhibits contained in the Iraq Museum occurred, and immediately afterwards, university and research institutions from all over the world offered their help. As far as Italy is concerned, the first to proffer his services was the late Prof. Giorgio Gullini, President of the Archaeological Research and Excavations Centre of Turin.

In April of 2004, in response to an invitation from G. Gullini, G. Pettinato, Assyriologist at the University of Rome, and I went to Baghdad for the purpose of submitting to the Iraqis a project for cataloguing all the written artifacts belonging to the Iraq Museum. After a whole month of extenuating negotiations, on 30th April we finally returned to Italy with a document signed by Dr. D. George, then Director General for Museums, entrusting to two Italian institutions, "La Sapienza" University of Rome, and more specifically Prof. Pettinato, and the National Research Council (CNR), in my person, the supervision of the work of restoration and conservation of the epigraphic material held there, in collaboration with the Central Institute for Restoration (ICR) of the Italian Ministry for Cultural Heritage and Activities (MIBAC). Once the first phase of the work had been concluded, we were then to pass on to the cataloguing, in collaboration with two American universities (the University of California at Berkeley and the University of California at Los Angeles) and an Austrian one (Vienna).

We reported the outcome of our visit to Baghdad not only to Gullini, but also to various Italian authorities, besides, of course, the President of Rome University, Prof. G. d'Ascenzo, and the Commissioner of the CNR, Prof. R. de Maio. Shortly afterwards, the cataloguing project was succinctly outlined to Prof. R. de Mattei, Subcommissioner of the CNR, during his visit to the Institute for the Study on the Italic and Ancient Mediterranean Civilisations (ISCIMA); as well as to the RAI meeting held in Skukuza (South Africa) at the end of July 2004.

On my return to Italy, I was summoned by the Subcommissioner, now Vice-President, who asked me for a technical report on the possibility of further intervention by the CNR for the conservation and safeguarding of Iraqi cultural goods. Among the various proposals presented, he asked me to develop the "Iraq Project: Virtual Museum of Baghdad".

This project was approved by the Ministry of Foreign Affairs (MAE) which, as part of the humanitarian mission of stabilization and reconstruction

in Iraq (Decree Law of January 2005), intended to contribute to the funding of activities and initiatives aimed at the reconstruction and safeguarding, as well as the enhancement, of the Iraqi cultural heritage. The sum allocated concerned, for the time being, only the first part of the project.

2. The projects

Following talks with CNR researchers and the results of the meetings held during the Technical Roundtable set up by the Ministry of Foreign Affairs, presided over by me and with the participation of representatives of various institutions as well as experts who have been working for years in Iraq, various persons agreed on the main guidelines and decided to participate in the project.

As a further consequence, the project became more detailed and the virtual museum gradually took shape as the communicative projection of the real museum, with which it interacts and for which it displays the historical-cultural exhibits in the form of the most important and exemplificative pieces; at the same time, the virtual museum makes it possible to explore and get to know the ancient civilizations and the geographical context in which they arose. Furthermore, the virtual museum should facilitate the utilization and understanding of the cultural, historic and scientific content of the museum artifacts quite apart from limits of space and time, providing an analytical presentation that is extremely rich in content, flexible and lending itself to personalization by the user; it will offer, in addition, the advantage of a presentation made possible by instruments for the simplification and narration required for a public of non-specialists.

Consequently the virtual museum was organized in a "narrative" section and several sections of presentation of the iconographic and historic/artistic material, which included both objects in the museum – in all of their various facets, including restoration and conservation – and the territory, as well as the legislation in force regarding protection and conservation (to which another one should be added dedicated to debate and to ongoing training). In order to achieve this, it was decided to make use of innovative methodologies for modelling the contents and for the interactive presentation, respecting the criteria of accessibility and usability.

We felt that the narrative itinerary should unfold focusing on the main rooms of the Museum, each of which represents a different culture. The narration, undertaken thanks to modern interactive visual techniques, would start off with the presentation of certain significant objects contained in the rooms of the Museum and various links would provide the possibility, for anyone so wishing, to further develop topics of special interest. During virtual navigation of the rooms, the walls would open up and disappear, to reveal instead

the places of origin of the artifacts themselves, thus permitting a preliminary, partial recognition of the ancient sites, observing rituals, seeing possible reconstructions, playing, listening to stories and voices of history and of mythology through the reading of passages drawn from epics and poetry, interacting and trying to understand the ancient cuneiform writing.

The descriptive section of the virtual museum, on the other hand, would make it possible to immediately obtain further knowledge by providing dynamic functions of presentation of the multimedia material available: images, video, animations, three-dimensional models and models of the territory. Reference was also made to the possibility of opening up other different "rooms" or "sections", dedicated to experimenting and carrying out pilot projects, training, and illustrating the vicissitudes suffered by the Iraqi collections due to the present war and historic events.

Thus the sum-total of materials on the artistic heritage was organized in accordance with three levels of communication:

– Synthetic and attractive, liable to arouse immediate interest in the user of the narrative itinerary.
– Synthetic still, but more detailed and extended to various fields of information (historic, environmental, geographical, technical) by recalling key words (the links) highlighted in the narrative film material.
– Much more systematic, analytical and documented, with vast possibilities of developments, provided by the different sections.

The overall approach was aimed at making it possible to pass easily from one level of communication to another, the virtual visit in the narrative section lasting at the most – for each room – one hour (excluding the interactive parts and the games) with the possibility for the user to decide where and when to interrupt it. Moreover, the Museum was conceived for use in Italian, English and Arabic.

In addition, training courses and scholarships were foreseen for young Iraqis to enable them to maintain the site, to enrich it and modify it according to needs and the latest technologies. As we all know, IT is advancing by giant strides so that things quickly become obsolete.

Starting off from the assumption that very few people in the world have been fortunate enough to visit the Iraq Museum and that the Museum will probably be closed for a long time, here, more than elsewhere, we felt that it was necessary to reconstruct virtually so that the IT visitor could enter, wander through and observe the most important objects displayed there. We decided that for the First Project (to be followed shortly by a second one), we should prototype everything based on four rooms in the Museum (numerical, Assyrian, Islamic, Hatra). This choice was dictated, not only by symbolic criteria, but by essentially pragmatic reasons.

After the Museum was looted, the objects which remained and were still on exhibit in the rooms were gradually removed to the storerooms that were sealed starting in 2004. Only the exhibits which were impossible to move remained in their original places, most of which were located in the three rooms entitled Assyrian, Parthian and Islamic. At that time, for two of these rooms an Italian project already existed, funded by the MAE and by MIBAC, for the restoration and partial re-opening of the Museum. Besides the three aforesaid rooms it was also decided to present and describe certain Sumerian objects that Italian specialists from the ICR were restoring. These were superb objects, unique in history. To describe them also implied presentation of the work which had been done, by opening a window on the website, dedicated to their state of conservation and showing the relative historical map of the finds. A section is planned which could and should serve not only as general information, but also as a place for ongoing training and debate both for students and experts in this sector.

The reconstruction of the rooms immediately presented a number of problems, although undoubtedly not insurmountable; consequently to expedite the project it was decided, for the prototype exclusively, to place the objects in imaginary rooms. For Project II, presented in June 2005, however, we planned, among other things, to draw up a master plan in which the rooms of the Museum were re-studied, reconsidered and proposed, both from the architectural point of view and that of layout and security. In doing this, we wished to take into account the studies and the consequent solutions for the conservation of the material on display as well as the means of museum communication and the use made of them. With respect to the original historic, environmental and geographical reconstruction of exhibits, since the idea of missions to central and northern Iraq – where the Assyrian, Parthian and Islamic exhibits on show come from – was inconceivable, it was hoped that we would be able to conduct missions in the South, where the Italian contingent was stationed, and to document, both in the form of film footage and photographs, the sites from which a number of important Sumerian exhibits came.

In both of the projects which were approved, the names of the internal and external collaborators of the CNR were included, as well as those of certain institutions which, during the meetings around the Technical Roundtable had declared their availability (such as certain Universities, the ICR and the ICCD of MIBAC as well as the Carabinieri Force for the Protection of the Cultural Heritage) and those referred to during the planning stage of the project and the continuation of work such as, for example, RAITeche, the Ministry of Defence. As far as other institutions are concerned, the extent of their collaboration is now being defined. The preliminary results were submitted to the Iraqis in February 2006 during a meeting which ended with the drafting

of a Protocol of agreement. Two Scientific Reports related to the first phases of work were delivered by the author to the DGs of the MAE.

The two projects which are described below and which deal concisely with the general guidelines, are an integral part of the relative contracts between MAE and CNR and of the financial plans, which, however we are not reporting here for reasons of space, have both been registered by the Audit Office. Some of the institutions and persons later withdrew their participation, and for this reason and in respect of their written decisions, their names have been cancelled. For both programs Prof. R. de Mattei is the guarantor, Dr. G. Perri is in charge of Virtualization, while the author is responsible for the scientific aspects as well as being coordinator and president of the Italian working group.

IRAQ PROJECT I

Foreword

The program below concerns the comprehensive initiative within the final project. The funding objective is clearly stated in the "Expected Outcome".

The Project's aim

Presently, considerable international concern is focused on Iraq and the Italian government is deeply involved in that country (not only militarily, but also in its reconstruction), a cultural and symbolic project of significant importance was undertaken, the aim of which was to evaluate the Iraqi cultural heritage as a whole, and, in particular, the Iraq Museum in Baghdad.

Brought to the world's attention because of the looting it suffered in 2003 and the critically poor state in which it still persists, the Iraq Museum is certainly one of the most important museums in the world. Not only was a wonderful and priceless collection of ancient art housed in this institution, but, significantly, also the first known written records.

The Iraq Museum is not as well known as it should be to the great majority of people, because it was closed after the First Gulf War on account of the damage caused by the bombings, and it was re-opened just a few months before the war in Iraq began. During the first period of military intervention it was again looted and plundered. Nevertheless, the Museum still houses finds of great importance for the knowledge and understanding of the history of mankind. The Italian government, before intervening in the actual reconstruction of the Iraq Museum as planned, intends with the project outlined in this paper ("Baghdad Virtual Museum") to describe its involvement, as agreed with the Iraqi authorities, in the creation of a Virtual Museum of this priceless heritage on the net.

The Italian government project has been undertaken by the Ministry for Foreign Affairs – the promoter – and the Ministry of Cultural Heritage and Activities. The Italian National Research Council, an institution that has great cultural, scientific, and technological resources, is responsible for coordinating the scientific part of the project. Future funds will be provided by other institutions and private companies.

The intention: a Virtual Museum

While waiting for the return to normal in Iraq, this project intends to offer to the public as well as to scholars a "Virtual Museum" in which all the finds previously housed in the Iraq Museum are exhibited, both those still present in it and those, unfortunately, now lost. This Virtual Museum would be, in this way, a virtual tour to the cultural roots of the world, a trip through the great civilizations of the past. This aim, which constitutes the main objective of

the Italian project, will ensue – when possible – a second objective, which is the enlargement of the Virtual Museum to include the innumerable Iraqi treasures now in museums of various countries, especially in the USA, Great Britain, France, Russia, and Turkey.

For this reason, achieving the objectives of the Virtual Museum project represents a significant gesture of friendship towards the nation of Iraq and its culture, a concrete action that strengthens the ties between the two countries involved: Italy and Iraq.

The present situation of the Iraq Museum

The modern Iraq Museum was planned in 1937 by the German architect Werner March. Begun in 1957, construction was completed in 1963 under the supervision of the Iraqi experts. It was inaugurated on November 9th, 1966. Some alterations were made in the years that followed. In the last few months, construction of a new storeroom began thanks to Japanese funding.

The exhibition rooms originally covered an area of 4,700 m^2 of a total of 45,000 and the pieces in the Museum collection were arranged chronologically from Prehistory to the Islamic Era. As shown in the plan below, the archaeological finds were divided into six sections arranged as follows:

– First Floor: Prehistory, Sumerian Room, Babylonian Room
– Ground Floor: Assyrian Room, Hatra, Islamic Room

There was also an Educational Section and the rooms devoted to Assyria, the ivory collection, Chaldeans, and Sassanians.

Over the years the Museum was extended and modified, on account of the acquisitions from new discoveries, like those from Nimrud and Sippar (which caused the Hatra section to be moved) and because of war damage. At the time of the First Gulf War many pieces were put in the Museum's storerooms and in the Central Bank vaults and never exhibited again, whereas other pieces, like the Nimrud Gold, were displayed only for a few days. After the most recent plundering, the Museum was cleared out by Iraqi authorities, with the exception of the pieces that were too large to be moved.

The Museum catalogue – and other monographic and exhibition publications – date to 1975-1976 and after this date no updatings were made. Many modifications, however, were made in the exhibition rooms and some new rooms were added. Many pieces are now lost, due to normal deterioration, theft, and plunder.

The catalogue itself suggests many possibilities: a virtual tour could be organized using the same chronological criteria that the Museum had before the war or, beginning with the new historical data brought to light in the 70's and with a completely new idea of the Museum, in agreement with Iraqi personnel, the project for the next museum could be proposed on the network. In this feasible and Virtual Museum they could employ innovative technologies that could also be applied to the "real" Museum, like the new preservation techniques. These and other working hypotheses necessarily have to be determined in agreement with Iraqi authorities, in particular with the Ministry of Culture, the President of the State Board of Antiquities and Heritage, Dr. A. Hamadi, the General Manager of Antiquities, Dr. I. Hijara, and the Manager of the Iraqi Museums, Dr. D. George.

The project stages

The project consists of four main stages, i.e. those funded by the MAE:

A) Feasibility study with classification, iconographic research, formulation of a hypertext concerning the cultural, historical, and artistic aspects of the Museum collection.
B) Virtual Museum plan.
C) Iraqi personnel training.
D) Realization of an example concerning part of an exhibition room with its artifacts in order to explain how the system will work.

Beginning with the Museum plan the project will continue with a:

A) **Feasibility study** with particular attention to the three rooms that the Italian team is preparing; to these first three exhibition spaces, a fourth has now been added in order to direct

institutions and persons that worked and are working *in situ*. Only after this first stage has been completed, and after the agreements with the Iraqi authorities have been reached, a more extensive study will be initiated. This stage will take into account all the exhibition rooms of the Iraq Museum. These two separate phases are required because we must submit concrete, even though "virtual", examples for approval.

The study consists of a preliminary survey of the material suitable for display, a definition of the classification and cataloguing criteria, hierarchical choice of displayable objects, and division into historical periods of the objects exhibited.

Displayable Material Classification Criteria

Computerized organization of all the data gathered and web content management, that will be constructed with the possibility of multilingual choice (Figs. 1-2). In this way, in the stage following the first six months, it will be possible to manage all the information in more than one language.

Collaboration will be offered by:

Central Institute for Cataloguing and Documentation (ICCD: M.R. Sanzi di Mino, Director, and M. Lattanzi, who is in charge of the "Iraq Project": digitalized catalogue and Iraq archaeological heritage); G. Bergamini (Egyptian Museum in Turin); G. Pettinato and his collaborators; C. Cereti (Professor of Philosophy, Religion and History of Iran, University of Rome); A. Bianchi (ICR); Gen. U. Zottin, Col. G. Pastore, Magg. Facciorusso of the Comando Carabinieri Tutela Patrimonio Culturale; and other scholars that will be involved in the project.

Subjects and researchers from the CNR:

IIT-Institute for Informatics and Telematics (A. Vaccarelli, coordinator; A. Marchetti and M. Tesconi, for XML classification (Fig. 3); M. Martinelli and C. Lucchesi, responsible for computerized organization and content management system); ISTI-Institute of Information Science and Technology "Alessandro Faedo" (F. Rabitti); IBAM-Institute of Archaeological Heritage, Monuments and Sites (G. Scardozzi responsible for map-making); Department of Development and Application of Territorial Computer Sytems (M. Malavasi, Director).

Displayable Material Survey

This step will include a first draft of a hypothetical hierarchical order for the objects to be exhibited; a division into historical periods of the material in the rooms; internal and external links to the objects (i.e. what is shown, in what way, what they can be linked with); virtual tours; what kind of information is given; how to access; the narrative structure; audiovisual media.

As far as the external links are concerned, a study about putting into context the Iraq Museum and the archaeological finds housed in it is programmed. Furthermore, a topographical analysis through the study of aerial photographs, satellite images, etc., will be scheduled. For these two steps, the collaborators from IBAM will be: G. Scardozzi; M.P. Caggia, M. Cultraro, F. Gabellone, A. Torrisi, the Carabinieri of Tutela Patrimonio Culturale and M. Malavasi, Director of II Department "Sviluppo e applicazione dei sistemi informativi territoriali". At the moment all the studies mentioned above will be limited to the four halls that are now under the responsibility of the following persons (scholars, restorers, Carabinieri, architects, etc.):

Assyrian Section: S. Seminara (Assyriologist, University of Rome), A. Bianchi (ICR, responsible for "Progetto Iraq"), G. Proietti (MIBAC).
Hatra: A. Bianchi, G. Proietti (MIBAC).
Islamic Section: G. Curatola (Professor of Archeologia e Storia dell'Arte Islamica, University of Udine, Task Force expert at CPA), A. Bianchi, G. Proietti (MIBAC).
Sumerian Artistic Objects Restored: G. Pettinato; A. Bianchi; Col. G. Pastore (Carabinieri); G. Proietti (MIBAC).

As far as the division of the rooms into historical periods is concerned, a working proposal is shown below:

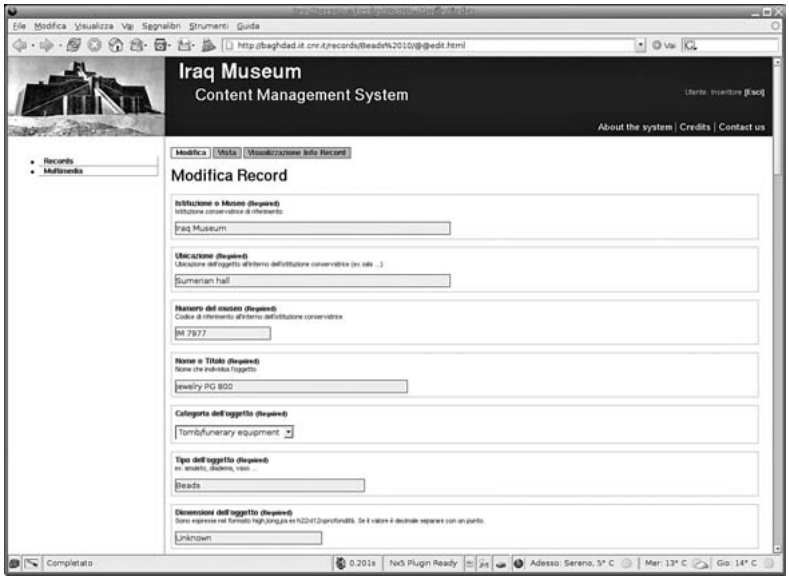

Fig. 1 – Iraq Museum Content Management System: detail of the screenshot, "Edit Record".

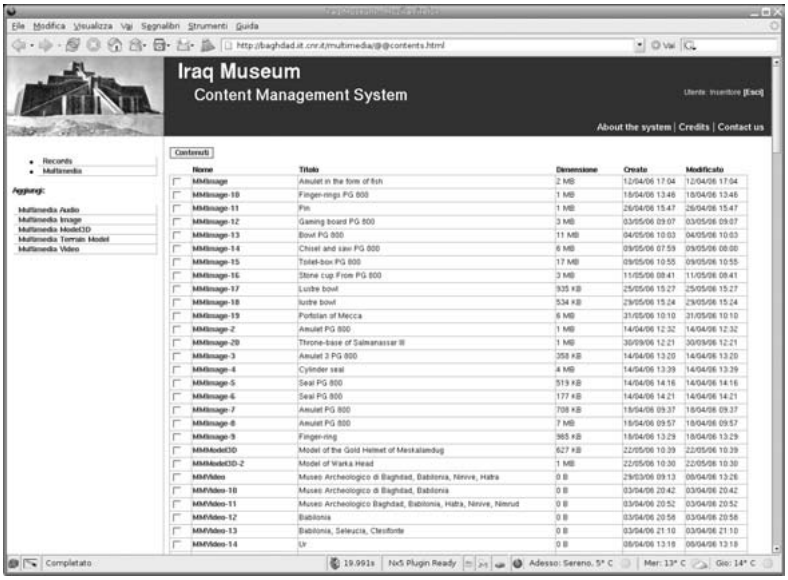

Fig. 2 – Iraq Museum Content Management System: screenshot, detail of the multimedia object's list.

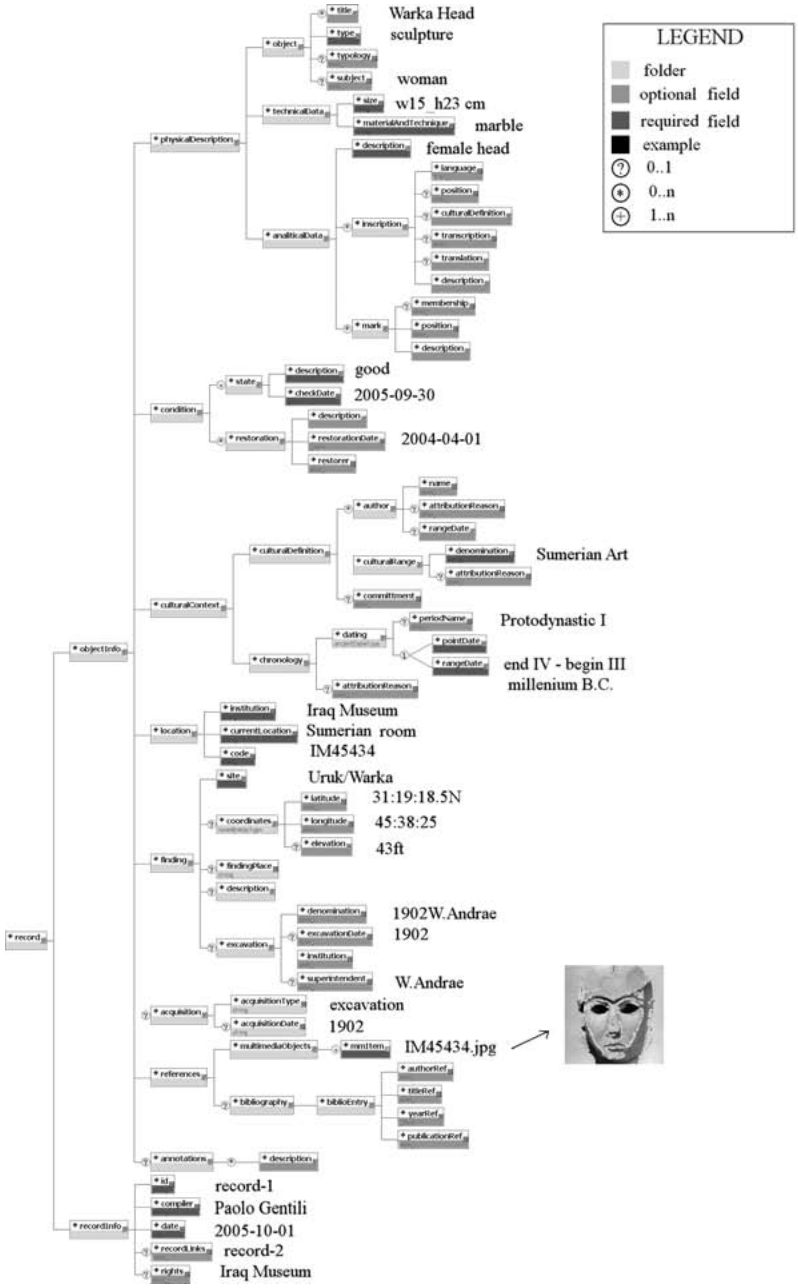

Fig. 3 – XML classification.

– First Floor: 1. The Beginnings; 2. Protohistoric and Sumerian Period; 3. Early Akkadian Period.
– Ground Floor: 4. Assyrian Period; 5. Babylonian Period; 6. Achaemenid and Persian Period; 7. Seleucid and Hellenistic Period; 8. Parthian Period; 9. Sassanian Period; 10. Islamic Period.

Moreover, a preliminary study concerning the virtual preparation, services organization, and the preservation of the exhibited material is programmed. This part of the project is under the responsibility of S. Massa (ICVBC; collaborators are: A.M. Mecchi, H. Porfyriou, L. Toniolo, D. Nichi) who will collaborate with the ICR.

An Iraqi counterpart will be found for every member of the Italian staff cited above.

B) At the same time as Part A, the **planning of the Virtual Museum** will be going on. Differently from Part A, however, a general statement in order to enable access to the Virtual Museum will be provided. The different means for visiting which are proposed can be extended to the whole Museum but, at least in this preliminary phase, will be illustrated as examples (Fig. 4a, b; Plate III, a-b).

In this step, three computer science institutions from Pisa will be involved:

IIT-Institute for Informatics and Telematics (P. Andronico, M. Martinelli, A. Marchetti and S. Minutolo); ILC-Institute of Computational Linguistics (N. Calzolari, E. Picchi); ISTC-Institute of Cognitive Sciences and Technologies (F. Antinucci in this projects is responsible for the ways the Museum communicates with the different kinds of public. This is the reason why he will be present in every step of the project. He is the coordinator of the research team that constitutes one of the many components of the "Baghdad Virtual Museum" project); ISTI (R. Scopigno. "Sistemi per la modellazione e la rappresentazione tridimensionale di oggetti"; O. Signore, F. Paternò: "Sistemi per la gestione di interfacce utenti usabili e accessibili"; F. Rabitti: "Sistemi per l'archiviazione e accesso a dati multimediali"; and P. Palamidese: "Creative Virtual System").

For data **protection and control of information access**, the following steps are programmed (carried out by the IIT, under the responsibility of A. Vaccarelli in collaboration with F. Martinelli and A. Falleni):

a) A design for a flexible certification and authorization system in order to combine each certification with a corresponding access privilege. The system has to be valid both for the data entry operator and for data inquiry.
b) The next step should be the study of a protection system through coding techniques.
c) Finally, a study of a protection system with Digital Right Management (DRM) techniques will be conducted. In particular, the use of watermarking techniques to protect the iconographic material and 3D models will be considered.

As far as the planning for the Virtual Museum is concerned the project will take into account the following aspects.

– For each "room" the following information should be accessible:

a) A complete description of each object (both textual and visual). The visual image will be particularly detailed and interactive, and include:

– High and low resolution images with data protection and personalized access rights.
– 3D models of the object that can be handled and visualized in real time. The digital models will be handed over to the Iraqi staff which will be trained by researchers from the ISTI and will work under the supervision of, and in collaboration with, researchers from the ISTI Visual Computing Lab. As for the 3D models, different data accessing strategies (in high and low resolution) will be applied.
– Short computer-aided films that will show the single object and more complex scenes (scenarios, historical background) (Fig. 5).
– Videos (digital reconstruction of the historical landscapes).

b) Reconstruction of the original context of each individual find (with geographical coordinates and, when opportune, videos concerning archaeological digs and original sites).
c) Reconstruction of the cultural and historical context.
d) Symbolic, literary, and artistic background, when appropriate.

To these "virtual rooms" three or four more could be added:

e) "Work in Progress": documentation of the works being restored. The Italian restorers, coordinated by ICR, have already cleaned and restored some artifacts that could be displayed in

this room. In this way it will be possible to offer the scientific issues to public opinion and to scholars from all over the world.
f) Temporary exhibition, concerning, in particular, the new finds.
g) Presentation of the artifacts confiscated by the authorities.

Moreover, the possibility of opening the following rooms will be taken into consideration:

h) A cybernetic shop that allows on-line purchases. The possibility of selling the 2D/3D images made for the Museum should be taken into consideration, in agreement with the Museum trustees. This merchandising would include digital images and/or posters, and 3D scale reproductions based on the 3D digital models.
i) A "room" for suggestions and comments.
l) A "room" for testing and creating pilot-projects prepared in collaboration with universities and schools in order to bring the younger public closer to the Museum and the Iraqi cultural heritage in particular.
m) A "room" to use for virtual training, where the Iraqi users can talk with the Italians in order to ask questions and solve problems in real time.
n) A "room" used to solve preservation problems that may emerge in relation to the exhibited objects and another room with suggestions for museum installations in observance of the rules for the protection and preservation of the material displayed.

Furthermore, the project will include:

– An explanation of the Museum and of the objects housed in it for people coming from an illiterate country like Iraq, a country which now must face the pressing problem of people disabled by the war. This explanation will not necessitate reading and writing skills.
– The adaptation of the texts to the communicative and stylistic features of Arabic.
– Use of the text in Italian, English, and Arabic.
– A presentation of the project.

A + B) At the same time as the above mentioned steps A and B, the following phases of the project will be instituted:

– A preliminary study of the **legal disciplining of Internet use** for the construction and management of the Virtual Museum (S. Marchisio, Director of ISGI-Institute for International Legal Studies is responsible for this part of the project. For the legal aspects concerning the net, R. Rossi, IIT, will collaborate).
– A preliminary study for the **trilingual conversion** of the project under the responsibility of E. Picchi (ILC). The aim of this study – to be completed with the organization, grading, and coding of the data concerning the treasures housed in the Museum – will be that of placing at the public's disposal (in each of the three languages available, Arabic, English, and Italian) all the descriptive information about the materials included in the Virtual Museum. For these materials, textual navigation tools will be prepared in such a way that a user would be able to use a language other than his own. Furthermore, this study will evaluate characteristics, typologies, and amount of the integrative information in order to prepare useful navigation and search tools.

C) **Training of young Iraqi personnel** in the fields indicated below and under the direction of the following institutions:

ISTI (2.5 months): a course in digital technologies and 3D visualizing and their application to the artistic archaeological heritage. The course will be held in Italy, at the headquarters of the ISTI, and its aim will be that of training Iraqi personnel in the techniques they need to know in order to make 2D and 3D images of the treasures in the Museum. The course will deal with all the information about the digitalization of the artistic masterpieces; training stages *in situ* – in laboratories both in Iraq and in other countries, as, for example, in Italian museums – will be added to it. The Iraqi personnel should already have a good knowledge of informatics (corresponding to an Informatics or Informatics Engineering Degree) and a good knowledge of English. Candidates will be selected by the Iraq Museum and the ISTI by means of a curriculum evaluation. Previous experience in working with 3D graphics will be considered as a title of preference.

Communication technologies: ISTC (15 days); ITABC-Institute for Technologies Applied to Cultural Heritage (20 days).

Fig. 4a – Details of the screenshot of the planning of the Virtual Museum.

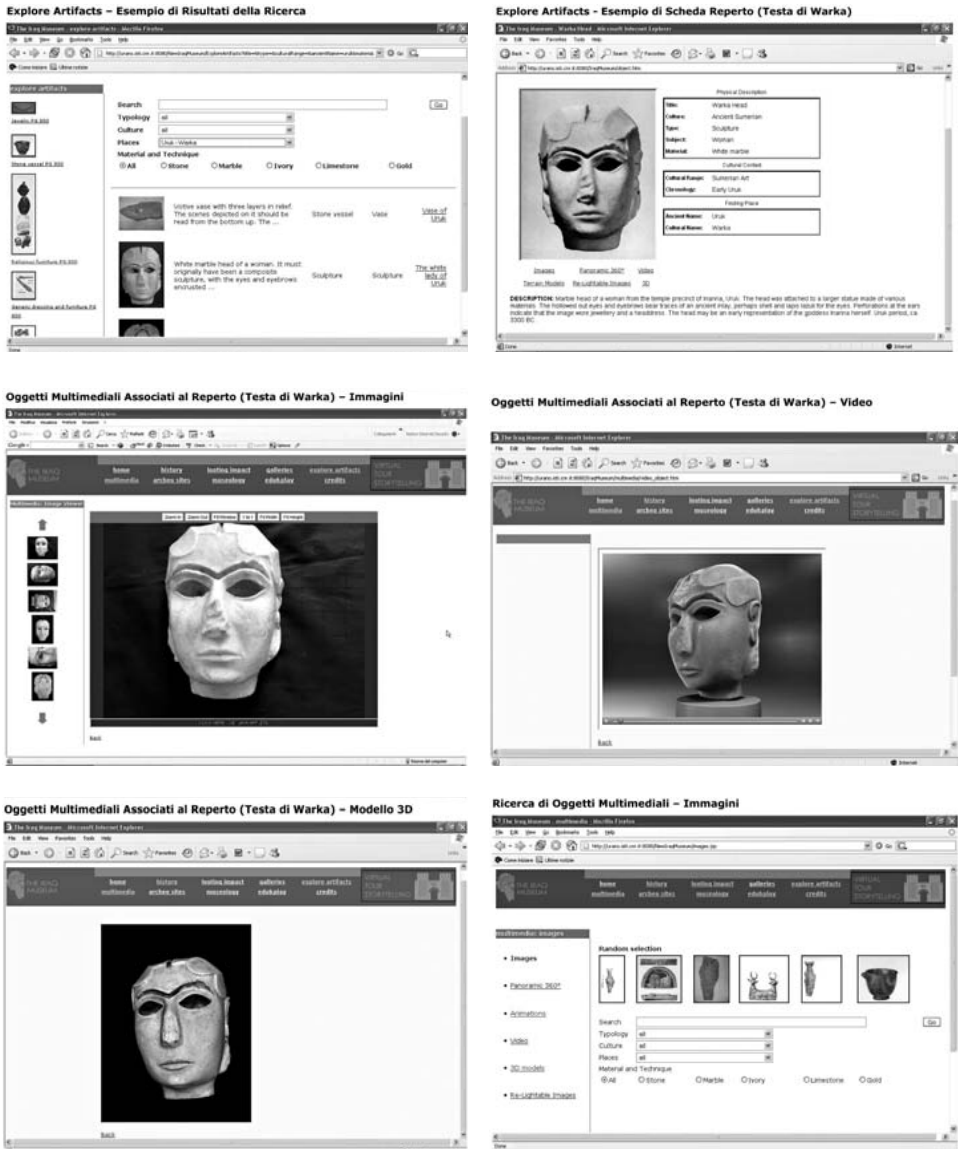

Fig. 4b – Details of the screenshot of the planning of the Virtual Museum.

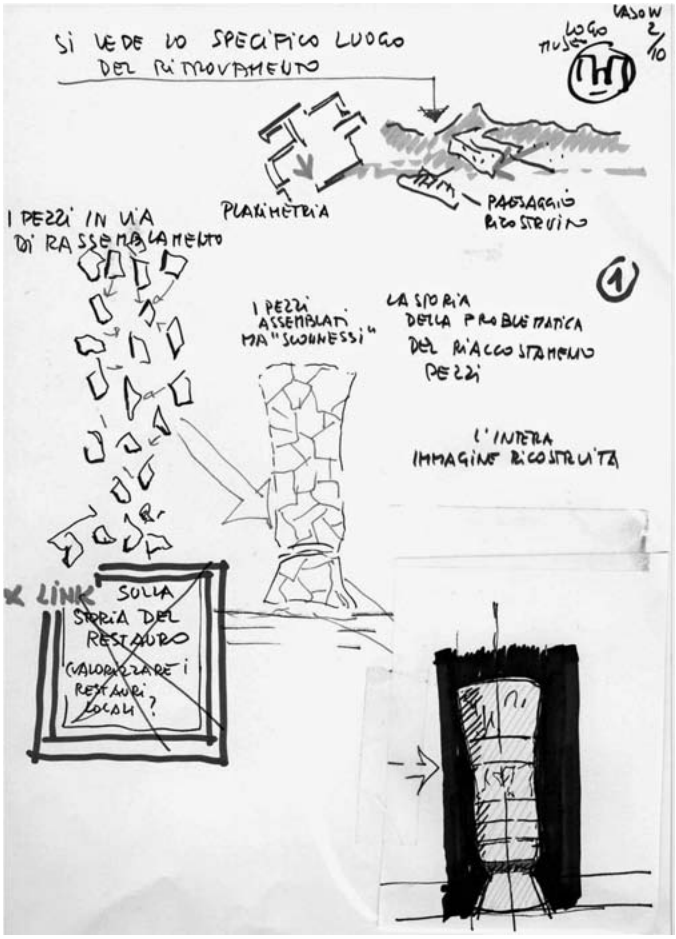

Fig. 5 – Details of Prof. S. Bracco's story board about a vase from Uruk for the Virtual Tour.

The training will be carried out at Amman and Pisa. After the course at ISTI, the digitalization in Baghdad by the Iraqi personnel will take place. Following this phase a preliminary evaluation of the raw data will be made, together with the realization of the pieces needed to create the Virtual Museum, under the supervision of R. Scopigno (ISTI) in Pisa.

D) Acquisition of documents concerning points 1 and 2 (referred to in point A) in order to create a **multimedia catalogue** and the first hypertexts and, at the appropriate time, a preliminary model. In this step many Italian and Iraqi scholars will participate under the supervision and the responsibility of Italian and foreign experts.

First formulation (conducted by the ISTC team) of evaluation tools to examine the efficacy of communication. Three meetings with the Iraqi staff are scheduled, one in Italy (Rome and Pisa) and two in Baghdad in order to share and approve the results of the project, designate the counterparts, compare progress, and adapt the texts for Arabic.

Up to this point, we have not yet considered contributions that the researchers from ITABC and the staff of the Second Video-productions Department of the Rome Research Area (under the direction of P. Malanima, ISSM-Institute of Studies on Mediterranean Societies) could give, because discussions are still in a preliminary stage.

Other CNR Institutes will be involved as problems related to their specific fields of specialization arise. Other Departments and Italian and Iraqi television officials will be contacted.

The Italian scholars contacted by the MAE that do not appear at this stage will all be called on to collaborate in the project and will became active subjects in the phases that involve the rooms where objects related to their specific specialities are displayed.

Expected outcome

1. An agreement protocol with the Iraqi staff in order to confirm approval of the project.
2. Drawing up of the document concerning the classification criteria in agreement with the Iraqi team.
3. Study and survey of objects suitable for display to be put in the first rooms; elaboration of a first hypertext with cultural, historical, and artistic components.
4. Drawing up of the final project.
5. Creation of a demonstration prototype regarding part of these first rooms, and of the artifacts housed in them, in order to offer an example of the communicative approach and how the system works.
6. Initial training of the Iraqi personnel in order to establish a real collaboration.

IRAQ PROJECT II

Preliminary remarks

The project in question has been defined also bearing in mind the indications which have already emerged from the "Iraq Project. Virtual Museum of Baghdad" now in progress, and from which, in fact, it should be distinguished, since this is an autonomous and self-sustaining initiative.

Phases of the project

In the six month program, the following different main phases of work are foreseen:

Feasibility study

While the main structure of the building of the Iraq Museum continues to hold up, the purpose of the feasibility study is, first of all, to identify the rooms of the Museum which must be redesigned in relation to their architectural-conceptual aspects and furnishings with an aim to drawing up a Master plan (overall plan) in which the following will be singled out:

– Location of the rooms for future intervention.
– Criteria of ease of access to the rooms (arrivals, entries, etc.).
– Basic security, storerooms and service facilities.

A progressively developed system of distribution of the exhibits in the rooms for a correct utilization in relation to the information provided by the Virtual Museum. For the six month program, information on the Sumerian, the Prehistoric and the Protohistoric periods are proposed.

The criteria of epigraphic order with elements of illustration and attractive descriptions, in order to provide, through play, for example, the fundamentals of the ancient forms of writing which were developed in Mesopotamia (participative sets, games based on simulation, projections, sound effects, etc.).

All of the items listed above, as well as the project itself, have to be discussed and agreed on with the Iraqi side. This aspect will be dealt with by the architects of the CNR in collaboration with Iraqi and Italian architects and experts. The coordinator, for the architectural side,

will be S. Bracco, and for the humanistic side, S. Chiodi. The organizational and architectural scheme should be based on the indications, studies and solutions provided by the ICVBC, with regard to the preparation and planning of the services connected with the conservation of the material exhibited. The coordinator for this aspect is S. Massa (in collaboration with A.M. Mecchi, H. Porfyriou, L. Toniolo, D. Nichi).

The working group of the ICVBC is participating, while awaiting a more direct involvement *in situ*, in the following activities:

– Survey evaluating the condition of deterioration of the works and the container.
– Setting up of a training course on Internet dedicated to the conservation and uses to be made of cultural assets with particular reference to the goods exhibited in the Museum.
– Survey of the environmental conditions of the Museum for the purpose of defining any design changes necessary for making it suitable for conservation.
– Integrated design of the technological systems of the Museum: lighting, security, climate.

The organizational and architectural scheme should likewise bear in mind the means of **museum communication** and how the user intends to apply the data on the artifacts as proposed by F. Antinucci (ISTC), who at present coordinates a research group from the ISTC that constitutes one of the modules of the Virtual Museum of Baghdad project.

At the same time we will start a new inspection of the **material to be exhibited,** which will include definition of the criteria used for classification and cataloguing, drawing up of the hierarchical scale of the material to be exhibited, etc., the internal and external links to the objects (what is being shown, how and with what they are associated), itineraries, type of information to be given and how to have access to the narrative structure and the audiovisual aids.

As for the external links, we will be conducting a study and topographical coverage of about eight ancient or modern Iraqi cities/sites (Baghdad, Samarra, Ur, Uruk, Nimrud, Niniveh, Hatra, Khorsabad), as well as developing a prototype virtual visit of the city, making use of aerial photography, satellite images, film sequences, etc.; the prototype city will be Ur, traditionally considered to be Abraham's native town.

G. Scardozzi, M.P. Caggia, M. Cultraro, F. Gabellone, A. Torrisi as well as the Carabinieri for the Protection of Cultural Heritage, M. Malavasi, senior executive of Office II, Development and application of territorial IT systems of the CNR, will be participating in this IBAM study. This part of the project will also include bibliographic materials:

– Acquisition of the graphic, photographic, film documentation, etc.
– Interpretation and comparative study of the bibliographic, graphic and photographic material acquired and of the satellite images.
– Development of the prototype visit to one of the cities.
– Elaboration of the site-card model to be included in the data bank of the Virtual Museum.

For film sequences, photographs, shots taken of the Museum and of the archaeological sites located in the area around Nassirija, we plan to have the Ministry of Defence, the COI and the Italian Joint Task Force participate in the project. COI and the Italian Joint Task Force, besides offering logistic support and, where needed, providing the personnel, will also supply the unsegregated material in their possession, so as to make it available on the web for civil purposes. This includes, for example, an extremely up-to-date and unknown cartography of the archaeological sites located in the province of Dhi Qar where the Italian contingent is stationed at present. We also plan that M. Balzani and F. Uccelli of the DIAPReM (Departmental Centre for the Development of Integrated Automatic Procedures for the Restoration of Monuments), of the Department of Architecture of the University of Ferrara, take part in the activity of 3D digitalization of monumental works (architectural structures, digital surveys in 3D).

New **documentary acquisition** for the creation of the multimedia catalogue, the drawing up of hypertexts, stories, narratives, short screenplays, etc. relative to the rooms to be set up during this six month period. Italian, Iraqi and foreign experts and researchers will collaborate under the supervision of Italian and other project leaders. We wish again to draw attention to the fact that the "texts" will be drafted in at least three languages and read by actors.

Along with point A, for the **Drawing up of the architecture of the Virtual Museum**, the following sectors will be analyzed:

– Study and planning of the instruments for the security and control of access to information, both at the filing level and at the various levels of utilization and use.
– Activity of promotion, documentation, maintenance and training of the instruments which have been set up, based on XML, for the structuring of the information collected; study, planning and setting up of the new instruments.
– Study and planning of a system of electronic filing for the acquisition of, indexing of, and search for "archaeological finds".
– Study of a Content Management System (CMS) with back-up for the various languages.
– Planning and setting up of a preliminary module of a Content Management System and of the multimedia metadata, with automatic extraction of the MPEG7 descriptors for video and images and back-up of interrogations by similarity on the multimedia contents.

The IIT will contribute during the second phase of the project, for the above-mentioned first four points, while ISTI will provide back-up for point 5. The IIT has had considerable experience in the aforesaid sectors through the development of specific projects and the setting up of software instruments. The activities will mainly come under the supervision of the persons in charge of the various aspects, who coordinate the research activities for which they are responsible.

Instruments for the security and control of accesses to information (A. Vaccarelli in charge).

In the second phase of the project steps will be taken to:

– "Engineerize" the prototypes available.
– Develop the instruments for security, authentication and access control, adapting those already available to the IIT.
– Study the systems of differentiated access control, based on authentication, according to the different resources available within the Virtual Museum and for the services and functions still not carried out in the preliminary version: for example, an image may be made available to all users in the low resolution mode but only to experts in high resolution mode.
– Study the systems of content protection for the artifacts themselves using ciphering techniques and single out an appropriate solution.
– Study systems of protection of the artifacts for purposes of their use, by means of techniques of Digital Right Management (DRM) and single out an appropriate solution.
– Provide any back-up for the personalization of reliable payment systems to be made available by credit institutions.
– Study and design an instrument capable of tracing the profiles of users accessing the web, also for the purpose of collecting statistics on user typology and, possibly, ensure evolution of the contents accordingly.

Instruments based on XML for structuring the information collected (A. Marchetti in charge)

We plan to carry out activities of promotion, documentation, maintenance and training. In addition we plan to define new methods for managing possible new typologies of objects.

In detail, this means carrying out the following activities:

– Creation of a system for documentation of the classification of museum objects for the purpose of facilitating their use (documentation activity).
– Setting up of systems of input and visualization, as examples of the utilization of the classification of museum objects (promotion activity).
– Release of new versions of the classification of museum objects, bearing in mind the new requirements which will arise when tickets are first sold (maintenance activity).
– Setting up of the XML classification for archaeological sites (archaeological sites activity).
– Integration into the classification schemes of further metadata useful for navigation through the cards inserted (metadata activity).
– Holding of training courses on utilization of the classification schemes produced (training activity).

Electronic filing system (M. Martinelli in charge)

The IIT will make its own contribution by providing for the study and planning of an electronic filing system. This system will be planned so that it will be capable of acquiring, in

electronic format, images of epigraphic items or of exhibits in general and of making them accessible using techniques of electronic interrogation via the web. A significant part of the activity should consist of associating with the metadata of the exhibits which will help in their description and presentation and, at the same time, permit their simple identification and search both in relation to their content and to any correlations they may have with other "exhibits". Ultra-modern technologies will be used, such as XML, XML Schema and Dublin Core.

Content Management System with multilingual back-up (C. Lucchesi in charge)

During the second phase of the project, study will be focused once more on problems relating to the management and updating of contents by various persons, possibly operating in different places, and control of the documentary flow to be published online. In addition solutions aimed at permitting content management in several languages will be analyzed. In this sector, the IIT is particularly competent in the planning and management of Content Management Systems (CMS) based on open source systems, which should undoubtedly contribute to achieving the OS objectives.

Content Management System and multimedia metadata

The management of multimedia contents, such as images and video, and of their links with the textual documents logically correlated to them, is one of the essential elements for producing a Virtual Museum accessible via the web. The setting up of the multimedia Content Management System, by the Networked Multimedia Information Systems Lab (NMIS Lab) led by F. Rabitti of the ISTI, will take place in close collaboration with IIT, since this component must interact closely with the electronic filing system and with the textual Content Management System. While performing the specific services of the system for the integrated management of multimedia and textual contents, and associated metadata, the NMIS Laboratory of ISTI will make use of the most modern technologies for setting up multimedia digital libraries, in which the NMIS Laboratory of ISTI has many years of experience and is recognized at an international level (for example, it directs the network of excellence DELOS, of the European Programme IST FP6 on digital libraries), with the following functions and characteristics:

– Filing, conservation and utilization of multimedia objects (audio/video, images, graphics) and of the links to textual documents.
– Automatic extraction of multimedia metadata as represented in the MPEG7.
– Back-up of interrogations based on similarity regarding multimedia contents and connected texts.

We plan an implementation based on Web Services, with guarantees of distribution, reliability and scalability, partly by re-utilizing the technologies and re-adapting the modules of the multimedia Content Management System MILOS: *Multimedia digital Library for Online Search* (http://milos.isti.cnr.it/), set up in the framework of various national and international projects by the NMIS Laboratory of ISTI.

The subgroup, under the direction of O. Signore, will deal with themes relating to the semantic labelling back-up adaptive exploration and to conceptual links between information (cognitive level).

For this module too, study of the trilingual conversion of the work directed by E. Picchi of the ILC is planned. The objective of this work – which integrates that of restructuring, classification and formal coding of the materials describing the Museum goods – will be, as pointed out earlier, that of ensuring access in the three languages used by the project (Arabic, English and Italian) of all the information describing the artifacts displayed in the Virtual Museum, and setting up instruments for textual navigation in these subjects in the different languages besides that used by the visitor. The project also includes an assessment of the characteristics, typologies and quantities of integrative materials for the purpose of setting up appropriate instruments of textual and content navigation and search.

The User Interfaces Laboratory (UI Lab) of the ISTI will be involved in the development of a preliminary interactive website which will be used to show examples of possible interaction and navigation on a limited number of items of information relative to the Baghdad Museum with a few initial examples of interactive games.

During this six month period, we will pay particular attention to the interactive part of the system of access and interaction with the Museum information, interfacing with the part dedicated to three-dimensional visualization and with that dedicated to content filing.

In particular, we plan to:

– Design and implement user interfaces adaptable and adaptive to different types of use (e.g.: experts, tourists, students), characterized by different modes and metaphors of navigation and content presentation.
– Insert into the interactive system interactive games to make the learning of information relating to the cultural goods more amusing and effective.
– Make the site accessible also to disabled users, backing up the guidelines of the W3C and others developed by us.

Setting up of the new rooms and access/visualization of the different information

This module also includes a complete description of each object (both textual and visual). In particular, the visual representation will be particularly detailed and interactive including:

– Photographic images, at both low and high resolution, with differentiated content protection and right of access.
– 2D and 3D models of the individual objects, which can be manipulated and visualized interactively in real time.
– Short animated film sequences (making use of computer technology), capable of showing both the individual object and more complex scenes (setting of the object, historical reconstruction, etc.).
– Video (digitalized historic film sequences made specifically for this purpose).
– A viewing of the location of each individual find (georeferential: the find with reference to its territory of origin, the making of any video documents of the excavation sites, of the zones of origin of the object). In this connection we hope to make film sequences and shots in the South of Iraq where the Italian contingent is now present.
– Historical and cultural re-contextualization.
– Any symbolic, literary, artistic references.
– Preliminary animation.

As far as the first point is concerned, the person in charge is R. Scopigno (ISTI-VCLab). This laboratory is responsible for the actions necessary for three-dimensional digitalization of the works of art present in the Museum and for their interactive presentation on the web and/or in other presentation settings.

The work schedule, coordinated by the CNR researchers and technicians on the basis of their intense cooperation and collaboration with local technicians, has the objective of training qualified technicians and of setting up the 2D and 3D digitalization activities *in situ*.

The new activity will deal with the following themes:

– Extension of the work of digitalization of Museum artifacts, extending the study case to other rooms of the Museum or works of art.
– Processing of the raw data and setting up of the components for making the Virtual Museum. Activities are to be carried out at Pisa under the aegis of the ISTI personnel. The ISTI technicians will have the task of processing the raw data produced by the Iraqi personnel, reconstructing complete 3D digital models created by filming on the site and converting them to formats suitable for their presentation on the web. In collaboration with the Italian group responsible for the planning of the website, the modes of presentation of the material produced will be both two-dimensional (panoramic images, for example in QuickTime VR format) and three-dimensional.
– Planning the setting up of multimedia material of various kinds, to be used both for the Museum presentation on the site and for conventional instruments of communication (reporting or television documentaries, backed up by didactics). In particular, reference is made both to the possibility of constructing multimedia systems in which the 3D data are connected to the historic, artistic or restoration data, as well as to the possibility of making animated film sequences starting with the 3D data surveyed.

– Modelling, analysis and classification of three-dimensional exhibits (directed by B. Falcidieno – IMATI). The IMATI group (Shape Modelling Group) is a leader in the sector of modelling and analysis of three-dimensional shapes, specializing in computational mathematics and graphics, and in the new field of coding of semantic information of the 3D models. The work schedule focuses in particular on:
– Study and development of innovative methods for analysis of three-dimensional shapes, that is of exhibits or settings of digitalized interest for the project. Particular emphasis will be laid on all the aspects of extraction of geometrical or structural characteristics able to contribute to the recognition and, consequently, to the classification of important details related to the exhibits in question.
– Definition of back-up methods for the semantic annotation of digital shapes, that is the development of approaches based on analysis of total or partial geometrical or structural similarity, which may serve to back up the annotation and indexing of the exhibits and which contribute to the formation and codification of all of the knowledge related to the exhibits in question and their setting.

Upon completion of the three-dimensional model of the Museum, virtual reproduction of the objects, and drawing up and definition of the multimedia information, we plan to start construction of the so-called "Immersive museum", a long-term objective of the CVS Lab of the ISTI. This is an attempt to represent the Virtual Museum of Baghdad and its contents in a total system of Virtual Reality, consisting of a large screen (minimum 2×3 m) for stereo visualization wearing special polarized goggles, and a special navigation and three-dimensional interrogation interface. A group of users placed in front of the screen will be able to move about inside the Museum by means of a joystick, to select certain objects and obtain multimedia information such as voices, sounds, images, film sequences, or to ask for information directly of a three-dimensional synthetic guide. It will also be possible to make a distributed version of the system in which remote users connected up to the network will be able to interact and to meet one another in the Virtual Museum.

The distributed application could be useful, for example, for an art expert in Baghdad wishing to give a lesson to a group in some other country. The modes of use and of interaction, including the itineraries and logics of user navigation, must be defined in this phase of the project together with the other partners. In this initial phase it should be possible to create a preliminary prototype with the data available, using provisional objects if necessary. The principal result will be definition of the conceptual outline of the application and of its architecture, above all referred to user interaction – what can the user do? – as well as implementation of a preliminary prototype. Having structured the scenario architecture, it should be possible to add the data and the information later on, gradually, as they are created.

The ITABC will be participating in the virtual reconstruction of certain ancient ritual structures made on site – in accordance with the groups listed earlier. As far the reconstruction of rituals and everything connected with these is concerned, in addition to two- and three-dimensional modelling, an initial graphic animation is also planned.

Contemporary to phases A and B, the ISGI will examine certain juridical aspects connected with the Baghdad Project. The person in charge of this is the director of the ISGI, S. Marchisio. In particular, the contribution of the ISGI will be concentrated on:
– Analysis, organic systematization and evaluation of international and national Iraqi law regarding the protection of cultural heritage, for the purpose of outlining and promoting legislative innovations intended to guarantee an effective internal legislation for the safeguarding and conservation of the national cultural heritage and for regulating of international trade in cultural goods.
– Examination of the juridical regulations and problems relative to the creation and management of the Virtual Museum (copyright, domain name) and to the conduction of the commercial activity of the cybernetics boutique. For the legal aspects relating to the law on Internet, R. Rossi (IIT) will also collaborate.
– Elaboration of new instruments for evaluating the effectiveness of communication (ISTC group). As regards the presentation of information, it should be recalled that this will also be addressed to average (non-expert) users and accordingly will seek, as far as possible, to make use of the modes of presentation and narration which facilitate its use, including play.

In the "virtual rooms" listed earlier, mention should be made of:

– Work in progress: documentation of restoration, under way or already completed.
– Temporary exhibitions, dedicated mainly to the new discoveries.
– Exhibition of the items confiscated by the Police.

Consideration will also be given, if not done already in the previous six months, to the advisability of opening:

– A cybernetics shop, where purchases can be made via the web.
– A space for suggestions and comments.
– A "room" for experimentation and conducting possible pilot projects drawn up in collaboration with universities and schools of all types for the purpose of encouraging, in particular, a public consisting of young people in relation to the Museum and the Iraqi cultural heritage.
– A "room" for virtual training, by means of which the Iraqis in training may converse with the Italians in order to discuss and solve problems requiring an immediate solution.
– A "room" in which problems of conservation of the objects on show are dealt with and one for the various possible solutions of lay-out, while respecting the safeguarding and conservation of the materials on display.
– A "room" for monitoring archaeological excavations and the possibility of observing them remotely also by means of written rather than video illustrations.

In addition, the project includes:

– Accessibility of the contents to users in a country characterized by a high rate of illiteracy, and which is now facing the dramatic reality of a large number of people who have been disabled or mutilated in the war; this would mean a type of access where the ability to read and write are not necessary and essential elements.
– The adaptation of the texts to the communicative and stylistic modes of the Arabic language.
– Utilization in the Italian, English and Arabic languages.
– A project of communication of accompaniment to the initiative.
– Training of young Iraqis in the various settings listed thus far and under the direction of the CNR institutions.
– Two-month course held by the IMATI of Genoa, under the direction of B. Falcidieno, on: "Computational methods for the analysis and synthesis of 3D digital exhibits" for 5 Iraqis.
– Course on the network held by S. Massa of the ICVBC dedicated to the "Conservation and Utilization of the Cultural Heritage with special reference to goods exhibited in the Baghdad Museum".
– 3 courses held by the IIT of Pisa, the duration of which will depend on the preparation of the participants. At this time, one week is hypothesized for: use of security instruments; use of instruments based on XML for cataloguing; use of instruments for content management and electronic filing; configuration, use and management of machine servers (if the need should arise).
– At least two meetings with the Iraqi counterpart, either in Italy or in Baghdad or Amman for sharing and approving the results of the project itinerary, discussing and comparing progress of the work, adapting the texts to the Arabic language and to popularization in that language, such as missions to Nassirija in order to make film sequences, take photographs, and 3D coverage of certain sites.

Other Institutes of the CNR will gradually become involved as problems arise related to their specific field of expertise. Other Ministries and persons in charge of some of the Italian and Iraqi television channels will be contacted, and we will also try to involve in the project a number of Italian and foreign experts specialized in specific sectors of Oriental art and culture, and experts will be convened to the technical roundtable of the MAE.

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ABSTRACT

The Author relates, in this article, the origin of "Iraq Project: the Virtual Museum of Baghdad", and proposes two projects that was approved by the Ministry of Foreign Affairs (MAE) which, as part of the humanitarian mission of stabilization and reconstruction in Iraq intended to contribute to the funding of activities and initiatives aimed at the reconstruction and safeguarding as well as the enhancement of the Iraqi cultural heritage.

A few days after the entry of the US army into Baghdad, the looting and partial destruction of the exhibits contained in the Iraq Museum occurred. After the Museum was looted, the objects which remained and were still on exhibit in the rooms were gradually removed to the storerooms that were sealed in 2004. Only the exhibits which were impossible to move remained in their original places.

Starting off from the assumption that very few people in the world have been fortunate enough to visit the Iraq Museum and that the Museum will probably be closed for a long time, we felt that it was necessary to reconstruct virtually so that the IT visitor could enter, wander through and observe the most important exhibits kept there. At the same time, the Virtual Museum makes it possible to explore and come to know the ancient civilizations and the geographical context in which these arose.

The Virtual Museum should facilitate the utilization and understanding of the cultural, historic and scientific artifacts of the Museum without limits of space and time. An analytical presentation is provided that is extremely rich in content, flexible and lends itself to personalization by the user. It offers in addition the advantage of a presentation made possible by instruments for the simplification and narration required for a public of non-specialists.