ADOPTION OF NEW TECHNOLOGIES IN THE SCIENTIFIC AND CULTURAL HERITAGE SECTOR: INSTITUTIONAL POLICY CHALLENGES[*]

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The institutions in the scientific and cultural heritage sector face the difficult task to follow the rapid pace in the information and communication technologies sector. While a couple of decades ago the implementation of new technologies was an exception, nowadays it is a necessity. At the same time, these organisations most frequently do not have the financial and human resources to apply newest technological developments. This paper presents some examples and concludes that under the current circumstances a reasonable approach in Bulgaria from economic and human resource point of view is the development of a specialised body which would support institutions from the sector instead of leaving the institutions to introduce them on their own. Such an approach would be more effective from economic and human resource point of view, and also would contribute to more standardised work.

Introduction. The institutions from the cultural and scientific heritage sector currently meet the following challenges related to the introduction of new information technologies:

- to implement systems that are prone to handle in order to meet the expectations of users/visitors, having in mind that the group of visitors vary dramatically in the level of computer literacy;

- to digitise increasing volume of heritage content and present it in adequate forms;

- to offer access to the treasures of the World cultural heritage by providing interoperation between its various sectors;

- to address problems related to the archiving and preservation of cultural heritage content;

- to offer personalized, interactive ways to the user exploration of heritage content.

The technologies that are now in use in the sector cannot meet all these challenges on high quality level. The recent survey of the DigiCult project funded by the EC [1] focuses on new technologies that are still not widely implemented in the cultural

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heritage sector. Such technologies are emerging at an impressive pace and the aim of the survey is to present those among them that could have a significant positive impact on the cultural and scientific heritage sector. The project is focused basically on technologies that are in an early but promising stage of deployment, on technologies that requite further development and repurposing or on technologies that have been already successfully implemented in other domains and can be easily transferred to the cultural heritage sector. This paper focuses on three new technologies, which are not widely used to the heritage sector, and on the institutional policy challenges imposed by their introduction. We have chose new technologies which are summarized and described according to the different application areas they are covering, namely:

- management of objects and collections (radio frequency identification tags – RFID);

- presentation of the cultural heritage on a scale which tends to become global (virtual communities and collaboration);

- new ways of presenting the heritage content (mobile communication).

RFID. Issues related to the management of holdings are among the core concerns for cultural heritage institutions. This area could be compared to the supply chain management in the business sector. Time of delivery, cost and prevention of losses are key factors in both cases. However, improvements of these characteristics are restricted by the traditional technologies used for tracking items where the most popular technology is known as bar-coding. The necessity to process items with human intervention (leading to limiting space and time constraints) plays a significant role. In addition bar codes are easily damaged.

An increasingly popular alternative to bar-coding is the use of *smart labels*, a technology based on radio frequency identification (RFID). Radio frequencies are used to read information on devices known as *labels* or *tags* that can be affixed to or embedded into virtually any object and that either reflect or retransmit the radio-frequency signal.

The use of smart tags in the cultural heritage sector leads to enhancement of work processes and improvement of customer service. The introduction of smart labels in fact means not only a faster way of checking the status of a particular item, but in many cases leads to a rearrangement of data processing structures within the organisation. Timeframes of the traditional services change, but also the mode of information processing (e.g. avoiding queries to databases).

Factors that are currently limiting the implementation of this technology in the cultural sector are: *cost* (investments in *specialised hardware* – readers, printers, tags and in *staff training* are required) and *low level of standardisation* (the physical data interchange is standardised, but this is not yet the case for the data structures).

The implementation of RFID offers substantial benefits such as: *reduced supply chain costs* (through less human intervention, automatic items tracking), *enhanced customer relationships* (spending less time on checking items and higher accuracy) and *improved efficiency* (through better organisation of data management processes).

A number of organisations in the sector have already adopted the smart label technology. On the one hand, the technology helps to cover traditional work processes, such as check-in, check-out, anti-theft control, inventory and asset management. Thus libraries,

archives and museums may benefit from the technology in managing their everyday work. On the other hand, innovative guiding services are provided and interesting new studies of visitors' behaviour are being launched.

The current library applications of RFID technology can be put into practice by following clear procedures. The process of tagging collection does not require extensive training and is usually done successfully by the library staff. The standard work procedures are facilitated after the implementation of RFID. Tensions due to expectation of staff cuts are preventable.

The museum applications, while on the innovative side, are not so predictable. They lie more on the border of current research and application of new technologies in experimental ways. The estimation of unexpected outcomes can be more problematic.

Existing Infrastructures Required. The technological infrastructure in the organisation definitely changes with the implementation of RFID technology. This influences both hardware equipment (gate sensors, staff stations, check-out stations, tag printers, specialised wands) and installation of new software.

Organisational structures. The RFID technology does not influence the organisational structure. Usually a core committee for the RFID implementation is set up, and in fact all organisational staff responsible for the collection management are likely to be involved in the project work.

A checklist of typical issues for discussion includes:

- Is preliminary planning covering all anticipated organisational processes, or just a subset to start with?

- What are the performance criteria for the "ideal" system?

- Is the project plan realistic compared to the experience of other organisations?

- Is simultaneous use with barcodes envisioned?

- What are the needs with regards to staff training? Will the provider train the staff properly?

- What is the most adequate way to introduce the technology to the visitors (users)?

Virtual Communities and Collaboration. Modern information technologies offer a broad range of tools supporting communication. The urge to get closer to people located all over the world, nowadays can be fulfilled in various ways. The oldest technologies from this class offered asynchronous tools such as the e-mail and mailing lists to distribute messages within a group. Later, synchronous tools gained great popularity not only as means for personal amusement, but also as channels for building professional contacts. With the implementation of peer-to-peer technologies the possibility to share resources in a new manner, using the computers of community members instead of server machines was added to communication.

These developments opened two important new possibilities:

- To attract people from all over the world to study or present cultural heritage artefacts through intensified communication;

- To build consortia with other cultural/scientific organisations in order to present the cultural heritage on a scale which tends to become global.

In addition, virtual community technologies can contribute to goals such as better and faster professional development; collecting and discussing feedback from visitors of virtual and real collections. Another class of technologies is targeted to offering new experiences in sharing a visit to museum, for example, in a new way – using devices which allow the communication with another person.

It is difficult to imagine what changes could imply all these developments. Availability of *more* resources does not mean *better* resources. More communication in a virtual world does not increase necessarily the emotional intelligence and do not prevent from alienation in the real world. The understanding of this raises the responsibilities of the specialists and organisations from the cultural and scientific heritage sector to consider carefully the options and to provide resources of the best possible quality for the emerging communities.

We can summarise that virtual communities, while looking so easy to build, require hard institutional work. What is definitely needed is extensive analysis, planning and guidance through the process of clarifying community goals and best ways to achieve them, coupled with strong alignment of personal and organizational goals and high level of commitment from participants.

The basic set of questions before an organisation which considers development of a virtual community are:

- What are the goals of work on collaborative resources or creating a virtual community: to present knowledge which is otherwise not available? To attract more attention to the collection? To support educational initiatives? To offer unique visiting experiences? To make wider the circle of people who are friends to the museum? To find ways to increase the competence and the interest of the staff to their work?

- Are these aims to be achieved in collaboration with other institutions from the same type, or from another sector?

- What work has to be done to prepare the resources for community use? (Are the resources already available in electronic form, do they need to be restructured, are the standards compatible to the practice of other participants)? Would this harm anyone's rights?

- Should the community use peer-to-peer or server-based resources?

- Would the community be controlled in some way (by a moderator, owner or other figure)?

- How the communication between participants be increased/improved?

- How the resources will be saved from malicious use?

- Should the community be built around synchronous or asynchronous technologies?

Mobile communication. To facilitate access to exhibits and visitors' experiences and learning, cultural and scientific heritage institutions traditionally present the information on the spot through labelled exhibits and docent-led tours as well as through a variety of printed materials. Digital technologies are presented most typically by multimedia kiosks and portable pre-recorded audio guides.

Publishing information on collections on the Internet or creating virtual collections gives the visitors a chance to study information on the collection they are intending to visit in advance, which facilitates learning. Yet, studying this information precedes or follows the actual visit to the exhibit.

Current mobile access technologies are a powerful tool to make the cultural institutional information resources available simultaneously with the visit. Their basic applications in the cultural and scientific heritage sector are currently of two types. The first one offers better orientation in the picture what happens in a specific geographic location—a feature that especially appeals to cultural tourism sphere, but also to indoor collections. The second one supports the process of obtaining information on specific items on display, which might be considered as a further development of the audio guides.

The current mobile technologies that could be applied to the cultural heritage institutions include devices (such as PDA's and cellular phones) and new communication protocols (bluetooth).

In contrast to the use of audio guides or other specialised devices, which had to be maintained by the cultural heritage institutions and borrowed by the visitors, the current mobile access devices are very often owned by the visitors. What is necessary is to provide wireless connection to the right information and suitable content.

Thus visitors benefit from guides offering a new level of personalization. They now have the chance to follow the most suitable learning content matching their interests, and to mingle information on the collection with WWW content, at the most suitable speed.

Mobile access devices are already applied in a number of institutions, basically in museums and open-air exhibits, such as archaeological sites. Yet, this field is expected to undergo serious changes in the years to come. A great concern currently is the understanding of the difference between the wireless and wired network approach. The wireless applications need development of new information architectures and imply specific human-device interaction challenges. The basic promises they bring are those of radically improved personalisation and connectivity, which was never experienced before in the cultural and scientific heritage sector.

The implementation of hand-held devices in cultural heritage institutions requires careful preliminary planning. A number of questions should be discussed, amongst them, with staff members assigned during the project:

- How to select the right handheld that fits to the particular museum and its specific audience? Would it be planned to use visitors' devices, or the museum will offer its own set?

- Will the mobile access devices be used as a communication tools, or the positioning features are also important? In most cases, positioning is necessary. What is the distance for tracking the visitors' location? Is it less than 10 m from the exhibits (in

this case, bluetooth, infrared devices or smarty labels will be sufficient; in the case of greater distances GPS or smart labels with longer distance should be considered).

- What kind of interface will match to the audience? Would it be possible to offer designated guiding tours to users with different types of disabilities – vision, hearing or motion impairments?

- What information delivery methods will work best (in what situation and for which group of visitors)?

- How to use the handheld as a way finding device? Who is guiding – the visitor, the device or both?

- How to track the user interest for studying visitors' response?

- Are hand-helds distracting from the exhibits themselves? Is it expected that the visitors will follow only the information supplied by the device, and forget about their partners?

- By providing more information to the visitors, will their appreciation increase, or they will feel overloaded by information?

- Does this organisation already have experience with handheld devices? If no, why? Was it because of the cost, or because of the lack of audience ability to use such a device?

- Is there enough information to justify the use of a device? Are there similar institutions that could provide feedback?

Conclusions.   The three new technologies presented above address various issues related to cultural and scientific heritage sector organisations. In the case of *RFID*, this is management of objects and collections. This is a technology requiring impressive funding, and providing better management of the everyday work. While the use of RFID is a matter of choice of the institutional managing board, *virtual communities and collaboration and mobile communications* are examples of technologies which just can not be disregarded. The adequate presentation of the organisation on the Internet and the use of tools for communication with visitors is something which makes organisation live in the Internet space. This relates also to mobile communications. Their increased popularity should be definitely taken into account as a new medium of presenting the heritage content.

Thus we have two types of technologies – these which would improve the functioning of the organisation in the first group, and those which users expect to find on the spot in the second one. The first group is most important for the effective functioning of the institution, the second – for meeting users' expectations.

In Bulgaria, the various institutions look for solutions on the introduction of new technologies on their own; the efforts are thus dissolved. It would be more efficient if there would be a national body which would assist various organisations by know how, demonstrations, expert advise and staff training.

REFERENCES

[1] `http://www.digicult.info`

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ПРЕДИЗВИКАТЕЛСТВА ПРИ ВЪВЕЖДАНЕ НА НОВИ ТЕХНОЛОГИИ В ОБЛАСТТА НА КУЛТУРНОТО И НАУЧНО НАСЛЕДСТВО

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Институциите, свързани с културното и научното наследство, срещат сходни затруднения при въвеждането на нови информационни и комуникационни технологии в своята работа. За разлика от предходните десетилетия, организациите от културния сектор са по-мотивирани да прилагат нови технологии, но обикновено нямат финансовите и човешките ресурси да се справят самостоятелно с подобни нововъведения. Докладът представя примери на три нови технологии, които все още не се използват пълноценно у нас. Направен е изводът, че при съвременните условия в България би било ефективно да се създаде специализиран екип, който да подпомага различни институции, вместо те да решават проблемите си по отделно. Този подход би бил по-ефективен от гледна точка на ресурсите (финансови и човешки) и би довел до по-високо ниво на стандартизация в областта на прилагането на информационни технологии в областта на културното и научното наследство.